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Nina P. Azari
Founding Editor

Encyclopedia of Sciences and Religions



SpringerReference

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With 61 Figures and 14 Tables

 **Springer** Reference

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*“To all who love the God with a 1000 names
and respect science”*

Preface

Since the time of Ancient Greece science and religion have been closely related, at least epistemologically. For instance, as Bertrand Russell notes in *Wisdom of the West* (1959:13), perhaps the most important notion in Greek philosophy was the concept *logos*, meaning both *word* and *measure*. We believe there are few doubts that *logos* is one of the main concepts used in both contemporary theology and the sciences, including social and human sciences.

In *Religion and Science in Context*, Willem B. Drees argues, “there is not only a need for serious study of ‘Religion and Science’, as an object to be studied, but also for serious reflection *in* ‘Religion and Science’” (2010: 150). Scientists and scholars taking the debate seriously face the following questions. Firstly, the question of how to relate scientific theories and findings to questions of faith, meaning and purpose as raised by religions and theology. Secondly, the question of how to relate empirical questions and answers to ethical and existential questions and answers. It was through questions and reflections such as these together with the quest for an adequate understanding of the world that does justice to what it means to be a human being embedded in oneself, the world, and for many, in God, that led to the emergence of the new discipline “Science and Theology”. As the name suggests, academics working in this field are interested in both science and religion in one way or another. They may belong to the academic field of the natural sciences, the social sciences, the human sciences, theology or religious studies.

Science and Theology is ideally an intellectual venture that aims at informing scientists about the theological relevance of scientific research on religious phenomena as well as at informing theologians about the impact of scientific progress on religious hermeneutics. Seen as such, a specialization of the academic field of Science and Theology seems unavoidable. However, some esteemed voices have lately become concerned about some of the recent developments in this new discipline. There is some unease about the consequences of an excess of specialization, which would render this new field too “professional” and too far removed from the traditional interests and methods of scientific as well as theological communities. Another reason disciplines may distance themselves from the academic course of study of Science and Theology is the confusion with the academic programme called Theology of Science on the one hand and the programme of Scientific Studies of Religion on the other.

Nevertheless, in the last quarter century this new academic field has attracted scholars from a wide variety of disciplines. However, such enterprises come with questions. For example, exactly which disciplines are attracted and what do these disciplines have to contribute to the debate? Hence, in order to describe accurately the shape and character of a possible relation between science and religion, it is important to clarify the identities of the suggested participants in that relationship.

Nina Azari founded the Encyclopedia of Sciences and Religions. Her idea was to produce an encyclopedia that is complete and covers all currently self-identified distinctive academic disciplines and religious traditions, within and across a wide range of cultures worldwide. Furthermore, the idea was to provide a comprehensive, up-to-date picture of how the *Science and Religion* discourse or dialogue has thus far been treated. The encyclopedia was meant to provide a starting point for new lines of inquiry and an invitation for fresh perspectives on the possibilities for engagement between and across sciences and religions. In addition, the idea was to make the current (self-)identities of the proposed participants within Science and Religion accessible to the academic community, in order for scholarship to proceed fruitfully in that field. She was successful in recruiting several of the editors listed in order to cover as many disciplines and traditions as possible. However, it soon became apparent that the project was too big to be handled by only one editor in chief. Hence, in 2008 Anne L.C. Runehov became the second editor in chief, with responsibility for the non-scientific sections while Azari would manage the scientific sections. Unfortunately, Azari retired from the project in the fall of 2010. At that point, Lluís Oviedo, being the editor for the section on anthropology, became the second editor in chief. While taking stock of the project thus far a troublesome imbalance was discovered between the amount of assigned and submitted entries in the different sections. We also realized that the guidelines needed to be revisited. Then we realized that we needed to change the direction of the scope of the encyclopedia in order to launch this wonderful ship. In this regard, we are very grateful to Springer, especially to Willemijn Arts, Anita Fei van der Linden and Harmen van Paradijs, for organizing an editorial board meeting in January 2011 in Amsterdam. At the time of the meeting, all sections represented different stages of development and different academic levels as well as different degrees of relevance, consistency and completeness. Needless to say we were forced to make some drastic changes. The meeting had several advantages. Firstly, all the editors from different disciplines got to know one another and became a devoted team working on different aspects of one encyclopedia. Secondly, divided into several groups, we could redirect and finalize the contexts of the different sections in order for the encyclopedia to meet the necessary criteria. Thirdly, we had a renewed working plan and could reinstall deadlines. Finally, when we left Amsterdam, we knew we were back on track and we had regained confidence that we would finish this important project.

The next challenge came when we, the EiCs, had to perform the final proofreading of the entire encyclopedia. At such stage, we realized that we could have prevented yet another delay of the publication of the work, if we had been responsible for the whole process from the beginning and,

furthermore, had we known more about certain layout standards. The A–Z format, together with its extended cross-references, is indeed user-friendly. The problem was that the glossary terms, which originally provided additional information to the entry in question, also were alphabetically ordered throughout the encyclopedia and were thereby taken out of their original context. The result was, besides glossaries losing their original sense, we ended up with double and triple explanations of one and the same term written by different authors. Also, we discovered that some authors had explained the term already within the main entry and provided the explanation separately as a glossary term. Hence, we had to reorganize the glossaries by removing some, gathering some into a short entry, and reentering some in the main text where we found it to be relevant. What we also realized even more clearly was that some of the questions concerning the disciplines' or traditions' self-identification were redundant. More precisely, the questions concerned with identification as a science or a religion. Obviously, sciences are not religions and religions are not sciences. Hence, and in order not to postpone publication even more, we took the liberty to remove the clearly irrelevant answers to these questions. We sincerely hope that the result of our carefully performed final proofreading will be to the author's satisfaction.

What the Encyclopedia of Sciences and Religions provides

As mentioned above, in the last quarter century, the academic field of Science and Theology (Religion) has attracted scholars from a wide variety of disciplines. The question above was which disciplines are attracted and what do these disciplines have to contribute to the debate? In order to answer this question, the encyclopedia maps the (self)-identified disciplines and religious traditions that participate or might come to participate in the Science and Religion debate. This is done by letting each representative of a discipline and tradition answer specific chosen questions. They have to identify the discipline as a discipline or sub-discipline, or tradition or sub-tradition and also identify the disciplines in relation to the Science and Religion debate. Understandably representatives of several disciplines and traditions answered in the negative to the latter question. Nevertheless, they can still be important for the debate; indeed, scholars and scientists who work in the field of Science and Theology (Religion) may need knowledge beyond their own specific discipline. Therefore the encyclopedia also includes what are called general entries. Such entries may explain specific theories, methods, and topics. The general aim is to provide a starting point for new lines of inquiry. It is an invitation for fresh perspectives on the possibilities for engagement between and across sciences (again which includes the social and human sciences) and religions and theology. This encyclopedia is a comprehensive reference work for scholars interested in the topic of 'Science and Religion.' It covers the widest spectrum possible of academic disciplines and religious traditions worldwide, with the intent of laying bare similarities and differences that naturally emerge within and across disciplines and religions today. There are medium to long entries for all potentially relevant academic

disciplines and religious traditions worldwide. The A–Z format throughout affords easy and user-friendly access to relevant information. Additionally, a systematic question-answer format across all Sciences and Religions entries affords efficient identification of specific points of agreement, conflict, and disinterest across and between sciences and religions. The extensive cross-referencing between key words, phrases, and technical language used in the entries facilitates easy searches. We trust that all of the entries have something of value for any interested reader.

It has been a long journey but a very interesting one allowing for fishing in many seas. The journey is not completely over yet because as well as the hard-cover version there is also an internet version which is to be updated on a regular basis.

April 2013

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Secondly, and naturally, we want to thank Nina Azari for initiating the idea of this encyclopedia.

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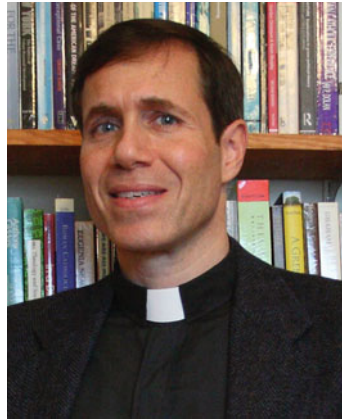
To all the authors: we once again apologize for the delay and the worries this caused you.

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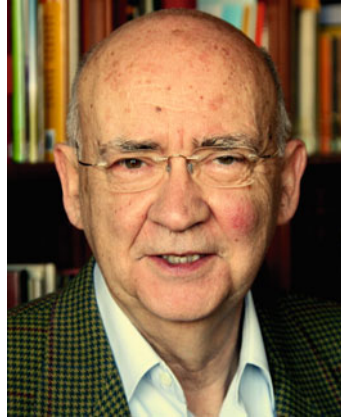
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Other well-known works include *Painted Black* (HarperCollins, 1991), which surveys the relationship between certain religious cults and violence in contemporary society; *The Interruption of Eternity* (Nelson-Hall, 1980), regarded as a standard reference work on the origins of the New Age movement; *The Digital Revolution and the Coming of the Postmodern University* (Routledge, 2002), an analysis of the online revolution in higher education; *Fire and Roses: Postmodernity and the Thought of the Body* (State University of New York, 1995), a study of what the term “postmodernism” means in a broad theoretical and cultural perspective; and *The Engendering God* (Westminster, 1995), an investigation of “feminist” strains in early Bible and early Christianity.

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His books include *The Burning Saints: Cognition and Culture in the Fire-walking Rituals of the Anastenaria* (London: Equinox 2012), and (with William McCorkle) *Mental Culture: Classical Social theory and the Cognitive Science of Religion* (London: Acumen 2013). He is a founding member of the International Association for the Cognitive Science of Religion and Managing Editor of the *Journal for the Cognitive Science of Religion*.

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A

A Priori Arguments

► [Ontological Arguments](#)

A Priori/A Posteriori

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Terms used to distinguish concepts existing in the mind independently of, and hence before (*a priori*), any experience from those only formed on the basis of, and so after (*a posteriori*), the experiences to which they relate. Immanuel Kant, in particular, held that it is only in terms of *a priori* ideas that we can make sense of experience; by contrast empiricists, such as John Locke, contended that all concept-formation was contingent upon, and so *a posteriori* to, experience.

Abhidhamma Piṭaka

► [Abhidhamma, Southern](#)

Abhidhamma, Southern

Ven. Agganyani
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Centre for Buddhist Studies (CBS), Myanmar,
Bruckmuehl, Germany

Related Terms

[Abhidhamma Piṭaka](#); [Abhidharma](#); [Philosophy in Buddhism](#); [Psychology in Buddhism](#)

Description

Abhidhamma (Pāḷi) (<http://www.abhidhamma.com>; <http://www.abhidhamma.org>) is the third division or basket (*piṭaka*) of the *Tipiṭaka* or Pāḷi canon, the foundation of Theravāda Buddhism. While similar, slightly different kinds of Abhidharma (Sanskrit) belong to the various Mahāyāna traditions or to the Hinayāna schools, the latter having perished already. “Abhidhamma” literally means the higher or special teaching (of the Buddha). It is a huge collection of systematically arranged, tabulated, and scientifically classified teachings of the Buddha, representing the quintessence of his teachings, timeless and independent of culture, race, and gender. Abhidhamma is the Buddhist philosophy,

describing the reality and truth completely. Abhidhamma is also the Buddhist psychology, dealing mainly with mental phenomena and explaining in detail how the mind works and how it can be liberated.

In the discourses (*sutta*), the Buddha takes into consideration the intellectual level of his audience, their development of the perfections (*pāramī*), their attainments, and the specific situation. He therefore teaches the dhamma in conventional terms and relative concepts (*paññatti*), referring to persons and objects as I, he, she, man, woman, cow, tree, etc. In the Abhidhamma, however, the Buddha does not make such concessions, but is treating the dhamma entirely in terms of the ultimate reality (*paramattha*). All phenomena are analyzed into their ultimate constituents (*dhamma*) which are precisely defined, classified, and systematically arranged. Then, the laws of interaction between the dhammas are taught, their synthesis – a net of conditionality.

The Abhidhamma Piṭaka ([Nyanatiloka](#)) consists of seven books:

1. Dhammasaṅgaṇī – Enumeration of the dhammas, “Buddhist Psychological Ethics”

Description of the fundamental, ultimate mental, and physical phenomena constituting human experience.

2. Vibhaṅga – “The Book of Analysis”

Exposition of the analysis in the Dhammasaṅgaṇī in form of a catechism with many references in Suttanta.

3. Dhātukathā – “Discourse on Elements”

Description of the 18 elements in sets of questions and answers. Similar substance like Dhammasaṅgaṇī and Vibhaṅga.

4. Puggalapaññatti – “A Designation of Human Types”

Description of the qualities of individuals and personality types. By differentiation, suitable teachings and meditation subjects can be given individually.

5. Kathāvatthu – “Points of Controversy”

Collection of questions and orthodox answers in order to show superiority and distinguish Theravāda from other schools (compiled by Moggaliputta Tissa in the third century B.C.).

6. Yamaka – “The Book on Pairs”

Twisted and vice versa Abhidhamma questions and answers for deep understanding.

7. Paṭṭhāna – The Book of Conditions or “Conditional Relations”

Explanation of the 24 forces working between cause or condition and effect. Describing the laws of interaction of the dhammas analyzed in Dhammasaṅgaṇī, this is the great synthesis.

Self-Identification

Science

Abhidhamma, which presents itself as very abstract, profound, logical, and scientific, should not be looked upon as all theory and pure scholasticism. Abhidhamma stems from empirical knowledge of the Buddha which he acquired by his full enlightenment. It describes the full range of knowledge, insight, and human experience with all and everything. Studying Abhidhamma can be compared with studying a map, but the map has to be used; one has to travel in order to reach the destination or, rather, to achieve one’s goal. Abhidhamma alone is just abstract science. It has to be applied in daily life and meditation.

Religion

Abhidhamma is to some extent religion in which one is supposed to believe or have confidence in, as long as one has not yet experienced it oneself. But the more one can prove by own experience with clear, sharpened mind, especially in Vipassanā meditation, the more confidence (*saddhā*) will arise in one’s mind. The Buddha himself did not talk of his teachings as religion, and encouraged and urged to accept and believe only what practically turns out as wholesome and beneficial for liberation. People turned the dhamma into a religion called “Buddhism.” Buddhism, and especially Abhidhamma, has nothing to do with a creator god or a god responsible for our life and fate. To the contrary, Abhidhamma clearly explains about life, death, rebirth, *kamma* and its result, and all causality-conditionality. Therefore, it can be seen as

a doctrine transcending death and giving its followers meaning in life, sense, guidelines, and understanding.

Albert Einstein is ascribed to have said: “The religion of the future will be a cosmic religion. It should transcend a personal God and avoid dogmas and theology. Covering both the natural and the spiritual, it should be based on a religious sense arising from the experience of all things, natural and spiritual as a meaningful unity. If there is any religion that would cope with modern scientific needs, it would be Buddhism” (Quotation ascribed to Einstein according to: <http://www.spaceandmotion.com/Albert-Einstein-Quotes.htm>, referring to Albert Einstein (1954)). Most probably Einstein did not come into contact with Abhidhamma, which would have been a wonderful supplementation and enrichment.

Characteristics

While other religions have to be accepted because of a god, heavenly messenger, or prophet, Buddhism and Abhidhamma are to be accepted and practiced only if, when tested, lead to wholesome states, more happiness, calmness, serenity, mental peace, and liberty (Essence of the popular Kālāma Sutta, Collection of Gradual Discourses, A III. 66). One follows according to one’s own level of insight and understanding.

While traditions and religious teachings, including most of the Buddha’s discourses (*sutta*), give practical guidelines and explanations to concrete persons in various, distinct circumstances, cultures, and eras which might no longer be suitable for our present age and problem, Abhidhamma – with its ultimate realities (*dhamma*) – offers a complete, abstract picture so that we can find our own answers for an ethical and wholesome life, for mental development, and for understanding the world and seeing things as they really are. All other religions and common philosophies rely on a soul or self (*atta*) in one way or another and follow personality belief either with eternity or annihilation views, while the Buddha taught nonself, soullessness (*anatta*) and Abhidhamma can be regarded as a huge compendium on *anatta*.

Relevance to Science and Religion

Abhidhamma, explaining things and phenomena according to the experience of the fully enlightened Buddha, does not need a proof by science and also does not fear science or any new results from research. There can never be a contradiction. Abhidhamma encourages scientific research, and some modern Abhidhamma scholars and practitioners are interested in related sciences, like physics (especially quantum physics), neurology, psychology, modern ways of psychotherapy, and research in the field of meditation, psychosomatic diseases, and working of the brain, mind, and memory.

Sources of Authority

There is the story or legend in the Theravāda tradition that states Abhidhamma was first taught by the Buddha for 3 months in the 7th year after his enlightenment in *Tāvātimsā* heaven to deities including the Buddha’s departed mother, who had been reborn there. Ven. Sāriputta, one of his main disciples and second in knowledge after the Buddha, had received a brief summary each day from the Buddha himself. Then, Ven. Sāriputta formulated and arranged what we call Abhidhamma today and taught it to a selected group of his monk-pupils, who were ready to grasp it. Sāriputta might be the real author indeed, since he is known through the *suttas* as a very analytical, sharp-minded person. His excellent knowledge and way of explanation were praised by the Buddha himself.

Modern Buddhologists, linguists, and historians claim that the Abhidhamma is a later work. Traditional Buddhists deny this and maintain that at least the essence of the Abhidhamma goes back to the Buddha himself, while later rearrangements and rewording found in the books are of minor importance. All six Buddhist councils, the first was held just 3 months after the Buddha’s death, up to the latest international council from 1954 to 1956, have reexamined, accepted, and confirmed the Abhidhamma Piṭaka as authentic and correct. An exception is the

fifth Abhidhamma book, Kathāvatthu, which definitely is more recent and was included during the third council under King Asoka in 246 B.C. (Nyanatiloka).

Further, Abhidhamma is consistent with and does not contradict the Suttanta, but systematizes and explains the manifold contents of the *suttas* in greater detail.

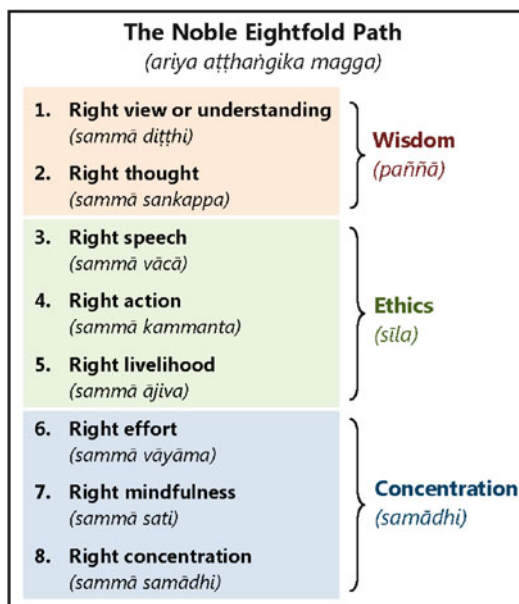
Last but not least, Abhidhamma gets its natural authority by being confirmed and proved true by generations of meditators according to their own experience.

Ethical Principles

Ethics and morality are the basics and foundation of Abhidhamma. Without an ethical lifestyle as foundation, no insight, attainment, or realization is possible. In the Abhidhamma, all phenomena (*dhamma*) are classified according to their ethical qualities, which additionally have to be kammically wholesome in the sense of leading in the right direction toward goodness and liberation. The traditional system of classification of consciousness and mental states therefore differentiates between wholesome, unwholesome, and kammically variable or neutral states. Abhidhamma always stresses their difference, their origination, and their impact. Without blaming unethical persons or behaviors, without dos and don'ts, the Abhidhamma just teaches the abstract facts of these wholesome and unwholesome physical, verbal, or mental actions. It is up to everyone which path to follow, ethical or unethical, but one should know the effects – not only for others but also for oneself. One who really understands and penetrates Abhidhamma will definitely train oneself and lead an ethical life.

Key Values

Key values according to Buddhism are ethics (*sīla*), concentration (*samādhi*), and wisdom (*paññā*), which together form the Noble



Abhidhamma, Southern, Fig. 1 Constituents of the Noble Eightfold Path

Eightfold Path (*ariya aṭṭhaṅgika magga*), leading to the cessation of suffering (Fig. 1).

Abhidhamma teaches all three values systematically and in the ultimate sense. Being a Buddhist psychology, Abhidhamma analyzes the connected mental states, the circumstances and conditions which lead to their arising, or, in the case of ethics, the right mental attitude and motivation in order to behave ethically.

Some factors of the Noble Eightfold Path, like concentration and effort, can be either wholesome or unwholesome. The Abhidhamma offers criteria how to differentiate and decide, which one should be developed, and which one should be abandoned.

The purpose of struggling and developing these values is the final goal of liberation, the attainment of *Nibbāna*. The way is shown as a step-by-step process through increasing insight and knowledge and by penetrating the realities or, rather, experiences, and through realizing them as impermanent (*anicca*), as suffering or unsatisfactory (*dukkha*), and as nonself or uncontrollable (*anatta*). The Abhidhamma aims specifically at the understanding of *anatta*.

Conceptualization

Nature/World

Abhidhamma has a realistic view. The world is made up of animate and inanimate things. According to the Abhidhamma, inanimate things such as mountains, rocks, trees, tables, or books are made up of matter only, of various material qualities or physical phenomena (*rūpa*). Animate or living beings consist of mind and matter (*nāmarūpa*). These various mental and physical phenomena comprising beings and the world are taught in detail in their origination and relation in Abhidhamma. The conditional relations of phenomena, following natural laws, are seen in the interrelationship and dependence among beings and in the whole nature. Therefore, to care for the nature, the environment, and others will in turn lead to caring for oneself. Nature is not seen as perfect, but because of its characteristic of impermanence (*anicca*), unsatisfactoriness (*dukkha*), and nonself (*anatta*), nature belongs to the conditional world (*Samsāra*) and is tied to the endless cycle of arising and dissolving, of birth and death.

Human Being

A human being is mainly differentiated from other beings by its rebirth consciousness (*paṭisandhi citta*), which is a direct product of its previous wholesome kamma. The Abhidhamma describes 31 planes of existence in the world; only one is human, and only two, human and animal, planes can be perceived by us. Productive *kamma* decides where and as what kind of being one is reborn. It is said, as a human being, one has the best chances for mental development and liberation because there is much freedom in decision. In this plane, various types of *kamma* can ripen and produce results; usually a mixture of happiness and suffering is experienced that can motivate one to struggle and train the mind.

Life and Death

Life or a living being is characterized in the Abhidhamma by two phenomena called life faculty (*jīvitindriya*) (**Bodhi**; **Tin Mon**). There is

physical life or physical vitality in the material groups, which has the function to protect the coexisting matters from rotting and decay. It is a direct and immediate product of *kamma* and makes the difference between the body of a living person and a human corpse. The other life phenomenon is mental or psychic life or psychic vitality, which is a mental factor (*cetasika*) associated with all types of consciousness (*citta*) and various kinds of mental states. Its function is to protect the coexisting mental phenomena within the same mental unit for a certain tiny lifespan. The great majority of beings consist of mind and body, having both mental and material life. Some beings of the higher planes of existence consist of mind only, without bodies, having only mental life. Then, there is a rare unconscious being (*asaññasatta*) in higher planes of existence who has no mind but is made up of matter only, having at least material life.

How is it that there are all these different beings and types of life? They are all results of various and quite different *kamma* performed in previous lives. The higher planes and life without body, that is, only mind, or without mind, that is, only body, are reached through intense meditation, through attaining and mastering the various meditative absorptions (*jhāna*) and through special aspirations.

For the birth – or rather conception – of a human being, three things have to coincide: Mother and father, that is, ovum and sperm, need to be present and, as main factor, a kammic impulse from a just departed being. The death of a being once again has to do with kamma. Death, that is, the cutting off of the individual lifestream of a being, may happen because of four reasons according to Abhidhamma:

1. End of lifespan (differs for species and in epochs)
2. End of kammic energy of the life-producing *kamma*
3. Case 1 and 2 together
4. A destructive *kamma* which intervenes and cuts off the energy of the life-producing *kamma*

Abhidhamma, Southern,**Fig. 2** Reality according to Abhidhamma**Reality according to Abhidhamma**

Conditioned realities (<i>sāṅkhata dhammā</i>)				Unconditioned realities (<i>asāṅkhata dhammā</i>)
Conventional realities Conventional realities/concepts (<i>paññatti</i>) conventional truth (<i>sammuti sacca</i>)		Ultimate realities Ultimate realities (<i>paramattha dhammā</i>) or ultimate truth (<i>paramittha sacca</i>)		
<i>nāma-paññatti</i> name of a thing, phenomenon, person or being	<i>attha-paññatti</i> thing, person or being itself	<i>nāma</i> mind, mentality, mental / psychic phenomena <i>citta</i> (89/121) = consciousness <i>cetasika</i> (52) = mental factors, mental states, mental qualities	<i>rūpa</i> matter, body, corporeality, material / physical phenomena 28 <i>rūpas</i> : 4 great elements, 5 sense-organs, sense-objects, etc.	<i>Nibbāna</i> 1. <i>kilesa-nibbāna</i> = <i>sa'upadisesa</i> <i>Nibbāna</i> 2. <i>khandha-nibbāna</i> = <i>anupadisesa</i> <i>Nibbāna</i>
Objects for <i>Samatha</i> meditation		Objects for <i>Vipassanā</i> meditation Universal characteristics: <i>anicca, dukkha, anatta</i>		Object in the enlightenment (<i>magga + phala</i>) Characteristic: <i>anatta</i>

Death caused by case 1–3 is called timely death, while case 4 is called untimely death, which might happen even at young age by a fatal accident or a life-threatening disease.

The Abhidhamma gives minute explanations about the working of *kamma* and the mental death and rebirth processes. *Kamma* performed or remembered just before dying has a great chance to produce the next life. In that way, Abhidhamma even proves the benefit of modern hospice work by providing guidelines to relatives or nurses who accompany a dying person.

Reality

Abhidhamma is a science of reality or rather “realities.” First, there is the differentiation into conventional and ultimate reality or truth. In daily life, we deal only with concepts (*paññatti*) which are essential in the field of ethics, loving kindness (*mettā*), compassion, etc.

To see with Abhidhamma or “Vipassanā eyes” means to see the ultimate realities (*paramattha dhammas*) (Boriharnwanaket) behind the facade of concepts and to penetrate through to their characteristics in order to let go, detach, and liberate the mind.

Second, reality is twofold: conditioned and unconditioned. Whatever phenomena, things, beings, and states – they are all conditioned.

The only unconditioned reality is *Nibbāna* (Sanskrit: *Nirvāna*).

Abhidhamma deals with ultimate reality, conditioned and unconditioned. (<http://www.abhidhamma.com>) Ultimate realities are what really can be experienced by the six senses directly. The Abhidhamma distinguishes four ultimate realities:

1. Consciousness (*citta*)
2. Mental factors (*cetasika*)
3. Matter (*rūpa*)
4. *Nibbāna*

These four kinds of reality are again classified manifold. Abhidhamma enumerates 170 (or 202, if consciousness is classified into 121) different realities (Fig. 2).

These ultimate realities are ultimate in the sense that their characteristics do not change, whenever they are present, not that they are permanent themselves. For example, anger is not permanently with us, but whenever anger arises, it presents itself with the same typical distinguishing features. Each ultimate reality has its specific, individual characteristic, manifestation, and function. Therefore, each reality is defined exactly and, in practical experience, can be distinguished clearly by a sharp, well-trained mind. Universal characteristics of all ultimate, conditioned realities are:

- Impermanence (*anicca*)
- Unsatisfactoriness or inherent suffering (*dukkha*)
- Nonself (*anatta*)

In contrast, *Nibbāna*, the only unconditioned reality, has the characteristics of permanence and satisfactoriness or happiness (*sukha*). Yet, as the conditioned phenomena, *Nibbāna* too has the characteristic of nonself (*anatta*).

Knowledge

Different kinds of knowledge are differentiated in Abhidhamma (Bodhi; Tin Mon): knowledge by own thinking (*cinta mayā ñāṇa*), book knowledge or knowledge by listening (*anubodha-ñāṇa* or *suta mayā ñāṇa*), and direct knowledge by own, intuitive, and penetrative insight (*paññā* or *bhāvanā mayā ñāṇa*), the latter being the most important and transforming knowledge, which includes insight knowledge (*Vipassanā ñāṇas*). Meditators have to go through these insight steps in order to attain *Nibbāna*. Only the Buddha himself is awarded omniscience (*sabbāññūta-ñāṇa*).

Knowledge (*ñāṇa*) or wisdom (*paññā*) is one of the “beautiful” mental factors (*sobhana cetasikas*), which can associate only with wholesome and beautiful types of consciousness. It definitely should be developed and included in all actions. If knowledge is associated with beautiful mental factors, then the kammic quality of a wholesome action becomes stronger and better. Furthermore, in Abhidhamma we learn that only people with a kammically acquired rebirth consciousness associated with knowledge can attain meditative absorptions (*jhāna*) and may attain *Nibbāna*, that is, path and fruition consciousness (*maggā* and *phala citta*).

Truth

Truth is often mentioned in the same sense as reality. However, conventional truth and ultimate truth are differentiated. The dhamma is attributed truthfulness (*svakhata*) and timelessness (*akalika*), that is, it is a teaching according to the truth, giving ever true replies to questions about suffering, its origin, and its cessation, and describing solution of existential problems of past times as well as today.

Speaking about truth in Buddhism implies speaking about the Four Noble Truths, the quintessence of the Buddha’s teachings. They are explained in greater detail in the doctrine of dependent origination (*Paṭiccasamuppāda*) which is clearly explained in the Abhidhamma too (Nyanatiloka; Bodhi; Tin Mon; Buddhaghosa b, c) (Fig. 3).

The first noble truth of suffering is found in the second and fourth section of the circle comprising the phenomena conventionally called birth, decay, death, sorrow, lamentation, pain, suffering, and despair. In terms of ultimate truth, they are phenomena like resultant consciousness (*viññāṇa*), mind and matter (*nāmarūpa*), sense bases (*saḷāyatana*), contact (*phassa*), and feeling (*vedanā*), which are the kammic results (*vipāka*) that we have to face.

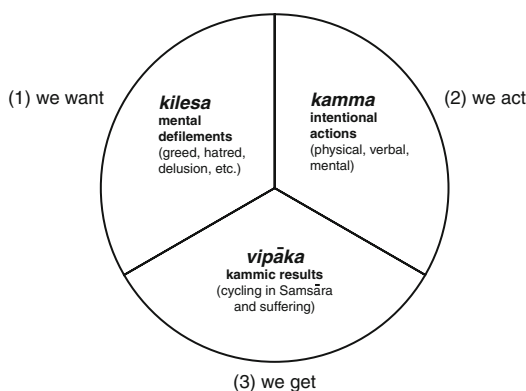
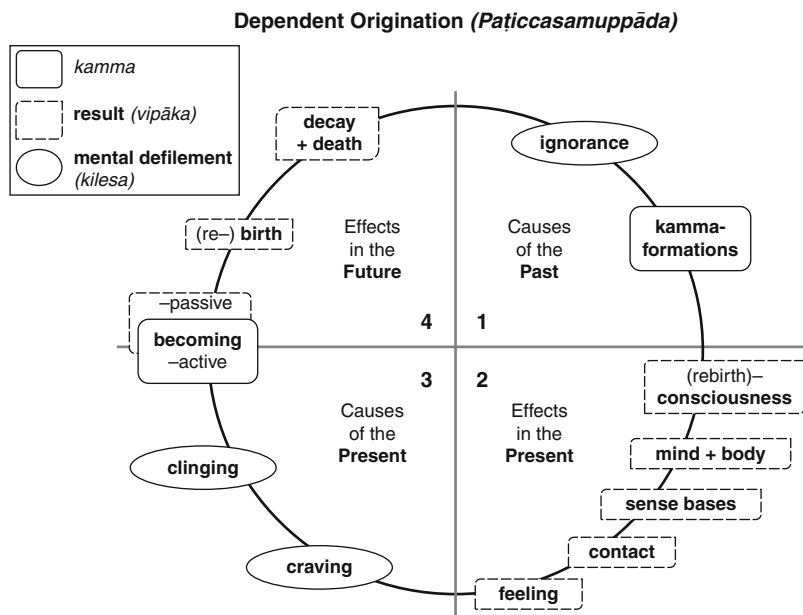
The second noble truth of the origin of suffering is found in the first and third section of the circle: Ignorance (*avijjā*) and kamma formations (*saṅkhāra*) are mentioned as past causes for suffering, craving (*taṇhā*), clinging (*upadāna*), and active, kammic process of becoming (*kamma-bhava*). Indeed all these factors worked in past, work in present, and will work in future as a natural law – as long as we have not yet found and used the exit. In this way, *Paṭiccasamuppāda* explains *Samāsāra*, the endless cycle of cause and effect of suffering. Summarizing it can be said that Kamma produces its results (*vipāka*) with the help of mental defilements (*kilesa*), like ignorance and craving. The way to stop suffering, that is, painful, undesirable results, is not to stop actions (*kamma*), but to eradicate the defilements (*kilesa*) (Fig. 4).

This cessation of suffering or the end of the cycle of *Samāsāra* is *Nibbāna* – the third noble truth. And the path to achieve this practically is the Noble Eightfold Path, which constitutes the fourth noble truth. These are fundamental truths in conformity with natural laws.

Perception

Perception (*saññā*) according to Abhidhamma (Bodhi; Tin Mon; Boriharnwanaket; Buddhaghosa b, c) is a universal mental factor (*cetasika*), that is, it associates with all types of

Abhidhamma, Southern,
Fig. 3 Dependent
Origination



Abhidhamma, Southern, Fig. 4 Cycling in Samsara

consciousness. It is the awareness of an object's distinctive marks. If, through repeated perception of an object, these marks are recognized, *saññā* functions as memory. Sometimes *saññā* can mislead if it compares a new, similar object with the memorized marks of a previous object.

Perception is sometimes used for the whole mental unit including consciousness. But still, an object cannot be fully perceived or known clearly by just one mind moment, one single unit of sense perception, which is conditioned by the sense organ and its corresponding object.

Abhidhamma commentaries (Bodhi; Tin Mon; Dhamma 2007) explain that at least four mental processes (*vīthi*s) are necessary to be able to know and name the object which, for example, was seen in the first process only. Each process is made up by 17 or 12 mind moments, respectively, following each other in fixed and reasonable series.

Usually people say and think “I perceive” or “myself perceives this and that.” Yet, according to Abhidhamma only bare processes are running, conditioned by certain circumstances. There is no perceiver, no observer, no creator, no soul, or no self behind it. Just impersonal processes devoid of I or self.

Time

Time is a concept that – according to Abhidhamma – is relative and is derived from changeability, impermanence, and movement in phenomena. “Chronological time (*kāla*), denoted by reference to this or that event, is merely a conventional expression....Since it has no existence in itself, one has to understand it as a mere concept (Atthasālinī, §58–59, commentary by Buddhaghosa to Dhammasaṅgaṇī, the first of the seven Abhidhamma books).” Albert Einstein

puts it tersely: "Time is what one reads from the clock (Quotation ascribed to Einstein)." The measurement of time is possible only because of the movement of the hands relative to the clock's face or by marking events or certain states in changes: birth and death, sunrise and sunset, and appearance of a phenomenon and its disappearance. The shortest time span that can be defined according to Abhidhamma is the duration of one of the three submoments of consciousness: (1) the arising submoment, (2) the existence or standing submoment, and (3) the falling or vanishing submoment. All three together form one mind moment, that is, the lifespan of consciousness. Seventeen times longer than that is the lifespan of matter.

In Abhidhamma and its commentaries, past, future, and present times are defined precisely for the material and mental phenomena or the five aggregates (*khandhā*) respectively according to four points: period of time (*addhā*), continuity of a process (*santati*), occasion (*samaya*), and moment (*khaṇa*) (Buddhaghosa b, c) (Path of Purity (Visuddhimagga), XIV, §494 or §472/473 in most translations).

Concerning *Nibbāna*, the unconditioned reality, the concept of time becomes meaningless and cannot be applied.

Consciousness

Consciousness (*citta*) is one of the four ultimate realities in Abhidhamma (<http://www.abhidhamma.com>; <http://www.abhidhamma.org>; Bodhi; Tin Mon; Boriharnwanaket; Dhamma 2007; Buddhaghosa a, b, c). It is that which is aware of an object or cognizes the object. Consciousness always has an object; it might be a present sense object or a mental object, a thought or a memory.

Throughout life there is consciousness, one consciousness after the other without gap, but only one consciousness a time. Even when someone is "unconscious" like in coma or when fainted, a subtle, passive type of consciousness (*bhavaṅga*) is present. Therefore, it is spoken of a "stream of consciousness" which flows continuously according to its conditions from birth to death and continues in the next life (*citta*

santāna); this continuous stream will cease only in the attainment of the final *Nibbāna*. This individual stream of consciousness follows a fixed, defined sequence as natural law (*citta niyāma*).

Consciousness does not arise alone, but always together with at least seven mental factors (*cetasika*), which together constitute the mind (*nāma*). Consciousness is compared to clean, clear water which cannot be seen. Only by added colors or dirt, water becomes visible. In the same way, consciousness can be perceived by its "colors" only – the mental factors (*cetasika*) – which arise simultaneously with the same object but with different characteristic and function.

According to the six senses as bases, there are six types of consciousness:

1. Eye consciousness
2. Ear consciousness
3. Nose consciousness
4. Tongue consciousness
5. Body consciousness
6. Mind consciousness

These are conditioned essentially by the sense organ and its respective object, when they come into contact with each other.

In Abhidhamma, 89 types of consciousness are known; however, another classification shows 121 types (Fig. 5) (<http://www.abhidhamma.com>).

Consciousness is classified into four groups according to plane or sphere, where it predominately occurs (Rewata Dhamma 2007):

1. Sense sphere consciousness
2. Fine material consciousness
3. Immaterial consciousness
4. Supramundane consciousness

Consciousness is also divided into four classes according to its nature:

1. Unwholesome consciousness
2. Wholesome consciousness
3. Resultant consciousness
4. Functional consciousness

Furthermore, within these classes, consciousness often is classified according to roots, feeling, association, and promptitude.

Consciousness arises and dissolves in a person at a tremendous rate of more than 1,000 billion

Nibbāna is not possible to describe and explain. Surely, one cannot get or imagine the taste of something of which one does not have any experience. However, Abhidhamma offers a description which can be grasped and understood intellectually, although one has not yet tasted it (Bodhi; Tin Mon; Boriharnwanaket).

Nibbāna literally means end of craving (*vāna*). As craving is the main cause for suffering (*dukkha*), which is already taught in the Four Noble Truths of the Buddha, the end of craving is the cessation of suffering, and that is *Nibbāna* (Boriharnwanaket).

Nibbāna, deathlessness, the unconditioned, is an ultimate reality beyond impermanence and beyond suffering and even any latent suffering or unsatisfactoriness. *Nibbāna* is peace, is stillness, is neither coming nor going. There are two types of *Nibbāna*, and they should be distinguished precisely. *Nibbāna* means extinguishing, fading away. The type of *Nibbāna* the Buddha had realized in his enlightenment is *Kilesa Nibbāna*, the irreversible extinguishing of the mental defilements (*kilesa*). However, mind and matter still remain and follow their own processes. This type is called “*Nibbāna* with rest” (*sa-upādisesa Nibbāna*). In the other type of *Nibbāna*, there is no rest, no remainings (*an-upādisesa Nibbāna*), and this is *Khandha Nibbāna*, characterized by the extinguishing of the five aggregates (*khandha*), that is, mind and matter.

The common saying “*Nibbāna* is the highest bliss” can be explained in various ways. While the mind takes *Nibbāna* as object, there are sublime happiness and peace. Also, having attained *Nibbāna*, the person experiences a great feeling of release and is filled with happiness because one knows that one has attained it and that there will be no more suffering and rebirth. However, the enlightened person still has body and mind which oppress one and which are naturally bound to decay. Only the cessation of body and mind – even the good, happy states, and emotions – is bringing total stillness and peace; that is the highest bliss indeed.

This final state is eloquently summarized in the Buddha’s famous phrase:

Impermanent, alas, are all conditioned phenomena,
They have the nature of arising and decay,
Having been born, they vanish.
Their calming is true happiness (“*Aniccā vata saṅkhārā, uppāda vata dhammino, uppajjitvā nirujjhanti, tesam vūpasamo sukho.*” *Dīghanikāya*: Collection of Long Discourses, D16 and D17).

Cross-References

- Anatta
- Consciousness (Buddhist)
- Dependent Arising
- Dukkha
- Impermanence (Buddhist)
- Karma (Buddhist)
- Psychology in Buddhism
- Reality in Buddhism
- Relations in Buddhism
- Truths, four Noble

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Abhidharma

► Abhidhamma, Southern

Abhidharma, Northern

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Related Terms

[Buddhism, Sarvāstivāda](#)

Description

The Abhidharma is a system aiming at a systematic analysis and proper understanding of the Buddha's teachings. Its origin is to be traced to the *sūtra*-s. The northern tradition of Abhidharma is mainly represented by the Sarvāstivāda – or its orthodox camp known as the Vaibhāṣika, based mainly in Kaśmīra – and the Sautrāntika. In fact, it is these two schools that later Indian philosophical texts typically mention as the “Abhidharma” or “Hīnayāna” schools of thought. Around seventh or eighth century C.E., the Sāṃmitīya – a branch of the Vātsīputrīya – came into prominence as

a leading Hīnayāna school, more or less eclipsing the Sarvāstivāda. However, both the Sautrāntikas (and their forerunner, the Dārṣṭāntikas) and the Vātsīputrīyas originally descended from the broad Sarvāstivāda lineage, so that an understanding of the Sarvāstivāda doctrines as representative of the northern Abhidharma tradition is indispensable.

Like the Theravādins, the Sarvāstivādins too maintain that the *abhidharma* was taught by the Buddha himself. But unlike the Theravādins who claim that the whole set of their canonical Abhidhamma texts was authored by the Buddha, the Sarvāstivādins ascribe their seven canonical texts to individual authors: (1) *Dharma-skandha* by Śāriputra, (2) *Śāṅgīti-paryāya* by Mahākauṣṭhila, (3) *Prajñāpti-sāstra* by Mahāmaudgalyāyana, (4) *Vijñānakāya* by Devaśarman, (5) *Prakaraṇa-sāstra* by Vasumitra, (6) *Jñānaprasthāna* by Kātyāyanīputra, and (7) *Dhātukāya* by Pūrṇa. Of these, the first three belong to the earlier period, and the rest may be grouped under the later period. The *Jñānaprasthāna* was upheld as the supreme authority by the Vaibhāṣikas who called it the “body,” in contrast to the other six which were called the “feet.”

The Meaning of “Abhidharma”

On the term “*abhidharma*,” in the developed Abhidharma system represented by the period of the Abhidharma treatises, firstly, “*abhi-*” in the sense of “facing directly” (*abhimukha*) signifies direct realization (*abhisamaya*) into the true nature of *dharma*-s. This is the meaning of the definition that “*abhidharma* is outflow-free (*anāsrava*) or pure *prajñā*” (2, 2), where both *abhidharma* and *prajñā* are defined as “investigation/discernment of *dharma*-s” (*dharma-pravicaya*). Secondly, “*dharma*” here does not mean “Doctrine,” but refers either to the ultimate reals, each having a unique intrinsic nature (*svabhāva*) and being uniquely experienced as an intrinsic characteristic (*svalakṣaṇa*), or to *Nirvāṇa* as the *Dharma par excellence* (2, 2). In the *Abhidharma-mahāvibhāṣā* (compiled around

150 C.E.), the Sarvāstivāda master Buddhapālita explains the signification of “*abhi-*” thus:

“*abhi-*” is a prefix signifying “*abhimukha-*.” This *dharma* is called *abhidharma* because it induces all skillful *dharma-s*—the factors conducing to Enlightenment (*bodhi-pakṣa-dharma*)—to manifest directly. (3, 4b22–25)

Abhidharma as pure *prajñā* defines *abhidharma* in the highest or absolute sense. We can also speak of *abhidharma* in the conventional sense as comprising all that serves as the means for the acquisition of this pure *prajñā* (2, 2). In the northern Abhidharma, *prajñā* does not refer exclusively to pure wisdom; it represents the faculty of understanding which can be pure or impure, proper or improper, correct or erroneous, etc. Abhidharma in the conventional sense then includes the various forms of impure or with-outflow (*sāsrava*) understanding – possessed by an ordinary worldling (*prthagjana*) – derived from listening (*śruta-mayī*), from reflection (*cintā-mayī*), from cultivation (*bhāvanā-mayī*), and from birth (*upapatti-prātilambhikā*) – as well as the Abhidharma texts that serve as the means for the development of the pure *prajñā*.

The definitional identification of “*abhidharma*” with “*prajñā*” spells out the central importance of the latter as both the means and the ultimate aim of *abhidharma* investigation. This is more explicitly shown in the definition of *prajñā* in the *Abhidharmadīpa-prabhāvṛtti* (1, 70) and Skandhila’s *Abhidharmāvatāra*:

Understanding (*prajñā*) is the discernment of *dharma-s*. It is the examination (*upalakṣaṇa*), as the case may be, of the following eight kinds of *dharma-s*: inclusion (*saṃgraha*), conjunction (*saṃprayoga*), endowment (*samanvāgama*), causes (*hetu*), conditions (*saṃgraha*), effects (*phala*), intrinsic characteristic (*svalakṣaṇa*), common characteristic (*sāmānyalakṣaṇa*). (5, 83)

The eight items enumerated constitute the fundamental topics as well as methodological devices of the Ābhidharmikas.

- 1–2. “Intrinsic characteristic” and “common characteristic.” These two constitute the core concern of *dharma-pravicaya*, so much so that Abhidharma in a gist may in fact be defined as the methodological

study of intrinsic and common characteristics of the real existents (*dharma*) within and outside the sentient being.

3. “Conjunction” studies the dynamic relationship between the simultaneously existing mental factors.
4. “Inclusion” is an important device for determining the nature of *dharma-s* in terms of their intrinsic natures:

For instance, the visual faculty is subsumed under the matter-aggregate, by the visual abode (*caḥsur-āyatana*) and the visual element (*caḥsur-dhātu*), and the truths of unsatisfactoriness and origin. This is because they constitute its intrinsic nature. It is not [subsumed under] the other aggregates, etc., for it is distinct in nature from them. (2, 12)

- 5–7. Every *dharma* is both a cause/condition for other *dharma-s* and is also caused/conditioned by other *dharma-s*; the study of causality (“causes,” “conditions,” and “effects”) is therefore of fundamental importance.
8. “Endowment” – a modality of acquisition (*prāpti*) – is a special topic, also of fundamental importance to the Sarvāstivāda system (see below).

From the perspective of the above definition of *prajñā/abhidharma*, an “Ābhidharmika,” i.e., a specialist in the Abhidharma, may be succinctly defined as one who specializes in the study of these eight topics.

The Five Fundamental Categories Comprising 75 *Dharma-s*

The totality of the ultimate reals arrived at by the Ābhidharmika-s are subsumed under the traditional “five-aggregates” (*pañca-skandha*) scheme, plus the group of three unconditioned *dharma-s*:

- (1) Matter (*rūpa*); (2) sensation (*vedanā*); (3) ideation (*saṃjñā*); (4) conditionings (*saṃskāra*), divisible as the conjoined conditionings (*saṃprayukta-saṃskāra*, i.e., the thought-concomitants other than sensation and ideation) and the disjoined conditionings (*viprayukta-saṃskāra*); and (5) consciousness (*viññāna*). The three types of unconditioned (*asaṃskṛta*)

dharma-s are (6) cessation through deliberation (*pratisaṃkhyā-nirodha*), (7) cessation independent of deliberation (*apratisaṃkhyā-nirodha*), and (8) space (*ākāśa*).

A more commonly adopted scheme of classification is that of the five fundamental categories, innovated by Vasumitra in his *Prakaraṇa-pāda*. A total of some 75 *dharma-s* are subsumed under this scheme:

1. *Matter (rūpa)*: visual faculty, auditory faculty, olfactory faculty, gustatory faculty, tangible faculty, visual object, auditory object, olfactory object, gustatory object, tangible object, noninformative matter (*avijñapti-rūpa*)
2. *Thought (citta)*
3. *Thought-concomitants (caitasika-dharma)*
 - (a) Ten universal *dharma-s* (*mahā-bhūmika*): sensation, volition, ideation, predilection, contact, understanding, mindfulness, mental application, resolve/determination, equipoise
 - (b) Ten skillful universal *dharma-s* (*kuśāla-mahābhūmika-dharma*): faith, diligence, calm, equanimity, modesty (*hrī*), shame (*apatrāpya*), nongreed, nonhatred, harmlessness, vigor
 - (c) Six universal *dharma-s* of defilement (*kleśa-mahābhūmika-dharma*): delusion, nondiligence, slackness, lack of faith, torpor, restlessness
 - (d) Two unskillful universal *dharma-s* (*akuśāla-mahābhūmika dharma*): nonmodesty (*āhrikyā*), shamelessness (*anapatrāpya*)
 - (e) Ten defilements of restricted scope (*parīttakleśa-bhūmika dharma*): anger, enmity, dissimulation, jealousy, depraved opinionatedness (*pradāśa*), concealment, avarice, deceptiveness, pride, harmfulness
 - (f) Eight indeterminate *dharma-s* (*aniyata dharma*): remorse, sleep, reasoning, investigation, greed, hostility, conceit, doubt
4. *Conditionings disjoined from thought (cittaviprayukta saṃskāra dharma)*: acquisition (*prāpti*), nonacquisition (*aprāpti*), group homogeneity, ideationlessness, ideationless attainment, cessation attainment, vital faculty, production-characteristic,

duration-characteristic, deterioration-characteristic, impermanence-characteristic, words, phrases, syllables

5. *Three unconditioned dharma-s (asaṃskṛta-dharma)*: cessation through deliberation, cessation independent of deliberation, space

Remarks on the Five-Category Classification

1. Matter comprises the four Great Elements (*mahā-bhūta*) and the derived matter (*upādāya-rūpa, bhautika*).

Under this category, there is an item known as the noninformation matter, which is a special doctrine of the Sarvāstivāda school. This is a special type of *rūpa*, being invisible, nonresistant, and nonspatialized. Nevertheless, it is said to be of the nature of matter since its supporting basis (*āśraya*) – the four Great Elements – are resistant matter. This is the medium of preservation of the karmic efficacy projected from a momentary bodily or vocal *karma*. It is “noninformative” because it is a karmic action that does not inform us of the mental state of its doer. At the time when an information (*viññapti*) *karma* – namely, a bodily or vocal *karma* – is accomplished, the corresponding *avijñapti* is projected as an invisible force in which the karmic efficacy is preserved. Once projected, it continues to exist as a series until either the corresponding karmic effect is retributed or when a certain condition is met with – such as the person’s death. In the course of development, it came to be particularly emphasized as the karmic efficacy projected when one solemnly takes an ordination vow (*saṃvāra*; “restraint”); e.g., of abstaining from killing (2, 8, 205, 208, etc.). But even when its serial continuity has been terminated by reason of the person’s death or his giving up the ordination vow, etc., the karmic efficacy is not lost. In the Sarvāstivāda tenet of the tritemporal existence of *dharma-s*, the said *avijñapti* continues to exist in its past mode of being (*bhāva*). The difference between a serially continuing *avijñapti* that always arises in the present and one that has become past is that,

unlike the former, the latter's karmic status has come to be fixed and subsequently no more capable of being continuously interacted upon – and thus modified – by the person's actions. Nevertheless, as a past *dharma*, it is still efficacious in contributing to the actual giving of the corresponding effect at a future time.

The Sautrāntikas deny that the *avijñapti* is a real entity. They hold that, as the Buddha has taught, all *karma* is volition (*cetanā*), and a karmic force of the nature of matter is unimaginable and unacceptable. For them, the preservation of karmic efficacy is to be explained in terms of a progressively transformed serial continuity projected from the initial volition (see below).

2. The Sarvāstivādins hold that (1) thought and the thought-concomitants (such as sensation, ideation, etc.) are distinct real entities and (2) no thought or thought-concomitant can arise singly – they necessarily arise in conjunction (*samprayoga*). For instance, any thought necessarily arises with the set of ten universal thought-concomitants. When a skillful thought-concomitant arises, it necessarily does so together with the thought involved, the set of ten universal *dharma*-s and the set of ten skillful universal thought-concomitants (faith, etc.).

A conjunction presupposes a fivefold sameness or equality (*samatā*): The thought and thought-concomitants (1) arise at the same time, (2) share the same basis (*āśraya*), (3) take the same cognitive object (*ālambana*), (4) have the same mode of activity/understanding (*ākāra*), and (5) each has a singularity of substance (*dravya* – e.g., a single thought conjoined with a single species of sensation, a single species of ideation, etc.).

The Dārṣṭāntikas in the *Abhidharma-mahāvibhāṣā* maintain that mental factors arise sequentially, rather than simultaneously. Among them, Buddhadeva teaches that the so-called thought-concomitants are none other than thought itself. Dharmatrāta and others concede that there are three distinct thought-concomitants – sensation, ideation, and volition – all other “thought-concomitants” are merely different modalities of volition. The 4th C.E. Dārṣṭāntika-Sautrāntika master, Śrīlāta, vehemently opposes

the Sarvāstivāda conception of the simultaneous existence of distinct thought-concomitants.

3. The category of “conditionings disjoined from thought” is not found in the Theravāda and other schools. It represents an Abhidharma development that recognizes the existence of a third category of reals, beyond the matter–mind duality. Although these disjoined forces are neither physical nor mental, they can nonetheless exercise efficacies in both domains.

Their nature and function are best illustrated with the example of “acquisition” (*prāpti*), a force which links a *dharma* – whether physical or mental, conditioned or unconditioned – to a sentient being. Thus, when, say, a sensual craving arises in the sentient being, he comes to “possess” this *dharma* called sensual craving, which has always been existing in the universe, thanks to this force, “acquisition,” which as it were ties (like a rope) the craving to him. The acquisition of this craving, once projected, serially flows on in the person even when the craving does not arise manifestly – e.g., when the person's mental stream is of a skillful or neutral nature. For this reason, he is continuously possessed of this craving. When, as a result of spiritual praxis, the person comes to be freed from (to “abandon,” *pra-√hā*) this craving, it is not that the *dharma* called craving as an ontological entity comes to be destroyed but, rather, that the serial continuity of its acquisition is cut off from him.

When one comes to attain *Nirvāṇa*, it cannot be that the unconditioned *dharma* arises as an effect of a path which is conditioned (see below). What is produced by the path is the acquisition (itself a conditioned *dharma*) of the *Nirvāṇa*, which links the latter to the practitioner.

In this way, we see that through the operation of acquisition, the ever-existent *dharma*-s come to be linked to the domain of the sentient. It is also as much a *sine qua non* for the explanation of the process of pollution (*saṃkleśa*) as for purification (*vyavadāna*) and even the attainment of *Nirvāṇa*.

4. For the Sarvāstivādins, not only are the conditioned *dharma*-s pluralistic, the unconditioned

dharma-s as well, are pluralistic. They are the only *dharma*-s that can be truly said to be “permanent” (*nitya*), because they alone transcend time and space. Even the “intrinsic natures” of *dharma*-s, which retain their integrity throughout time, are impermanent. There are three types of conditioned *dharma*-s:

- (a) Cessation through deliberation. This is a cessation brought about through an effort of understanding (*prajñā*; *pratisaṃkhyā* is explained as *prajñā-viśeṣa*) the true nature of defilement. This cessation is a real entity, not a mere absence of the defilement. It contributes to the absolute prevention of the defilement’s future arising. There are therefore as many instances of cessation through deliberation as there are instances of with-outflow entities to be disconnected from.
- (b) Cessation independent of deliberation. This cessation is acquired without specifically applying any effort of understanding, but simply on account of deficiency in the required conditions for a *dharma*’s arising. For example, when the present eye and the mental faculty are focusing on a particular object giving rise to its visual consciousness, it is not possible for any of the five sensory consciousness to arise with regard to any of the other objects (visibles, sounds, etc.) existing in that same moment. There arise accordingly the cessations independent of deliberation of these latter instances of sensory consciousness by virtue of the deficiency in the conditions for their arising. As another example, when one has fully abandoned a certain amount of defilements and attains the spiritual fruition of stream-entry (*srota-āpatti*), causal conditions for rebirth in the unfortunate states of existence (*durgati*) come to be deficient: One acquires the *apratisaṃkhyā-nirodha* of these unfortunate rebirths.

This cessation, too, is a real entity. It is a positive force, and not a mere absence of conditions. It is efficacious in absolutely preventing the possible rearing of the

dharma that has come to be of the nature of nonarising (*anutpatti-dharmaka*).

- (c) The Sarvāstivādins make a clear distinction between conditioned space, which is visible in the openings in windows, doors, cleavages, etc., and the unconditioned space. The conditioned spaces, called the “space element” (*ākāśa-dhātu*), though nonobstructive in nature, are nonetheless obstructed by material things. The unconditioned space, in contrast, is beyond space and time and is characterized by being neither obstructive to, nor obstructed by, any material thing. Its reality is to be comprehended from the fact that there exists the conditioned space which accommodates conditioned things and provides the venues for their activities. This does not mean that space can exercise any activity, but that it serves as a necessary contributing factor – a “dominant condition” (*adhipati-pratyaya*) – through a sequence of conditionality, making possible the fact of cognition of things in space–time. (3, 389a).

It is to be noted that not all canonical Abhidharma texts of the Sarvāstivāda mention space as an unconditioned *dharma*. In the *Abhidharma-mahāvibhāṣā*, we see that some masters, like Dharmatrāta, do not accept space as a real entity. Saṃghabhadra (*ca.* late fourth century C.E.) argues that we can infer its reality from its observable, distinctive function and characteristic (*lakṣaṇa*); and that which possesses a unique function and a unique characteristic is a unique real: Its function is manifested through the fact that it accommodates resistant things; its characteristic – i.e., its observable aspect – is manifested through light (9, 429a–430a. Cf. 6, 496).

The conditioned *dharma*-s, which arise into space–time and their operation therein, are described by two terms: (1) *saṃskṛta* (“compounded”), indicating their aspect of being causally produced by an assemblage of conditions, and (2) *saṃskāra* (“conditioning”), indicating their aspect of being conditioning forces that contribute to the arising and operation of other conditioned *dharma*-s.

The unconditioned *dharma*-s are in complete contrast: Being transcendent to space and time, they are neither causally produced nor do they operate as causes. However, they can serve as “condition qua object” (*ālambana-pratyaya*) inasmuch as they can be apprehended as cognitive objects. The Sarvāstivāda Ābhidharmikas would also concede that in some special sense and in conformity to worldly parlance, it is permissible to speak of the unconditioned *dharma*-s as “efficient causes” (*kāraṇa-hetu*) inasmuch as they do not hinder the arising of other *dharma*-s. Although not causally produced, the cessation through discernment may also be expediently spoken as a “disconnection-fruit” (*visaṃyoga-phala*) inasmuch as it is acquired (*pra-√āp*) through the efficacy of the noble path – even though it is not directly produced by it (2, 91).

The Sautrāntikas deny the realities of all the three types of unconditioned *dharma*-s. But they do not assert that unconditioned things do not exist in any sense – just that they do not exist as metaphysical entities. In particular, *Nirvāṇa* is emphasized as a true spiritual attainment. This, they explain in terms of the doctrine of the transformation of the basis (*āśraya-parivṛtti*) – the spiritual path culminates in bringing about a totally transformed psychophysical basis (*āśraya*) which is completely purified, utterly purged of any latency of defilements:

Nirvāṇa is said to have been attained as a result of the obtaining—by virtue of the counteragent—of a basis which is absolutely opposed to the generation of defilements and rebirth. (2, 93)

Investigation in Terms of Doctrinal Perspectives

Abhidharma also investigates into the nature of *dharma*-s from different doctrinal perspectives. In Vasubandhu’s *Abhidharmakośabhāṣya* (ca. late fourth century C.E.), there are some 22 such perspectives in the first chapter: (1) visible (*sa-nidarśana*), invisible (*anidarśana*); (2) resistant (*sa-pratigha*), nonresistant (*apratigha*); (3) skillful (*kuśāla*), unskillful (*akuśāla*), nondefined

(*avyākṛta*); (4) connected with/pertaining to (*pratisaṃyukta*) sensuality sphere, to fine-materiality sphere, to nonmateriality sphere; (5) with-outflow, outflow-free; (6) with-reasoning (*saṃvitarka*), with-investigation (*saṃvicāra*); (7) with cognitive object (*sa-ālambana*), without cognitive object (*anālambana*); (8) appropriated (*upātta*), nonappropriated (*anupātta*); (9) Great Elements (*bhūta*), derived from Great Elements (*bhautika*); (10) accumulated (*saṃcita*), nonaccumulated (*asaṃcita*); (11) that which cuts (*chinatti*), that which is cut (*chidyate*); (12) that which burns (*dāhaka*), that which is burnt (*dahyate*); (13) that which weighs (*tulayati*), that which can be weighed (*tulya*); (14) the five species: retribution-born (*vipākaja*), accumulative (*aupacayika*), emanational (*naiḥṣyandika*), yoked with a real entity (*dravya-yukta*), momentary (*kṣaṇika*); (15) acquisition (*prāpti/pratilambha*), endowment (*samanvāgama*); (16) external, internal; (17) participative/active (*sabhāga*), nonparticipative/facsimile (*tat-sabhāga*); (18) abandonable through seeing/vision (*darśana-heya*), abandonable through cultivation (*bhāvanā-heya*), not to be abandoned (*aheya*); (19) view (*dṛṣṭi*), not view; (20) consciousness (*viññāna*), object of consciousness (the cognized; *viññeya* – i.e., what elements are cognized by which consciousness); (21) permanent, impermanent; (22) faculties (*indriya*), nonfaculties.

Thus, through such a process of perspectival analysis, the nature of an ultimate real factor in the universe can be articulately determined. For example, a given mental factor is invisible, nonresistant, skillful/unskillful/neutral, nonaccumulative, emanational, momentary, a consciousness or object of consciousness, etc.

Sarvāstivāda Versus Vibhajyavāda

A controversy of fundamental doctrinal importance occurred quite early (probably around third century B.C.) in the northern Abhidharma tradition and came to exert tremendous impact throughout the subsequent development in Buddhist thought. This relates to the question

of the ontological status of *dharma*-s in the three temporal periods.

One camp of thought, described as the “all-exist,” *sarvāstivāda/sarvāstīva*, maintains that *dharma*-s exist in their intrinsic nature through the three periods of time. But temporal distinction is nonetheless possible on account of a *dharma*’s “activity” (*kāritra*), defined as its efficacy to “project its own fruit” – i.e., to serve as the condition for its own rearing in the succeeding moment of its serial continuity. Such an activity, which is neither identical with nor different from the *dharma* itself, is necessarily and uniquely possessed by a present *dharma*: When the *dharma* has not exercised this activity, it is said to be “future”; when it is exercising this activity, it is “present”; when it has exercised this activity, it is “past.” Such is the standpoint of the Sarvāstivāda school and its offshoots (such as the Vātsīputrīya and Sāmmītiya). An important point to bear in mind is that the doctrine of *sarvāstivāda* asserts that “*dharma*-s exist at all times” (*sarvadā astī*), but never that they are permanent (*nīya*) (see above).

The other camp of thought, called the “distinctionist” (*vibhajyavāda*), represented by the Sautrāntikas and others, holds that only the present *dharma*-s are existent. The past and the future are mere concepts (*prajñāpti*) derived on the basis of the present: The “past” is simply “what has been”; the “future” is “what will be.” Some of them, like the Kāśyapīyas, also concede that the *karma*-s that have not given fruit (*adatta-phala*) can be said to be existent (Cf. 6, 117 ff).

Theory of Karma and Causality

The above-mentioned contrasting standpoints have profound implication for the doctrinal interpretations of the Abhidharma schools. For instance, on the question of the preservation of karmic efficacy, the Sarvāstivādins explain that a past *karma* is still existent – it its past “mode of being” (*bhāva*) – and is still causally efficacious, albeit devoid of “activity.” It is

therefore capable of yielding a fruit at some point in the future. In fact, a nonexistent cannot be causally efficacious.

The Sautrāntikas, on the other hand, must explain everything in terms of the single present moment. In this connection, they developed the theory of the seed (*bīja*): The momentary volition (*cetanā*) qua *karma* projects into the mental serial continuity of the person a specific efficacy which is continuously transmitted from moment to moment. At a distinctive point of this serial continuity which has been undergoing a process of transformation (*saṃtati-pariṇāma-viśeṣa*) in terms of the progressive maturation of the karmic efficacy, when the required assemblage of conditions is obtained, the corresponding fruit is generated. This efficacy in the serial continuity is called the “seed,” which is neither identical with nor different from the serial continuity.

Another important difference among the Abhidharma schools relate to their theory of causality. All Abhidharma schools accept that *dharma*-s are momentary (*kṣaṇika*). The Sāmmītiya (like the Theravāda) is an exception, holding that material things last relatively longer than the momentary mental factors. However, these various schools differ with regard to their understanding of the causal process. The Sarvāstivādins and others uphold the theory of simultaneous causality (*sahabhū-hetu*): Cause and effect can exist simultaneously. In contrast, the Sautrāntikas and others maintain that the causal process is strictly sequential: A cause necessarily precedes an effect. As a result, the two schools developed contrasting theories of perception. For the Sarvāstivāda, a sensory object is directly perceived, since the sensory faculty, the external object, and the resulting sensory consciousness all arise in the same moment. For the Sautrāntikas, all perceptions are indirect (*apratyakṣa*) and representational. In the first moment, the sensory faculty and object exist; the sensory consciousness then arises in the next moment: As the object arises only to cease, it leaves behind an imprint or exact

resemblance (*ākāra*) of itself, which becomes the cognitive object (*ālambana*) that generates the corresponding knowledge of it in the next moment. Thus, external reality is never known directly; its knowledge is necessarily derived from our mental content. This theory came to be known as the “theory of the inferability of the external object” (*bāhyārtha-anumeyavāda*) (Cf. 4, 136 ff).

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Action Control

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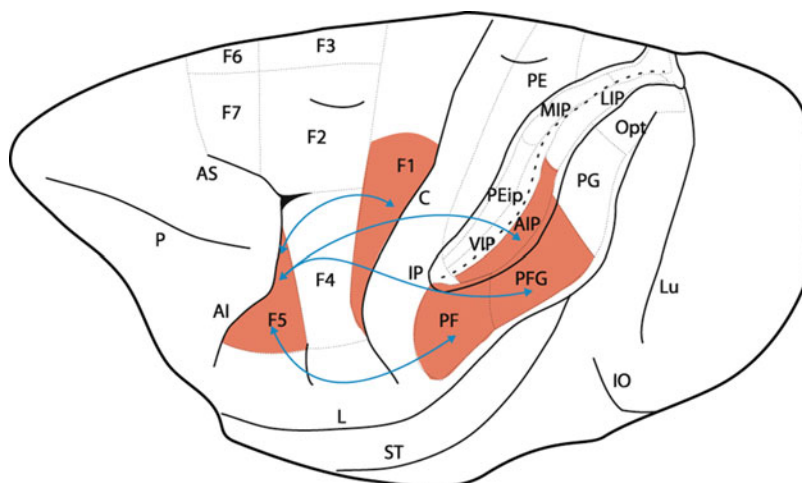
Related Terms

- [Canonical neurons](#)

Introduction

The capacity to generate movements is a characterizing aspect of animals' behavior. Some movements are rigidly determined by external or internal stimuli. They are called *reflexes*. Others are manifestations of a centrally generated intention to act. They are called *voluntary movements*. The way in which intention to act is generated is irrelevant for the notion of voluntary movement. It may result from bodily needs such as hunger or thirst, or from higher-order deliberations based on one's own beliefs and desires. What counts for voluntary movements is that the individual has a goal and that this goal determines movements leading to its achievement.

Being endowed with the capacity to generate movements, animals move in their environment looking for objects or situations that may satisfy their immediate or future needs. When they find an appropriate stimulus they may interact with it. Unlike for reflexes, however, in voluntary behavior stimuli do not determine the response, they only *set the occasion* for it. According to their needs, animals may respond to the same stimulus in different ways. They may approach it, avoid it, or ignore it.



Action Control, Fig. 1 Lateral view of macaque monkey cerebral cortex showing frontal and parietal areas. The intraparietal sulcus is opened to show areas located in its medial and lateral banks. Motor areas are indicated with F and Arabic numbers; parietal areas are indicated with P and progressive letters. For nomenclature and definition see Rizzolatti and Luppino (2001). Abbreviations: AIP

anterior intraparietal area, AI inferior arcuate sulcus, AS superior arcuate sulcus, C central sulcus, Cg cingulate sulcus, L lateral fissure, LIP lateral intraparietal area, Lu lunette sulcus, MIP medial intraparietal area, Opt occipito-parieto-temporal area, P principal sulcus, ST superior temporal sulcus, VIP ventral intraparietal area

The region centrally involved in the genesis of voluntary movements is the posterior part of the frontal lobe. Classically, this region was subdivided into two areas: the primary motor cortex, located on the cortical convexity and the supplementary motor area located on the medial aspect of the hemispheres. Modern data showed that this region is actually formed by a mosaic of different areas with specific functions and connectivity (Fig. 1). These premotor areas code different types of motor behavior among which are hand grasping, arm reaching, mouth movements, and different types of eye movements (Rizzolatti and Luppino 2001).

The frontal motor areas receive inputs from the anterior part of the frontal lobe that plays a crucial role in the control of overt behavior, setting when a voluntary action may or may not be executed, and from parietal lobe. Classically, this lobe was thought of as an association area combining all sorts of sensory stimuli mostly for space perception. Modern research showed that the basic organization of the parietal lobe is in terms of a motor representation of body parts (Hyvärinen 1982). On the top of this basic motor organization, an integration of motor information with sensory

inputs gives origin, in higher primates, to cognitive capacities such as space perception and comprehension of intentions of others (Rizzolatti et al. 2001).

In this entry we describe the neural basis of a specific voluntary behavior: that enables primates to interact with objects. Our aim, by using this behavior, is to outline some general principles of action organization.

The Importance of the Hand

Unlike most mammals, primates have a prehensile hand. This evolutionary achievement tremendously enriched their motor capacities and had profound consequences on the development of cognitive capacities. As the German philosopher Friedrich Engels wrote in 1882: “Man alone has succeeded in impressing his stamp on nature. He has accomplished this primarily and essentially by means of the hand. But step by step with the development of the hand went that of the brain” (Friedrich Engels 1882).

The evolution of the hand’s prehensile abilities radically changed the way in which primates relate

themselves to the external world. For primates, humans in particular, objects are not only something on which to jump or avoid, but things that can be *used*. This required the evolution of new cortical circuits that enable the transformation of objects into motor acts having different purposes.

The Organization of Grasping

The behavioral analysis of reaching to grasp movements showed that an individual facing an object performs two main separate, although interacting, series of computations in order to get possession of it (Jeannerod 1988; Fagg and Arbib 1998). One is the transformation of the spatial position of the object into the appropriate reaching movement; the second is the transformation of object intrinsic properties (e.g., shape and size) into an appropriate hand shaping. The notion that operations underlying reaching and grasping require parallel processing has been fully confirmed by neurophysiological studies (Jeannerod et al. 1995). Here, we describe the motor act of grasping a paradigmatic example of action organization.

The cortical circuit mostly involved in the organization of grasping is formed by a parietal area (area AIP) and a premotor area (area F5) (see Fig. 1). Single neurons were recorded from area AIP in behaving monkeys trained to grasp different types of objects. It was found that the most neurons fired during grasping performed with a specific grip. Furthermore, many AIP neurons, with or without motor properties, responded to object presentation. Most interestingly, neurons that discharged selectively during grasping of a specific object also discharged during the observation of that object. This finding suggests that AIP neurons are involved in the transformation of seen objects into the representations of how to grasp them (Rizzolatti and Luppino 2001; Jeannerod et al. 1995).

A similar experiment was performed on the premotor area F5 where a motor representation of hand is located. The results showed that area F5 contains neurons that discharge in association with different types of hand motor acts (e.g., grasping, holding, manipulating). Some hand-related neurons

were active regardless of how the object was grasped. Most, however, discharged only when the monkey grasped objects using specific types of grips. As in AIP, a considerable portion of F5 neurons also discharged when the monkey simply observed an object. The visual and motor responses of majority of these neurons (called “canonical” F5 neurons) were congruent one with another (Rizzolatti and Luppino 2001; Jeannerod et al. 1995) (Fig. 2).

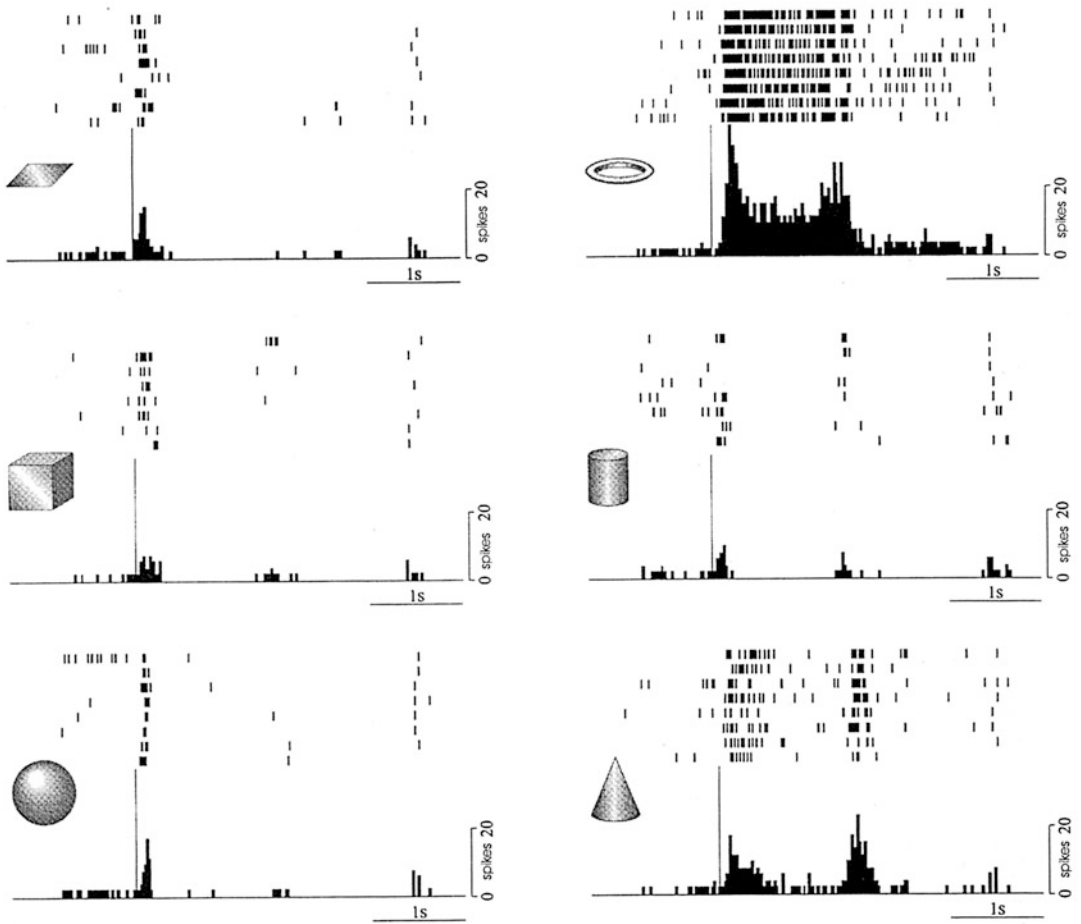
What is the meaning of this coupled visual and motor discharge? The most accepted interpretation is that the object presentation determines the transformation of the object visual properties into a *potential motor act*. Every time an appropriate object is presented, AIP and canonical F5 neurons code a potential motor act toward it. The potential motor act may be executed or not (Jeannerod et al. 1995).

A Model of How Objects Are Transformed into Potential Motor Acts

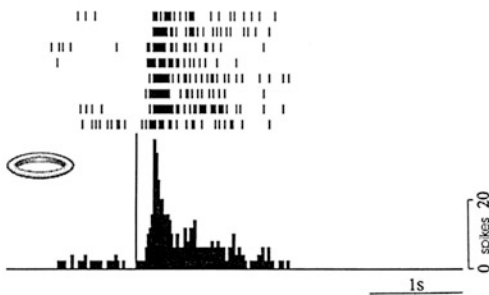
A fundamental property of neurons of AIP and F5 is that they respond to the presentation of three-dimensional objects. The functional meaning of these responses could be understood considering the notion of “affordance” introduced by James J. Gibson (1979). According to Gibson, the observation of an object entails an immediate and automatic selection of those of its properties that allow one to interact with it. The affordances are not the visual aspects of the object, but the *pragmatic opportunities* that the object offers to the observer.

Visually responding AIP neurons represent the stage in this processing in which, after the extensive elaboration of object visual properties in the extrastriate visual areas, affordances became the neuron triggering features. This information is then sent to AIP and F5 visuomotor neurons, which code potential motor acts. Because of the congruence between AIP and F5 neuron responses elicited by a specific object characteristic (i.e., by its affordance) and the motor act they control, a given object affordance is transformed into the appropriate potential motor act. Objects become motor acts.

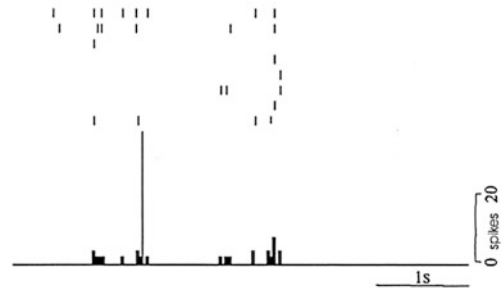
object grasping



object fixation



LED fixation



Action Control, Fig. 2 (continued)

The Importance of Potential Motor Acts for Increasing the Individuals' Freedom and Understanding the Actions of Others

An extremely important characteristic of F5 canonical neurons is that they discharge both when the monkey performs a motor act like grasping *and* when an appropriate visual stimulus is presented. Note that, in both cases, the experimenter records the neurons' output, that is, the message that the neuron sends to other neural centers. Because of this, the experimenter knows the meaning of neuron discharge even when there is no overt behavior. If the overt motor act, associated with neuron discharge, is grasping, the firing of that neuron in the absence of an overt movement also means grasping. However, because there is no motor response, the grasping in this case is a *potential* motor act and not an overt response.

The presence of potential motor acts has two important functional consequences. First, this mechanism enables the individuals to decide whether or not to respond to a given stimulus. The vision of a graspable object does not necessarily lead to grasping. The object may be acted upon, the action may be delayed, thus choosing the moment most appropriate for performing it, or may be not emitted at all.

Second, recent data showed that, besides canonical F5 neurons, there is another set of visuomotor neurons in F5 that respond both when the individual makes a given motor act *and* when it observes another individual doing the same act (Fig. 3). For these neurons, called "mirror neurons" the effective visual stimulus is not the object affordances as for the canonical neurons, but the observation of

a motor act done by another individual. If one considers that the same motor pattern is evoked, *internally*, when the individual intends to do an action, and *in response* to the observation of the same action done by another individual, it is very plausible that that the potential motor act evoked by observation of others gives meaning to the observed action (Rizzolatti and Sinigaglia 2007). The mirror mechanism is considered one of the ways in which individuals understand others and the only one that gives an experiential knowledge of what the others are doing.

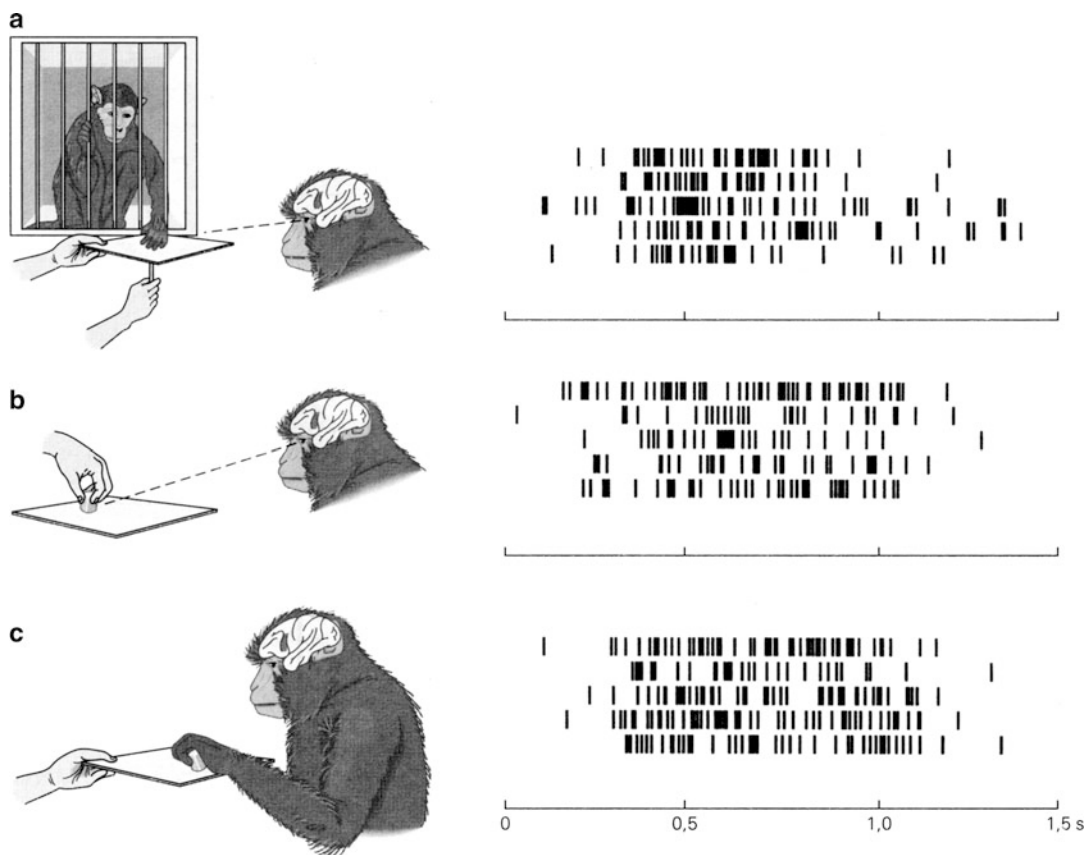
Conclusions

Historically, the motor system has been considered as a mere executor of commands coming from higher-order association areas. A common view was that the motor system exist "to *translate* thought, sensation, and emotion into movement" (Mountcastle et al. 1975). According to this view, all the more "intelligent" processes occur before its activation. The example we described of how the control of grasping is achieved and, in particular, the existence of potential motor acts indicates the close relation between the motor system and higher cognitive capacities. Even more telling is the presence in the cortical motor system of neurons that are involved in understanding motor acts done by others. The modern view of the motor cortex is that of a system intimately linked to perception and cognitive functions and, according to some, the backbone on which conscious perception evolutionary originated.



Action Control, Fig. 2 Example of an F5 canonical neuron. The *upper part* of the figure (object grasping) shows the neuron's activity during observation and grasping of different objects. The monkey was seated in front of a box, which housed six different objects. Objects were presented one at a time in a central position in random order. Rasters and histograms are aligned with the key press (the moment when the object became visible). In the ring grasping panel, the second peak of discharge corresponds to the activity related to the grasping movement.

The *lower part* of the figure (*left*) shows the activity of the same neuron during object fixation (only the responses to the *ring* are shown in the figure). Rasters and histograms are aligned with the key press. The *lower part* of the figure (*right*) shows the activity of the same neuron during fixation of a spot of light. In this condition, the task was the same as in the object fixation condition, but carried out in the dark. No object was visible and the monkey simply was required to fixate the spot of light



Action Control, Fig. 3 Example of the visual and motor responses of an F5 mirror neuron. The behavioral situations during which the neural activity was recorded are schematically illustrated near the rasters. (a) A tray with a piece of food placed was presented to a monkey that grasped the food and ate it. The monkey from which neuron was recorded observed the first monkey.

(b) A piece of food on a tray shown to the monkey, the experimenter grasped it. (c) Neuron activity recorded when the monkey grasped the food. Clear responses of the neuron were present both during grasping and grasping observation. Abscissae: time. Ordinates: spikes/bin. Bin width: 20 ms

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Adaptation, Behavioral

- [Evolutionary Psychology](#)

Adaptationism

- [Functionalism](#)

Adaptiveness

- [Evolutionary Psychology](#)

Adoration

- [Love \(Affective, Sexual\)](#)

Aesthetics (Philosophy)

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Related Terms

[Philosophy of aesthetic experiences](#); [Philosophy of art](#)

Description

Aesthetics is a branch of philosophy that is concerned with two general domains: the philosophy of art and what may be considered the philosophy of aesthetic experiences, especially the experience of beauty and ugliness. In the philosophy of art, philosophers in aesthetics have developed different definitions or analyses of what makes an object or event a work of art, different accounts of the meaning of art, its value,

and the relationship of art to other domains. How does the art world intersect with the world of culture as a whole, the world of politics, commerce, religion, and so on? When the term “aesthetic” is used to refer to experience, it is customarily used to pick out emotive features, as in the experience of the austere desert, the moody valley, the sanguine brook, the sublime mountain, and so on. Such motive features seem to mark the object, as we experience it. Thus, Beethoven’s ninth symphony may be experienced as itself joyful, and not merely thought to be joyful because it makes listeners and performers feel joy. The precise nature of such experiences is (as in most topics in philosophy) under debate.

The term “aesthetics” was introduced in the late nineteenth century and the field (as just described) took shape gradually in the twentieth century, but reflection on beauty and art may be traced back to Plato. Arguably, Plato was the first philosopher to develop a substantial position in aesthetics. He held that there was an ideal form of beauty and that the beautiful things we observe are beautiful because they participate in this ideal form. He treated matters of beauty as objectively real (not as a matter of taste), and he thought that works of art must involve “techne” or a disciplined practice. In his dialogues, the *Ion* and the *Republic*, Plato advanced the thesis that Homeric poetry is not a proper art form. Aristotle was the next great contributor to what we would today call aesthetics. He defended Homeric poetry and theater and other artistic practices as proper disciplines while also serving an overall good in terms of the moral formation and enrichment of citizens.

David Hume in the eighteenth century was one of the most prominent of those in the history of ideas in the west to propose that beauty is in the eye of the beholder. Even so, he thought that there were standards that were better or worse when it comes to assessing beauty.

Today, the field of aesthetics is diverse. There are contemporary versions of aesthetic theories that are Platonic, Aristotelian, Humean, and a plethora of different methods and topics. Contemporary philosophers disagree on the normative nature of beauty.

Self-Identification

Science

There have been scientific accounts of the aesthetic experience. Evolutionary biologists have debated about the role of beauty in mate selection, for example, and this was a matter that very much engaged Charles Darwin and the co-founder of the theory of evolution, Alfred Russel Wallace. It has also been argued that the practice of science itself involves aesthetic standards, for example the appeal to elegance, simplicity, coherence, and the like have been thought of as aesthetic properties.

Religion

The discipline of aesthetics has involved the philosophical exploration of the religious implications of art, and there have been many philosophers who have engaged in aesthetics with an eye on considering the cognitive value of religious experience. This may be seen clearly in the works of Coleridge, the British romantic poet and Platonist. There has been recent work that has also studied the aesthetics of religious versus secular views of the world. The most recent example is *The Image in Mind: Imagination, theism, and naturalism* by Charles Taliaferro and Jil Evans.

Characteristics

Aesthetics is distinguished from other branches of philosophy by its subject matter. No other discipline is devoted explicitly to reflecting on the nature and value of beauty or of artworks, though one might do so in the context of axiology (the study of values) or ethics (when assessing the comparative worth of beauty and, say, principles of justice). Aesthetics is also a domain that takes up topics of great interest which are not otherwise typically covered by other subdisciplines. So, in aesthetics one investigates the nature of imagination and creativity. While imagination may come up in the course of epistemology or even metaphysics (Can one imagine other possible worlds?), imagination and creativity (as topics) are very much at home in aesthetics.

Relevance to Science and Religion

There has been recent interest in what might be called the aesthetics of science and religion, as noted earlier. In *The Image in Mind*, Taliaferro and Evans juxtapose the aesthetic dimensions of naturalism and theism. Many of the proponents of atheism, sometimes called “the new atheists,” may be read as offering an aesthetic critique of religion, sometimes in the name of science (Richard Dawkins seems to fit this description). And defenders of religious beliefs and practice offer a counterpoint, arguing that there is an ugly side to “new atheism.”

Some philosophers in aesthetics who are in the general, Platonic tradition (Douglas Hedley, Mark Wynn, Anthony O’Hear) tend to argue against what may be called “scientism,” the view that the sciences (especially the natural sciences) can offer a sufficient description and explanation of our life and values, including aesthetic values.

Sources of Authority

Categories are varied. Because aesthetics involves two domains (art and experience, in general) that are overlapping, the sources will vary depending on the way aesthetics is carried out. If, for example, one is concerned with the philosophy of art, then a chief source of material for reflection will be artworks themselves. What kinds of things or events have been considered or are being considered works of art? Presumably, a philosophical account of what it is to be a work of art needs to be responsible to the history and culture of art making. Questions about the meaning of works of art would presumably rely upon the discipline of history. One needs reasonable, reliable accounts, of how persons have treated the meaning of works of art over time in order to construct a philosophy of meaning.

In terms of the philosophy of beauty, philosophers have used a balance of reason and experience. One may refine this more with reference to phenomenology (the study of experiences, such as the experience of what we take to be beautiful)

and conceptual analysis (considering the concept of beauty, artwork, and so on).

Aesthetics as a practice often involves thought experiments. So, the way a philosophy of art may be tested is in terms of whether the philosophy can satisfy not just all actual works of art, but of imagined artwork as well.

There is also what is sometimes called “the test of time,” which is sometimes used in the assessment of works of art, that can also be applied to aesthetics itself as a discipline. The extent to which a philosophy of art or imagination can stand the test of time (stand up to counter-examples and arguments) it may be considered more sound than a philosophy that has not been so tested.

Ethical Principles

The ethical principles of aesthetics are those that pertain to academic publication and discourse generally. There is, however, interest in aesthetic accounts of ethical principles. Could it be that our senses or judgments of right and wrong are rooted in our aesthetic attraction to or revulsion of certain things? While an affirmative answer to such a question was a hallmark of positivism in the twentieth century and its rejection of ethics as a cognitive discipline, one can answer the question affirmatively and adopt a position of moral realism. In the nineteenth century, Brentano contended that ethical principles could be analyzed in terms of what persons should (correctly) love or not love.

Aesthetic work on the value of artworks also concerns itself with moral principles. There is currently significant debate about whether an artwork that promotes something unethical is thereby deficient as a work of art.

Key Values

Among the key values in aesthetics is its engagement with the world of art (historically and today) within and across cultures. Insofar as aesthetics also involves the philosophy of beauty, it invites

reflection on what aesthetic values are specific to a culture, and which values are cross-cultural. In terms of methodology and marks of excellence in the works of aesthetics: Key values include conceptual clarity, comprehensiveness, openness to counterarguments, historical soundness, scope (not employing too narrow a scope of art or artists), and beauty. A philosophy of beauty can itself be beautiful.

Conceptualization

Nature/World

Aesthetics is interested in the concept of nature and such questions as: Is the natural world beautiful? sublime? In environmental aesthetics, there is a concern to articulate the differences between an aesthetic appreciation of the environment when this is informed by the natural sciences or not. There is no single concept of “nature” accepted by all working in aesthetics. The concept of a “world” does have a use among some philosophers of art. Some artworks may be thought of as interacting with the world, for example a sculptural figure in a palace. But some works of art, like a novel or painting or play, may be thought of as constituting a world. J.R.R. Tolkien’s *The Lord of the Rings*, for example, may be thought of as a world in which readers enter.

Human Being

There is no one theory of human beings put forth by the field of aesthetics, except that there is probably a common assumption by almost all in the field that aesthetics (as this concerns works of art and beauty/aesthetic experiences) is a vital element in human life.

Life and Death

Philosophers working in the field of aesthetics do not share a common view of life and death, but they have given attention to what may be called the aesthetics of life and death. Some Christians in aesthetics treat death as something ugly (it is perhaps necessary to pass through, but not something that is itself fitting and possibly beautiful),

whereas secular naturalists tend to think that death is natural and not something ugly, in the case of someone who lives “a natural life span.”

Reality

There is some concern in aesthetics over the extent to which beauty and ugliness are objective properties of reality itself. Are some things in reality supposed to be the objects of pleasure or revulsion? Also, to what extent is reality, as revealed in human experience in affective terms (the tree looks sad, the sea feels angry, the mountain appears majestic), truly real or simply a reflection of our psychological attitudes?

Knowledge

In aesthetics, there is concern for (a) the extent to which we may know truth claims about beauty or works of art and (b) how much must be known about X (whatever) to know its value, meaning, or beauty or ugliness. So, some in aesthetics think that if you are assessing the meaning of a novel or poem, it is absolutely irrelevant what the novelist or poet was intending. On this view, one need not know anything of the biography of the artist. A growing number of philosophers disagree (Gary Iseminger).

Truth

Philosophers working in aesthetics have different views about the relationship of works of art to truth. Some think that a mark of excellence of a work of art is (partly) determined by the extent to which the work of art sheds light on the truth of its subject matter. A feminist (as well as many who do not self-identify as feminists) may object to a work of art because of its advancing a corrupt, sexist understanding of what it is to be female.

Perception

In aesthetics, philosophers have been concerned with the extent to which our perception is suffused with affective properties (properties with aesthetic content) and the implications of such properties. Is the fact (if it is one) that most human beings find certain acts ugly/revolting evidence that in fact such acts are (objectively) bad and deserve our disapprobation?

Time

Time is philosophically interesting in aesthetics for different reasons. Here are six matters:

First, there is “the test of time” that is sometimes used in assessing the value of a work of art.

The fact that Shakespeare’s work has been appreciatively embraced as great over many centuries may be taken as one reason to think it deserves praise.

Second, time seems to be part of certain works of art such as music.

Third, some philosophers in aesthetics believe that the meaning of an artwork can vary over time. Hamlet might have had one meaning when first performed (e.g., an embodiment of Protestant anxiety) and another at a later date (when performed in London during the Second World War, it may have embodied the spirit of the nation).

Fourth, some philosophers have contended that in a photograph, you actually see the past.

Fifth, there is a philosophy of ruins. For some, a ruin of an ancient civilization may be a sign of a past golden age, whereas for others it may be valued as a humble realization of the effects of time.

Sixth, how should artworks be cared for over time. Should we seek to preserve the way they looked when first made? Or should they be allowed to decay over time?

Consciousness

Some philosophers have considered the aesthetics of different accounts of the emergence of consciousness. See *The Image in Mind*.

Rationality/Reason

In the philosophy of art, rationality and reason have sometimes been seen in contrast to passion and the imagination (as in the Romantic tradition). One interesting account of reason in aesthetics has involved the invocation of ideal aesthetic observation. According to some, the ideal point of view to assess the aesthetic properties of an object or event would be to have almost limitless experiential access to the object or event, to be impartial, to know all of its history, and so on.

Mystery

Some philosophers treat aesthetic properties, as well as beauty, as basic, and not further explainable. Iris Murdoch may be a good case in point. She thinks that beauty is real, and it is not reducible to any sub-category such as ethics or psychological appetites.

Relevant Themes

Beauty and Ugliness: To what extent is a scientific view of the world beautiful or ugly? To what extent is a religious view of the world beautiful or ugly? These are questions explored at length in the book *The Image in Mind: Imagination, theism, and naturalism*.

Religious and Aesthetic Experience: David Brown has argued that our aesthetic experiences of the world are an important resource for theology.

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Affect

- [Emotion](#)

Affection

- [Emotion](#)
- [Love \(Affective, Sexual\)](#)

Affective Attitudes

- [Passion and Emotion, Theories of](#)

Affective/Emotional Computing

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Related Terms

[Computer science](#)

Description

The field of affective computing aspires to narrow the communicative gap between the highly expressive human and the socially challenged computer by developing computer interfaces that recognize and respond to the affective states (or emotions, e.g., frustration, surprise) of the user. Stemming from Picard's influential book (Picard 1997), affective computing is motivated by the assumption that computer systems that are able to recognize and respond to users' affective states (in addition to their cognitive states) will provide a more effective, meaningful, and naturalistic interaction experience. This assumption is grounded in contemporary psychological and neuroscience theories that claim that cognition and emotion are inextricably bound as emotion influences cognitive processes such as perception, memory, deliberation, problem-solving, planning, and action (Barrett et al. 2007; Damasio 2003; Lazarus 1991).

One major goal of the field is to develop computer systems with a degree of *emotional intelligence* (Goleman 1995). These affect-sensitive interfaces automatically detect users' affective states, respond in an affect-sensitive fashion, and even synthesize affect. *Affect detection* involves the development of sensors and computational algorithms to monitor and extract the affective content from users' physiological, behavioral, and verbal signals. Examples of physiological channels include *electrodermal response* and *electrocardiography*, while *facial expressions*, *speech contours*, *gross body movements*, posture, and gestures are the widely used behavioral channels to detect affect. Affect can also be inferred from a textual analysis of a users' utterance by analyzing the linguistic, syntactical, and semantic content of the utterance.

Once a user's affective state is detected, an affect-sensitive interface needs to respond to that state much like a human would. These affectively modulated responses should be tightly coupled to the environment supporting the interaction (i.e., the context of the interaction). For example, a computer tutor that detects that a human student is frustrated might make an empathetic remark (to acknowledge the student's frustration) and offer a hint (to presumably alleviate the student's frustration). In contrast, an affect-sensitive e-mail client that senses that a user is frustrated might suggest postponing the transmission of an angry e-mail (sensed from a textual analysis of the message).

In addition to detecting and responding to users' affective states, affect-sensitive interfaces with *embodied conversational agents* may also synthesize affect via facial expressions, inflections of speech, and body language. For example, an embodied conversational agent simulating a human tutor might synthesize encouragement by leaning forward, smiling, and increasing the pitch of its voice.

Recent advances in affective computing involve the development of nonintrusive physiological and bodily sensors along with computational systems that automatically detect affect with moderate accuracy in real-world environments (Calvo and D'Mello 2010; Zeng et al. 2009). While most of the

earlier systems focused on physiological measures, facial expressions, and paralinguistic features of speech, affect detectors that combine these classical channels with more novel sensors are coming online.

Although virtually any human-computer interface can be transformed into an affect-sensitive interface, some of the recent applications have involved affect-sensitive *intelligent tutoring systems* (D'Mello et al. 2007), affect-sensitive virtual avatars for online communication, and systems that facilitate emotional communication for individuals diagnosed with *autism spectrum disorder* (Madsen et al. 2008) (see <http://emotion-research.net/> for more information).

In addition to building functional affect-sensitive systems to assist users, the field is also devoted to understanding how humans experience, express, and regulate their emotions. Rigorous empirical investigations and computational modeling of users' affective experiences guide this endeavor. In this fashion, affective computing is a truly interdisciplinary field encompassing computer science, artificial intelligence, human-computer interaction, engineering, psychology, cognitive science, and artifact design.

Self-identification

Science

Affective computing self-identifies as a science. Before building computational systems to respond to affect, one must first understand how humans experience, express, and regulate their affective states. Hence, researchers in the field of affective computing conduct empirical investigations into the nature of human emotions via observations and experiments. In addition to empirical research, researchers also routinely build computational models of important affective phenomenon (Conati and Maclaren 2009). Insights gleaned from the empirical studies on human emotions and the subsequent computational modeling are leveraged towards engineering functional systems that address practical problems related to affect-sensitivity in different human-computer interaction contexts.

Characteristics

Affective computing can be distinguished from broader fields such as human-computer interaction, human factors, ergonomics, artificial intelligence, computer science, and cognitive science by its focus on affective states (in conjunction with cognitive and motivational states) and its goal of building functional affect-sensitive systems rather than simply studying human emotions.

Relevance to Science and Religion

Affective computing researchers are currently more interested in practical problems related to detecting and responding to affective states. They are less concerned with the issues pertaining to “science and religion.”

Sources of Authority

Affective computing has a science and an engineering side. Sources of authority on the scientific front are peer-reviewed publications that focus on empirical research on how humans experience and express affect. Falsifiable theories, empirical data, and replication of experiments are authoritative for affective computing researchers. On the engineering side, systems that work and can be deployed in real-world contexts as well as peer-reviewed publications describing and evaluating these systems are sources of authority.

Ethical Principles

Full disclosure of methods used to study human affect so that empirical research can be replicated, and honest descriptions and evaluations that highlight both the strengths and weaknesses of affect-sensitive interfaces are important ethical principles. Affect-sensitive systems attempt to diagnose and respond to human emotions; hence, nonmaleficence is also an important ethical principle.

Key Values

Building better computer systems to assist humans is a key value. Honesty in all research activities, intellectual curiosity, and a willingness to undertake challenging problems where success is sometimes indeterminate and fuzzy are key scientific values of affective computing.

Conceptualization

Affective computing does not explicitly conceptualize these terms.

Relevant Themes

There are no additional issues relevant to science and religion engagement.

Cross-References

- ▶ [Artificial Intelligence, General](#)
- ▶ [Brains, Artificial and Computational](#)
- ▶ [Cognitive Psychology](#)
- ▶ [Computer Science in Human Learning](#)
- ▶ [Emotion](#)
- ▶ [Happiness](#)
- ▶ [Passion and Emotion, Theories of](#)
- ▶ [Positive Psychology](#)
- ▶ [Robot Emotions](#)

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Affordances

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The perceived functional significance of environmental features taken relative to an individual. For example, a surface at approximately knee height to an individual is perceived as affording sitting-on. To perceive an object's affordances is to perceive its meaning relative to the actions of the self/another individual. Affordances point to a domain of values/properties that is neither "in" the environment, considered apart from an individual, nor "in" the mind, considered apart from the environment, but rather are relational properties of an environment-organism system. Formulated by James Gibson in his ecological approach to perception-action.

African Indigenous Counselling

► [African Psychotherapy](#)

African Languages and Literature

► [Languages and Literature, Africa](#)

African Psychotherapy

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Related Terms

[African indigenous counselling](#); [African traditional counselling](#)

Description

African psychotherapy, also referred to as "African indigenous counseling" or "African traditional counseling," can be defined as a subdiscipline within the currently more inclusive field of psychotherapy in Africa (Madu et al. 1996), devoted to the study of the psychological healing systems indigenous to the traditional communities of Africa (Nwoye 2010). Until recently, its initial preoccupation was the systematic study of the patterned ways and rituals, theories, and techniques, invented in indigenous African communities for addressing the psychological needs and problems of living in the African world. This definition implies that there are many dimensions to the meaning of the term African psychotherapy. One of these is that it has both a precolonial and postcolonial reference. In its precolonial emphasis, it is concerned with the task of understanding the various healing practices, processes, and rituals set up in indigenous African communities for assisting clients in traumatized circumstances and in making big life decisions. In its postcolonial concerns, it is

interested in helping modern African clients to regain belief in themselves and to find their way successfully through the complicated and difficult contemporary African environments.

Another dimension of its meaning that is not often well represented in the literature is that African psychotherapy is also concerned with achieving an understanding of the African worldview as a background for gaining a deeper appreciation of the African's perception of his or her world and his or her place within it. The African worldview implies unpredictable life events influencing people's destiny in the world. In this perspective, human beings have limited agency rather than complete control of what happens to them in this world. This angle of its preoccupation is important. It is from studying such a worldview that the practicing counselors in modern Africa would be able to discover important assumptions that contemporary African clients make regarding who to blame or not to blame for the sources and meanings of their various frustrations and difficulties.

In terms of the beneficiaries of its interventions, one can see that, broadly speaking, people judged in need of counseling in traditional and modern Africa are not restricted to those with important and difficult decisions to make in life. This is because in traditional African psychotherapy, even those with impatient and impulsive temperamental dispositions are equally seen as fitting cases for counseling. Through counseling, the elders and the relatives enjoin such people to reconsider their ways. In addition, people about to get married and those in grief and loss are equally considered as fitting cases for counseling in indigenous and modern Africa. In the context of grief work in Africa, for instance, the practice of counseling is often not confined to the idea of a psychological service which one individual gives to another individual in need of emotional support and care, but indeed extends to the important healing role of the community in bringing succor to one of their members in distress (Nwoye 2005a).

However, in whatever way it is delivered, whether for and by an individual or a group, the essential point is that in the actual practice of African psychotherapy, *the art of conversation* in which healing is effected through interpersonal meeting or the heart-to-heart dialogue between persons is valued very highly. Hence, the major techniques of African psychotherapy include oral dialogue; effective use of proverbs that inspire the need for inner recollections/reflections; didactic fixed expressions; and insight-promoting myths, stories, and wise sayings.

In terms of recent developments in African psychotherapy, one can say that, presently, some African counseling practitioners operate as bridge builders after receiving training in both the theories and techniques of the Western and the African indigenous healing systems and use their discretion to determine when each approach should be drawn upon and synthesized to form a more critical mass for successfully confronting the problem presented by contemporary African client/s. And there exist some important literatures that give an account of such new developments in the context of psychological therapies within the modern African continent (Madu et al. 1996; Makinde 1978; Moodley and West 2005; Nwoye 2010).

Self-identification

Science

African psychotherapy identifies itself as a science and as an art. In their research engagements, African psychotherapists are guided by the procedures emphasized in the research methods of the social science disciplines particularly Western psychology from which most of its practitioners have received training. However, in addition to operating in line with established scientific principles in its research endeavors and theoretical assumptions, from the point of view of their practice, African psychotherapists operate as artists, humanists, or people-makers, placing particular premium on the role of

interpersonal dialogues and the miraculous power of words in bringing healing to people in distress. Hence, one can say that African psychotherapy is essentially humanistic in emphasis with the goal of rational decision-making, cognitive restructuring, emotional healing, and problem dissolution as its major targets of intervention. In this way, African psychotherapy can be described as a discipline that promotes the processes of human care which according to Watson “consists of transpersonal human to human attempts to protect, enhance, and preserve humanity by helping a person to find meaning in illness, suffering, pain, and existence; to help another to gain self-knowledge, control, and self-healing wherein a sense of inner harmony is restored regardless of the external circumstances” (Watson 1985).

Religion

African psychotherapy does not self-identify as a religion. However, it is influenced in its practice models and rituals of action by the African worldview which is essentially religious in nature. The term African worldview is used in this context to refer to the African’s view of and approach to his or her world. Such a worldview is said to imply a religious perspective, encompassing a belief that the world is made up of two interdependent realms: the visible and the invisible or the material and the spiritual planes. Under this platform, the invisible realm is believed to be peopled by supernatural agencies, some of which are benevolent, while others are malevolent to humans in the world. The visible realm on the other hand is believed to be the abode of human beings and other material forms of existence, some of which are good, while others are evil in their direct or indirect effects on other lives in the world. Based on this understanding, African psychotherapists agree that the average African holds a precarious view of the universe (Kalu 1978).

In addition, one of the major reasons for the study of African psychotherapy is to prevent the extinction of and to recover and preserve the valuable ways and rituals of psychological healing systems indigenous to Africa. In this

context, it operates in the same line and spirit as those like African history, African religion, African literature, African music, and African archaeology, all of which support the call by African writers and leaders of thought such as Chinua Achebe and Ngugi wa Thiong’o for the need, which modern Africans have, to reassert their cultural heritage in all the various departments of life. The aim is not only to prove to non-Africans that we have something of value to share with the rest of the world in the area of theory and practice of psychological healing but also to get to understand the African worldview that controls the way the African client interprets his or her world, the sources of his or her problems and what she or he needs to do to resolve them. It is, of course, believed that when the non-African audience explores and understands the content and message of the African worldview, a better understanding between Africans and their foreign partners can ensue.

Characteristics

One unique element in African psychotherapy lies in the great respect it accords to understanding and working in line with the spiritual view of the people (Nwoye 2002). Another unique aspect of African psychotherapy in which it differs very much from the general philosophy of practice in Western psychotherapy (where professionals stay in their clinics to be sought out by needy clients) is that often in traditional Africa, counseling is not given at the formal request of the counselee. Rather, members of the community may often see the need to give counseling and guidance to their member(s) in need, particularly those traumatized by negative experiences. In that case, the intended beneficiary may not seek out for such counseling service. The people opt to visit him or her with their service/care, acting in the conviction that that is what they ought to do to assist their member(s) or friend(s) in need. In this way, the approach is not understood as a meddling but rather as a means of helping to lighten the burden faced by one of their own.

Relevance to Science and Religion

African psychotherapists do not participate in the scholarly debates within the area of “science and religion.” But in its research and practice, it recognizes and respects the spiritual view of the people and believes in the power of religion to fight against the crises of despair and demoralization in people overcome by the challenges of living in the difficult contemporary African world in which the ravages of war, poverty, and disease confront millions of people with enormous pain and distress.

In addition, the creative response of many trained African psychotherapists in modern Africa, particularly members of the clergy (who combine their African orientation with professional training in spiritual counseling), is to direct some of their skilled assistance toward the development and management of hope-healing communities intended to inspire and encourage the people in their difficult circumstances. In the majority of cases, the prayer sessions/services organized by these communities take place in an open-air theater platform to accommodate the mammoth crowd who come from far and near to attend the hope-healing sessions/services. Thus, some healing sessions/services of the most popular of these ministries have very close resemblance with the atmosphere of healing in ► [agoral gathering](#), as reported by Biela and Tobacyk (1987). Such communities serve as a place of spiritual renewal for those who participate in them. The participants use them as a place where they can go to be taught by God and to report their problems to Him. Presently, there are many such hope-healing communities found scattered in all the corners of the continent. The leadership of these communities typically goes along denominational lines. This is why it is amazing to see the enormous similarity of pattern of organization and theme emphases in the services and sessions of the six communities studied and reported by this present author in the article from which some of the data quoted above are drawn (Nwoye 2002).

The above indications imply that although African psychotherapists may not have

participated directly in the current scholarly debates on the interconnections between science and religion, some organize some healing practices that respond to the religious needs and views of the people.

Sources of Authority

There are multiple sources of authority for African psychotherapy. Some of these derive from results of continuing in-depth study of the variety of the psychological healing systems indigenous to Africa. Others come from results of cultural studies on the wealth of African ways and wisdom such as embedded in African proverbs, didactic myths, and figures of speech propagated in the works and writings of illustrious African novelists like Chinua Achebe, Wole Soyinka, Elechi Amadi, Sam Aluko, Flora Nwapa, Mariama Ba, Tsitsi Dangaremba, Buchi Emecheta, etc. From such sources as these, the needs, aspirations, beliefs, and worldview of indigenous African men and women are mined. And these help the African psychotherapists in understanding the stories of pain and despair of modern African clients. Current practices in African psychotherapy are also influenced by the theories and writings of important Western authorities in the field of mainstream psychology and counseling, such as those by Sigmund Freud, Carl Rogers, Carl Gustav Jung, Alfred Adler, Fritz Perls, Albert Ellis, and Aaron T. Beck. Modern African psychotherapists are equally influenced in their family therapy practice not only by the views and perspectives of Western authorities on the matter (e.g., Salvador Minuchin and Boszormenyi-Nagy) but also by the values and approaches of African indigenous marriage and family therapy systems.

In African psychotherapy, the notion of authority does not derive merely from the newness or recency of a given theory or viewpoint but from its capacity and economy to capture accurately and successfully and to address the needs, problems, and concerns of relevant African clients.

Ethical Principles

The African worldview provides an important guide to African psychotherapy and indeed for the successful practice of effective psychological therapies among African clients. Through a thorough knowledge of such a worldview, a lot of the problems which African clients bring up for attention become easily appreciated. This is because the African worldview profoundly permeates the African people's experience of the world and the way they give meaning to what affects their welfare in the world. In some cases, having a good knowledge of the African worldview helps to understand what needs to be done or the rituals to be conducted for healing to take place. Through the guide of such a worldview, important dos and don'ts in dealing with an African man or woman in the counseling context also come to light.

Yet, because the current African psychotherapists are often people of double socialization, a good number of them being well trained in both the Western models of psychotherapy and in the African way, most are members of psychotherapy associations scattered all over the world that abide by the *Ethical Principles of Psychologists and Code of Conduct* of the American Psychological Association (APA) and that of the *British Association for Counselling's (BAC) Code of Ethics and Practice for Counsellors*. African psychotherapists also abide by the principles of research ethics in the social sciences which emphasize the need for anonymity of respondents and for seeking the informed consent of these respondents before subjecting them to any research.

Key Values

In contrast to the nature of life in indigenous African societies, the modern African environment is characterized by the presence of an unpredictable world where people grow up with few definite guidelines on how to confront the problems of living. Increasingly bereft of the usual social support of the extended family

system and the typical cultural patterns of intervention in emergencies, people are constantly faced with enormous psychological brokenness and identity fragmentation (Gergen 1991), leading to social despair and demoralization. This arises from the complicated nature of the new cultural environment under which we live and work. Trained African psychotherapists endeavor to blend what is good in the healing systems of indigenous Africa and the West to fashion out an appropriate response to the psychological needs and problems of the contemporary African clients.

In particular, African psychotherapists do their work in full recognition of the kind of globalized influences that present challenges to the task of psychological adaptation of the modern African youth. In this regard, following the transformations wrought by colonialism, political independence, industrialization, and urbanization, as well as the missionary presence and Westernization of educational systems in Africa, the need for modern African psychotherapy has become intensified. The complicated nature of the new African environment compels the need for the use and application of psychological therapies (African and Western) and allied methodologies and frameworks that will enable the upcoming African youth to navigate the complex terrain of the complicated cultural, educational, and career worlds into which they have been embroiled.

Against the above, the effort and understanding of modern African psychotherapists (composed not only of trained counselors but also African novelists and poets) is that unless redirected, the emerging African youth may never be fully happy even in adulthood. In this way, the philosophy of African psychotherapy, as reflected in its various practice models (both critical and clinical), becomes an attempt to uproot or to facilitate the uprooting of the toxic factors (psychological, social, political, and cultural) in the modern African world. In the South African context, for instance, it was proposed that a more relevant indigenous counseling psychology must work to awaken the oppressed members of the black community to appropriate

political action and the counselor to conscientize all clients about the influence that sociopolitical factors have on their lives.

Conceptualization

Nature/World

African psychotherapy conceptualizes nature and the world from the perspective of the African worldview in which there is a belief that the entire universe is composed of three interdependent planes: the physical (material), the metaphysical (abstract), and the spiritual (transcendental) planes. Such a view of the world goes hand in hand with the African belief in the existence of mystical causality in the human world. In this perspective, humans are believed to live in the midst of invisible forces, to which they are mystically linked, which when provoked can visit them with anger and adversity, but when appeased and well served and disposed can bring them good fortunes and blessings.

Accordingly, African psychotherapists consider as incomplete, the Western individualistic picture of human beings as self-sufficient living systems, fundamentally determined in their basic motivation by the force of the pleasure principle, for, in the context of African worldview, an individual's life project is essentially multiple and broad-based in range and is worldly centered with the aim to achieve maximum success in various departments of life: life, health, wealth, offspring, and peace/joy (Nwoye 2005b).

Human Being

In African psychotherapy, a human being is conceived of as a complicated organism, simultaneously physical and spiritual in nature, and constitutive of multiple and interdependent dimensions that encompass the biological (the bodily), the social, the psychological (the heart, the emotional), the spiritual (the religious), and the metaphysical (the liminality, hopes, and beliefs) aspects. In African psychotherapy, in particular, the human being is conceived of

as a decentering subjectivity, rather than as a demarcated or bounded entity, walled off from the rest of the world (Nwoye 2006). Indeed, the common understanding in African perspective is that there is a dialectical interpenetration of the individual and the community in which neither has full primacy. Similarly, in African psychotherapy, there is a belief that within the metaphysical component of the African human being there exists a melioristic element, a *melioristic self* (Nwoye 2006) which acts as the individual's resident therapist for questioning misfortune, for responding to uncertainty, and for coping with the ordinary challenges and adversities of the African experience. Thus, the melioristic component of the African human being is the part of the human being which, in difficult circumstances, enables the individual to maintain psychological serenity by helping the individual not to fixate on the decadence of the present but on his or her own greater meaning or improvement that is yet to unfold. Another aspect of the metaphysical component of the human being as understood in African psychotherapy is the notion of its liminality. This refers to a recognition which is often celebrated in ritual form in Africa that every human being always lives in a state of liminality, that is to say, at the threshold of something, in which the individual is no longer one thing (e.g., a child), but still not yet another (an independent and self-supportive adult) (Nwoye 2006). The transcendental/spiritual element is the one that is assumed to be responsible for the widely acknowledged trait of exceptional religiosity in the African human being.

Based on the above, the Western notion of the self as a self-contained, imperial, and value-free agency in control of its fate in the world appears foreign to African psychotherapy.

Life and Death

African psychotherapists recognize and work with the view that the average African holds a precarious view of the universe. This means that they tend to attribute many forms of misfortune, illness, death, and failure to arise

from the activities of ubiquitous malevolent spirits, revengeful ancestors and forces of destiny operating through nature, and some evil human beings. This means that in African psychotherapy, there is recognition of the fact that humans are not in full control of their fate in the world. People come into the world not on their own behalf but from other people's (their parents') solicitations and decisions. But once born, the individual is expected to participate in the joint ownership of his or her life and to submit to training and normative guidance to benefit positively from the blessings of having earthly life and being in the world.

Reality

African psychotherapists acknowledge the existence of two levels of reality, visible and invisible or material and spiritual realms, both of which are interdependent in their relationship to one another. In this perspective, there exist both good and evil spirits as well as good and evil human beings, and everything in nature is either a manifestation of matter and, as such, is tangible, physical, and responsible for sensible perception, or supernature, that which is nature's hidden power and life. The perfect combination of the two levels of reality (material and spiritual) ensures the harmony and ordered progress of the African world.

Knowledge

African psychotherapists recognize in their research, theory, and practice that human knowledge is partial, historical, and evolutionary in nature and changes with time. They also believe that there are various sources of human knowledge. And they derive some of their working knowledge: from direct research on a given problem, from the wisdom of the sages, from interviewing and listening to clients offering own explanations and "theories" of the genealogy of their problems, from African and Western psychology, from African literature (oral and written), and from African art, African religion, African anthropology, and African archaeological finds.

Truth

African psychotherapy acknowledges and respects the existence of multiple perspectives to truth, including the existence of the phenomenon of complimentary duality in human contexts. By this is meant that in human life, nothing exists in complete isolation from one another and that when one thing stands, another stands beside it. In this perspective, there is no single road to truth, no royal road to success, or to good life. Thus, in the process of African approach to truth and reconciliation, four types of truth are sought for in the search for justice between opposing parties (Nwoye 2003). These include factual or forensic truth, personal or narrative truth, social or dialogue truth, and healing or restorative truth. These were the same four that were sought for and reported in 1998 by the Truth and Reconciliation Commission of South Africa.

Perception

African psychotherapists recognize that human behavior is influenced by the field as perceived or by the way things seem or feel to the individual or the group concerned. Human perception is therefore understood as phenomenological/perspectival or personal in nature and thus subject to human errors. African psychotherapists similarly believe in the evolutionary nature of perceptual competence in human beings. That is, that it gets better with age due to the influence of experience in the evolution of people's cognition; hence, the saying in most parts of Africa that *what the elders may see while sitting down, the youth may not see even while standing up*.

Time

African psychotherapists recognize that a special constituent of the African human being is its capacity for the abstract attitude, reflected in the individual's power to live and move in the shadow of the "thick present." This orientation refers to an African individual's capacity to hold in his or her present time consciousness the three dimensions of time: the "past present," the "present present," and the "future present" synoptically. In this way, the present state of the African individual keeps on reminding him or

her not only of the present situation (good or bad) confronting him or her but also of a past that has gone before and the future that is yet to unfold. Many African psychotherapists believe that this capacity for the abstract attitude, which promotes the African's capacity for a synoptic time consciousness, is a foundation for good mental health. It enables many people in Africa to live beyond the decadence and tribulations of their "present present" (Nwoye 2006).

Consciousness

One of the goals of African psychotherapy is expansion of peoples' consciousness in the form of psychoeducation. And there are several levels of human consciousness acknowledged and targeted for action in African psychotherapy. For instance, in African psychotherapy, enormous emphasis is placed on the development of extended family consciousness or the spirit of ► **ubuntu**, which although is often said to constitute a source of multiple pressure to provide for the needs of others in the modern African environment, yet is recognized as a source of moral and emotional strength in African traditions. Besides, the extended family consciousness plays the role in African traditions of reinforcing the individual's moral sense by making him or her constantly aware that his or her immoral actions will bring disgrace not only to himself or herself but also to the entire family and, through it, to the entire community among whom he or she is a part.

The crucial implication of the above is that in African psychotherapy, the successful life is not understood as one lived in self-sufficient isolation, in which the emphasis is toward greater self-sufficiency and independence of others, as often emphasized in the West. Rather, the notion of mature human development in African psychotherapy is conceptualized as one that is conscious of the interdependent nature of human beings from conception to death.

Rationality/Reason

African psychotherapists give due recognition to the place of rationality/reason in human life. But in African psychotherapy, it is acknowledged that

the most acceptable paradigm to guide practice is the one derived from quantum or post-Einsteinian physics which proposes that in their judgment of experience, people tend to go beyond the information given (to use Jerome Bruner's phrase (Bruner 1990)). This is an important insight in the context of African psychotherapy, in that Africa is a world where meaning that is given to events of life is influenced not always by rationality/reason but by the context and the grammar of the culture in which the individual is situated. This perspective implies that the African's universe is not an Aristotelian universe, but essentially an interpreted universe, implying a world of information and relationships dominated by the influence of local knowledge (Nwoye 2006). In this way, African psychotherapists acknowledge that in the experience of some of their clients, life can at times be larger than logic. Yet they also recognize that certain institutions like African marriage are built on a framework of order. In African marriage, the presumed order takes place if after marriage there comes childbearing, followed by childrearing/investment in children, and thereafter filial care and support of parents in old age.

Mystery

In African perspective, there is a belief in the existence of mystical causality (Nwoye 2005b, 2006) in the human world, reflecting an understanding in which mysterious happenings are seen to arise from unpredictable events and chance encounters. In that way, reasons for failure or success in this world are often interpreted to arise from the deliberate agency of inscrutable forces, which at times operate through the agency of evil-minded persons to cause disasters to targeted victims. A related belief to this conception is the attribution, still extant in present-day Africa, and which is often encountered in the context of practice of some African psychotherapists, that evil human beings can transform into dangerous animals like snakes, scorpions, and lions to kill their human enemies (Nwoye 2006). And some can mystically change into wild pigs to enter and destroy their enemies' crops or farm. This aspect of the African understanding of the

human condition is the one that is meant to suggest that in the African imagination, physical nature is not dead but, rather, is understood to be imbued with immanent vitality and spirit force. In the African view, there is a supernature underlying all aspects of nature, the spirit of which animates and infuses nature with mystical potency (Nwoye 2005b, 2006).

Relevant Themes

One additional issue or theme in African psychotherapy is the recognition and attention given to the influence of spirituality in the life of African clients. One implication of this is that a typical African client holds a number of religious beliefs that influences his or her way of living in the world. These include the following. First, there is a belief in the existence of the Supreme Being or a power from whom all good things come. This notion coincides with the important assumption in Africa that God is involved in the details of our human experience and that things do not happen unless God approves them. The same attitude encourages the great principle in Africa of resignation to God's will when confronted with problems that we can neither handle nor alter. Second, there is a belief in the existence of other spiritual agencies and in the capacity of these agencies to influence – positively or negatively – the course of human welfare in the world. This belief coincides with the notion that there is an intermingling of forces in the universe (Nwoye 2006).

Third, there is a belief that our ancestors and other deceased relatives, though dead, are still living (Mbiti 1969) – that like the gods, they need only to be venerated to be of service to us in challenging the problems of living. This notion goes with the idea of invisible loyalty that is ever present in the mind of a typical African, that the voice or directives of the ancestors and dead parents must be respected and adhered to. This aspect differs from the Western existential notion of the self as an unbounded, imperial, or a totalitarian subject that is invested with values and principles that are personally chosen (Nwoye 2006).

Cross-References

- ▶ [Coping, Psychology of](#)
- ▶ [Cosmology](#)
- ▶ [Counseling Psychology USA/Europe](#)
- ▶ [Epistemology](#)
- ▶ [Experience](#)
- ▶ [Holism](#)
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- ▶ [Meaning, the Concept of](#)
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- ▶ [Pluralism \(Religious\)](#)
- ▶ [Ritual](#)
- ▶ [Social Construction in Psychology](#)
- ▶ [Time](#)
- ▶ [Truth](#)
- ▶ [Worldview](#)

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African Traditional Counselling

► [African Psychotherapy](#)

African Worldview

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This refers to an African's perceptions of his or her world. In African psychotherapy, it is believed that Africans have a tragic sense of life (Madu et al. 1996). This means that in Africa there is a firm belief in the existence and operation of the power of unforeseen circumstances or unpredictable life events in influencing people's destiny in the world. In this perspective, human beings have limited agency rather than complete control of what happens to them in this world.

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Afterlife

► [Hope \(Life After Death\)](#)

After-Metaphysical Theology

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Related Terms

[End of metaphysics](#); [Philosophy of religion](#); [Postmetaphysical theology](#); [Postmodernity](#)

Description

The meaning of the expression “post-” or “after-metaphysical theology” is anything but obvious. Rather, the expression's omnipresence in postmodern theological circles rather appears inversely proportional to its transparency. The term covers a wide spectrum of dissimilar meanings and a certain amount of confusion therefore seems unavoidably present in any attempt to straightforwardly define this conceptual centaur. The term not only expresses a methodological position stressing the necessity of thinking somehow “after” metaphysics but also expresses a certain conception of our situation in the world. As such, “after-metaphysical” has become a key concept articulating a certain (but vastly divergent) philosophical and/or theological self-understanding. As an attempt to (in the words of Hegel) “apprehend our time in thoughts” (Hegel 1821, 26), the expression “after-metaphysical” seems to compete with and/or overlap a number of different, more or less idiosyncratic compound expressions such as “postmodern theology,” “postsecular theology,” “the end-of-metaphysics theology,” “deconstructive theology,” “theology after the death of God,”

“postliberal theology,” “feminist theology,” etc. (cf. Ward 2001; Vanhoozer 2003). Hence, the expression must be seen as a hybrid which covers a wide range of different movements or trends.

In his book, *Postmetaphysical thinking* (1992) (German: *Nachmetaphysisches Denken* 1988), Jürgen Habermas argues that the philosophical situation in the wake of Hegel’s speculative idealism (i.e., the “post-Hegelian situation”) does not differ significantly from our present age. In other words, the philosophical situation after Hegel has left us with no real alternative to an “after-metaphysical thinking” (Habermas 1988, 36). As regards theology, this after-metaphysical situation is reflected in the late-Enlightenment shift from “natural theology” (*theologia naturalis*) to a brand new philosophical discipline: philosophy of religion (Jaeschke 1992, 748). Even though, of course, it would be erroneous to identify “after-metaphysical theology” with “philosophy of religion,” it must be conceded that any attempt to think theologically without taking into account the different developments within philosophy of religion and modern science is untrustworthy. Thus, the dissolution of natural theology in the late-Enlightenment period may be said to offer a parallel to what Habermas refers to as philosophy’s after-metaphysical situation.

In any case, it is obvious that the exact meaning of the expression “after-metaphysical theology” not only depends on the understanding of what is meant by “theology” but also relies on the meaning of the other two elements contained in the expression: “after” and “metaphysical.” Whereas the meaning of the prefix “after” at a first glance may appear uncontroversial, the term “metaphysical” is notoriously ambivalent and controversial. The polysemic character of the term “metaphysical” threatens to efface any liable attempt to define the expression “after-metaphysical theology.” In order, however, to avoid making the expression unreasonably diffuse and vague, it seems necessary to unfold the different layers of meaning attached to the expression somewhat more in detail.

Metaphysical

Since the expression “after-metaphysical theology” is related explicitly to the notion “metaphysical,” it must first be clarified what is meant with metaphysical. The Greek expression *meta ta physiká* is a compound of the prefix *meta* meaning “after” or “beyond” and the substantive *ta physiká* meaning “physical” or “natural” and thus literally means something like “that which comes after or lies beyond the physical.” Even though this etymological “definition” on the face of it appears reasonably comprehensible, it must be remembered that the “physical” or “natural” is itself a metaphysical category which does not represent a constant in history. In relation to the question about “after-metaphysical theology,” the following three “aspects of metaphysical thinking” (Cf. Habermas 1988, 36ff) deserve particular attention since it is these aspects which are somehow critically refused or at least challenged by after-metaphysical theology:

- (a) *Identity*: Metaphysical thinking is guided by an attempt to reduce (literally: lead back) the manifold of experience to conceptual unity. The abstract relation between identity and difference is conceived both logically (“to give the grounds for”) and ontologically (as “foundation” or “basis”): The unifying principle of identity is both principle in the sense of “beginning” or “source” and in the sense of the stabilizing “ground” or “foundation” which underlies the manifold of reality. As “first philosophy” (*prima philosophia*), metaphysics is concerned with the “foundations” or the “principles” of “being *qua* being” (*Met.* 1026 a 32), a formulation which becomes a pivotal point in Heidegger’s account of metaphysics as ontotheology (see below). According to Deleuze and Guattari, the tree has become the predominant model of orientation in Western thought: “It is odd how the tree has dominated Western thought, from botany to biology and anatomy, but also gnosiology, theology, ontology, all of philosophy...: the root-foundation, *Grund, racine, fondement*” (Deleuze/Guattari 1988, 20). The roots of

Western (metaphysical) thought is to be found in its insistence on thinking within the model of the upright standing tree, thereby thinking being “vertically” (cf. Deleuze/Guattari 1994, 43). This aspect of metaphysical thinking is often referred to as “foundationalism” (cf. Green 1999, 2–3): The attempt to ground thinking on an incorrigible, firm foundation.

- (b) *Transcendence*: Metaphysical thinking is guided by the establishment of a “plane of transcendence” (Deleuze/Guattari 1988, 310). The abovementioned “ground” or “foundation” is thereby transferred to a realm “beyond” or “above” the immanently given. Nietzsche’s critique of the metaphysical tradition may be understood within this binary scheme: “Nihilism” is, in Heidegger’s interpretation of Nietzsche, “that historical process whereby the dominance of the ‘transcendent’ becomes null and void, so that all being loses its worth and meaning” (Heidegger 1982, 4). According to Heidegger’s interpretation of Nietzsche, the “death of God” constitutes nothing (!) but the dissolution or annihilation of every attempt to ground “being” in a transcendent level; a figure of thought which also resounds in Deleuze/Guattari’s claim that transcendence is a “specifically European disease” (Deleuze/Guattari 1988, 20), namely, the disease to interpret the “value” of life from a transcendent perspective.
- (c) *Order*: Metaphysical thinking is guided by the construction of a certain order which is to be understood both on an ontological and an axiological axis. The transcendent principle of identity is not only placed topographically “beyond” or “outside” the given but is also simultaneously declared “higher,” “better,” “more real,” “more true” than “the realities in which we live.” Such binary codes (good/bad/pure/unpure/essential/accidental, etc.) are not just, Derrida claims, “one metaphysical gesture among others, it is *the* metaphysical exigency, that which has been the most constant, most profound and most potent”

(Derrida 1977, 236). Thus, the “will to order” may be said to be an important facet of metaphysical thinking.

After

Even though the word “after” on the face of it appears harmlessly unproblematic, it does, on closer inspection, become quite unclear in what sense “after” should be taken when brought together with the word metaphysical. Already Heidegger’s project of a so-called *Verwindung* of metaphysics displays a fundamental ambiguity in relation to metaphysics: The process of *Verwindung* is neither identical with an “overcoming” (*Überwindung*) nor with a “leaving behind” but must rather be understood as a particular way of being related to the past in a “manner that (...) constitutes neither the acceptance of its errors nor a critical surpassing which would merely continue that past” (Vattimo 1987, 11). Inspired by Derrida, Mark C. Taylor has suggested the following understanding of the word “after”: “On the one hand, to come after is to be subsequent to what previously has been, and on the other hand, to be after is to be in pursuit of what lies ahead. Betwixt and between past and future, after is never present as such but is the approaching withdrawal and withdrawing approach that allow presence to be present” (Taylor 2007, 345). Nonetheless, the understanding of “after” remains a question: Does it mean that we have left something irrevocably behind us that we are definitively beyond metaphysics in the abovementioned sense? Would that not presuppose that metaphysics is indeed something “outside us” that we can divest ourselves of or “brush aside like an opinion” (Heidegger 1954, 72)? Moreover, to speak of “metaphysic” (in the singular, definite form) may be rhetorically appealing, but it suffers from a tendency to “liquidate the particular” (Adorno 1951, 15), thereby representing the exact same tendency toward “totalization” which it so passionately criticizes. Finally, it should be noted that the very discourse of the “end” (or, as a possible implication, “the return”) of metaphysics (or of “God”) *itself* seems to constitute a significant metaphysical line of reasoning.

After-Metaphysical Theology

Of particular importance for the understanding of “after-metaphysical theology” is the term “ontotheology.” Kant first introduced this *terminus technicus* in his *Critique of pure Reason* (1781/1787) as a term used to describe a particular type of theology which deduces the existence of God by “pure” concepts, i.e., concepts having no appeal to experience (Kant 1998, 556 (B 659)). Since then, the sense of the term has been expanded quite significantly by Heidegger and Derrida (Hart 2000, 75) so that all metaphysics fundamentally is “ontotheology” because it is the forgetfulness of the (ontological) difference between being and beings (Heidegger 1957, 59): “metaphysics is defined as the question about beings as such and as a whole. The wholeness of this whole is the unity of beings, the ground that brings them forth and unifies them. To anyone who can read, this means: metaphysics is Onto-Theo-Logy” (Heidegger 1957, 63). This identification of metaphysics (as such) with ontotheology raises the question whether it is possible to formulate a “nonmetaphysical theology” (Hart 2000, 75) which finds itself outside the area of ontotheology. Such an attempt has been pursued by, e.g., Gianni Vattimo’s “weak thinking” insisting on the structural similarity between the incarnation (understood as a nonviolent “kenosis”) and the “weakening of strong structures of being” attested to by after-metaphysical thought (Vattimo 1997, 40) and Merold Westphal’s endeavor to “overcome ontotheology” by means of a radically hermeneutical approach (Westphal 2001). In any case, the problem of a “negative dialectic” or “dependency” between the “overcoming” and that which has been overcome cannot easily be left aside (cf. Adorno 1966, 373) and the question therefore remains: Can we avoid thinking metaphysically; in which sense is an “after-metaphysical theology” altogether possible?

Cross-References

- Philosophy of Religion
- Secularization, Secularity, Secularism

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Agape

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Related Terms

Empathy

Common usages of the words “Eros,” “agape,” and “altruism” overlap in important ways. They are all used to connote a certain direction and substance of desiring or willing. It is a direction toward the other. And it is for the good of the other. Furthermore, ordinary use of the word *altruism* presupposes a threshold degree of intentionality. That is, the altruistic person is supposed to be aware of herself (self-consciousness) and of her positive regard for the other. The following interpretation of the concept of altruism is close to the ordinary use of the word.

Besides important overlapping aspects, in contemporary Christian ethical discourse as well as in Freudian Psychology, the words “Eros” and “agape” are also used in contrasting ways. Here, Eros connotes a desire, often supposed to be sexual in kind, to possess or enjoy the other. This usage of the word “Eros” suggests that both the direction and the substance of “Eros desires” are somewhat ambiguous. Desiring to enjoy another person does undoubtedly involve her or him, but it is not directed toward her or him in any other sense than as an instrument for the desiring subject. It is understood as more similar to the coveting of a piece of chocolate than to positive regard. The satisfaction of a desire to enjoy is something that solely happens to the desiring subject; it is self-regarding.

Other regarding desires in contrast are defined by a wish that something goes well or that something bad happens to the other. The

word “agape” is used by many Christian theologians to connote the particular other-regarding and self-giving love of the Christian God (e.g., cf. Anders Nygren, Gene Outka, and Timothy P. Jackson). The supposed self-giving nature of the love of God means firstly that it is supposed to flow out of the loving subject independently of any kind of reward. Secondly, agape is allegedly not conditioned by any possible merit or worthiness of its object. One possible merit could be that loving someone is in fact rewarding. Nevertheless, love can in principle be bestowed on deserving objects independently of whether loving the deserving is in any sense rewarding, and most theologians claim that loving independently of reward is better than if love would be conditioned by reward. Thirdly, agape is not only characterized by being unmotivated, it is also supposed to have the power and function to bestow value on its objects (e.g., cf. recent work by Nicholas Wolterstorff). Among contemporary theologians, this value is thought of as very high and as equal between all individual human beings. It is therefore also often labeled human dignity. It is worth noting here that equality does not belong to the concept of agape. It is used as an addition or qualification of the character of God’s love. It makes perfect sense to start explaining the meaning of God’s love by saying that God loves everyone equally. But the concept of agape is not similarly needed for the explication of the meaning of the concept of equality.

Finally, the word “altruism” has usages that usually differ in primarily two ways from the mentioned theological interpretations of both Eros and agape. In ordinary use, altruism is not supposed to have the function of constituting value. It, however, is not self-regarding either, like some claim Eros is. Like “agapist” action, altruistic action is not supposed to be motivated by merits of its object. Nor is it motivated by personal reward other than the simple satisfaction of the desire to do good for the other (which does not count as an ulterior motive). In recent Christian normative animal ethics where the

ingredient of bestowing value is downplayed, agape is oftentimes understood as synonymous to altruism. Thus, one can say that the concept of altruism contains the first two basic elements of classical theological interpretations of agape.

Cross-References

- [Altruism](#)
- [Christian Ethics](#)
- [Ethics](#)
- [Love \(Affective, Sexual\)](#)
- [Love \(Alterity, Relationship\)](#)
- [Passion and Emotion, Theories of](#)
- [Systematic Theology](#)
- [Virtue](#)
- [Virtue Ethics](#)

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Agency

- [Attribution/Attribution Theory](#)

Agency Detection

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Ascribing behavior to an internal mental state such as a desire, goal, or intention. Agency detection is the first, necessary step for developing a theory of mind (TOM) where one understands others to have beliefs and inferences based on his/her particular perspective of the world. There is some evidence indicating that nonhuman apes may understand others as intentional agents and may even possess a limited form of TOM. However, this is controversial and continues to be a topic of research and debate.

Aggression

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Related Terms

[Belligerence](#); [Violence](#)

Definition

Aggression is a complex concept historically rooted in social psychology, anthropology, and psychoanalysis. It encompasses behavioral (fighting), emotional (anger), and cognitive-

motivational (aggressive thoughts and goals) aspects resulting from a combination of genetic, neurobiological, endocrine, and social processes. Often reduced to the behavioral component, aggression is understood as the intentional physical harm of another person. Recent research acknowledges indirect forms of aggression such as social exclusion. The term violence is usually used for a subset of aggressive behaviors that are severe in nature, e.g., physical fights with dangerous objects or robberies that inflict severe psychological harm. The World Health Organization defines violence as “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation” (World health organization 2002). Although most often seen as a violation of social rules and norms, aggression is also sanctioned by societies in the case of war, revolution, certain sports, media, and the arts. Due to a lack of a unified concept, the field of psychiatry does not identify aggression as a distinct diagnostic category but rather as a symptom prevalent in many different mental illnesses such as antisocial personality disorder, borderline personality disorder, intermittent explosive disorder, and conduct disorder.

Types of Aggression

Current research supports the validity of subtypes of aggression. The most common distinction is drawn between reactive and proactive aggression (similar to affective vs. predatory aggression). Reactive aggression is executed in a state of increased emotional and autonomic arousal following a frustrating or threatening event. Proactive aggression is intentional, goal-directed behavior to obtain a desired outcome such as social dominance or money and has been associated with psychopathy. Empirical data has shown that there are two groups of aggressive individuals, those that present with reactive aggression and those that present with reactive and proactive aggression.

Social Correlates of Aggression

A major root of aggression is the relationship of the individual with her social environment. Several psychological mechanisms are known to be involved in the development and maintenance of aggression, including instrumental learning (aggressive behavior controlled by reward and punishment), social learning (observation and imitation of others' aggressive behavior), priming (e.g., weapons effect), desensitization (emotional blunting and changes in thoughts and beliefs), aggression-frustration (response to a frustrating event), and enacting (engagement in virtual aggressive behavior). Two research lines on the influence of social factors on aggressive behavior are described below as examples.

Aggression and Media Violence

Violent media is available to individuals of all ages. Hundreds of laboratory, retrospective, and longitudinal studies suggest that exposure to violent TV programs, horror movies, songs with graphic lyrics, and violent video games is associated with aggression. The exposure to these media facilitates physical aggression, anger, hostile thoughts, perception of violence as common and inevitable, and perception of the world as a mean and dangerous place and decreases prosocial behavior and empathy toward victims of real-life violence. Video games have been the focus of recent research because they portray violence in increasingly realistic settings and engage the player proactively in aggression. Long-term changes associated with exposure to violent media are thought to develop through observational learning, enactive learning, and desensitization. Violent media is usually presented without criticism, expression of remorse, or long-term negative consequences thus promoting the justification of aggressive acts. Other factors that moderate these effects are personality variables, e.g., predisposition for aggressive behavior and identification with the aggressor, as well as the context in which the media is consumed (Huesmann 2007).

Aggression and Religion

There has been a recent research interest in understanding violence in religious movements and appreciating the psychosocial dynamics of religious belief. Throughout the history of mankind, religious beliefs have been exploited to justify and drive war and violent attacks. It is assumed that religious people have a set of beliefs about the will of god and how to execute it and that these beliefs guide social behavior. First experimental findings indicate that violence portrayed in scripts and sanctioned by god increases the risk for aggressive behavior through processes of justification and identification (Bushman et al. 2007). Further studies are needed to investigate the link between religion and aggression, such as in-group identification and aggression toward out-groups and the cognitive processes underlying militant extremism and the refusal to tolerate divergent worldviews.

Development of Aggression

There is evidence suggesting that aggressive behavior develops along distinct trajectories: An early-onset form of aggression that starts in early childhood and persists well into adulthood and a later-onset form that is limited to adolescence and early adulthood (Moffitt et al. 2002). Regardless of the trajectory, risk and protective factors for aggression differ depending on the developmental stage. Early risk factors include child fighting, victimization, childhood substance use, inconsistent or harsh parenting, and family conflict. During adolescence, poor relationships with peers, gang involvement, and living in a violent neighborhood become significant risk factors for the development of severe aggressive behavior. Protective factors such as competent parenting skills, including monitoring, consistent discipline, and supportiveness, may reduce the likelihood of engaging in aggressive acts during childhood, adolescence, and later in life (National Institutes of Health 2004).

Recent advances in neuroimaging and other biological research can potentially promote the understanding of factors that contribute to the

development of aggression. For example, longitudinal research on structural changes in the prefrontal cortex – a region of the brain that has been associated with aggression – revealed that prefrontal cortex gray matter thickens until about age 11 and then begins to gradually decrease, currently thought to result from a combination of synaptic elimination and increasing white matter volume from myelination. Another neural system that undergoes significant changes during adolescence and that has been intimately linked to behavioral adaptation through reward and punishment is the dopaminergic system of the brain. To date, it is largely unknown how these morphological changes affect brain function and subsequently aggressive behavior in interaction with environmental influences during adolescence (Blakemore 2008).

Biology of Aggression

Neurotransmitters

Although neurotransmitters such as GABA and glutamate have been discussed in the literature, the most prominent neurotransmitter that is associated with aggression and violence is serotonin. Decreased brain serotonin activity as a correlate of aggression has been shown in studies employing chemical serotonergic indices, pharmacological challenge with serotonin agonists, functional imaging, and genetics. Compelling results in psychiatric populations with elevated levels of aggression revealed that depletion of the serotonin-synthesizing tryptophan increases aggression, whereas the administration of serotonin reuptake inhibitors decreases aggression. Furthermore, serotonergic stimulation increases metabolic responses in the prefrontal cortex, a region that has been associated with aggressive behavior and that has abundant serotonin receptors. It has been proposed that variations in serotonergic activity are particularly linked to impulsive aggression and investigations of normal variations of aggression in healthy individuals indicate a broader role of serotonin in self-control and goal-directed behavior (Manuck et al. 2006).

Genetic Aspects of Aggression

Twin and adoption studies have shown that violence has a heritable component. However, results from studies in the 1970s on chromosomal abnormalities in prisoners could not confirm the causal influence of the XXY genotype on aggressive behavior. Rather, modern molecular genetics research indicates that polymorphisms in neurotransmitter metabolizing enzymes are a fruitful approach to investigate the link between genetic dispositions and violence mediated through individual differences in neurocognitive functioning. For example, it is known that the low expression variant of monoamine oxidase A, a crucial enzyme in the serotonin catabolism, is involved in emotion processing and cognitive control and increases the risk for impulsive aggression (Meyer-Lindenberg et al. 2006). There is, however, an interaction between genetic polymorphisms that can increase the risk for aggressive behavior and childhood upbringing. The low expression variant of the serotonin transporter 5HTT generally increases the risk for aggressive behavior particularly in the context of an adverse childhood environment, but a supportive childhood environment suppresses the risk for aggression in the presence of the low expression variant of 5HTT.

Brain Structure and Function

Modern, non-invasive neuroimaging methods have stimulated the study of structural and functional correlates of aggression and violence. The prefrontal cortex, insula, and the amygdala – a gray matter structure underneath the cortex that helps weigh the emotional relevance of stimuli – have been linked to aggressive behavior. The amygdala is thought to be involved in the basic threat circuit and has a role in increasing or decreasing the likelihood of aggression in response to a threatening or frustrating event. Damage to the orbitofrontal and ventromedial prefrontal cortices, both parts of the prefrontal cortex, has been shown to increase aggression in patients with penetrating and other head injuries, and it has been argued that these structures are involved in the exertion of inhibitory control over aggressive impulses (Blake and Grafman 2004). Studies

investigating the association between behavioral measures of aggression and gray matter volume indicate that decreased prefrontal cortex, or increased amygdala, and insular volumes are associated with aggression in aggressive psychiatric patients, aggressive interactions between healthy adolescents and their parents, and symptoms of aggression in conduct disorder, respectively. Functional imaging studies revealed that reduced levels of activation in the ventromedial prefrontal cortex are linked to aggression in healthy individuals (Meyer-Lindenberg et al. 2006).

Treatment of Aggression

There has been a paradigm shift in the treatment of aggression from “nothing works” in the late 1970s to “some things work in some settings with some people” in the early 1990s. Despite limitations, there are several pharmacological options available for symptomatic treatment. Double-blind placebo-controlled studies and clinical experience indicate that mood stabilizers, anticonvulsants, antidepressants, antipsychotics, benzodiazepines, and beta-adrenergic blockers are useful agents for the treatment of aggression. Some of these agents, e.g., serotonin agonists and mood stabilizers, have a more direct effect on brain systems that modulate behavior and that have been associated with aggression including the prefrontal cortex. However, it cannot be determined today to which extent these agents are effective due to their antiaggressive impact rather than to their nonspecific sedative or neuroleptic effect, and there are currently no drugs available that primarily target aggressive behavior (Comai et al. 2012).

While pharmacologic agents can be helpful in reducing aggression, a combination with psychotherapeutic strategies is usually indicated to achieve long-term reductions in aggressive behavior. The successful implementation of psychotherapy depends on a number of variables including age, diagnosis, cognitive capability, severity of family dysfunction, and the willingness of the individual to engage in therapy. Children and intellectually challenged individuals typically profit from behavior modification

techniques and modeling of behavior, while adolescents and adults may benefit from more cognitive methods and dynamic psychotherapy due to their better insight. According to the NIH State-of-the-Science Consensus Statement for Preventing Violence and Related Health-Risking Behaviors in Adolescents, treatment that is most effective is characterized by the following criteria: it is based on sound theory, intensive and long-term, multimodal and multicontextual, developmentally appropriate, delivered with fidelity and in a noncoercive setting; it targets strong risk factors and the improvement of social skills and other relevant competencies and follows a cognitive-behavioral strategy. Without hesitation, these factors can be transferred to the treatment of aggression in adults (National Institutes of Health 2004).

Summary

Aggression is harmful behavior that directs physical attacks, angry feelings, and hostile thoughts toward other people. While some individuals display aggression only during adolescence, others develop notable violent behavior starting in early childhood. Through a combination of observational and instrumental learning, priming, desensitization, aggression-frustration pairings, and enacting aggressive thoughts, cognitive-emotional and behavioral patterns of aggression are formed. Children and adolescents are at particular risk for aggression when they face adverse family conditions, peer relations, and neighborhoods. Biological risk factors impact aggressive behavior in interaction with social mechanisms. Genetic predisposition and brain damage can set the stage for cognitive and social dysfunction in prefrontal and subcortical regions that lead to an increased likelihood of aggressive behavior. Pharmacological agents can help decrease aggressive symptoms in some patients, while behavioral therapies (sometimes in combination with drugs) can reduce social risk factors and foster interpersonal skills in other individuals.

Cross-References

- Forensic Psychology
- Neuroimaging
- Personality Psychology
- Social Neuroscience
- Social Psychology
- Violence

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Aging

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Description

Interest in all aspects of aging has rapidly grown for about 60 years, with the dramatic gains in health, population growth, and longevity and the increasing number of aging individuals worldwide. Neuropsychological aspects of aging are treated as part of, or as subdisciplines of a variety of disciplines such as psychology, psychiatry, medicine, and neuroscience. The respective subdisciplines attempt to understand the relationship between psychological aspects of aging and their relationship to neurological processes, especially, the functioning of the brain. An overarching endeavor is to understand and describe the aging process, and to search for mechanisms related to aging as distinct from earlier development. For example, earlier development appears to be primarily driven by processes of genetic regulation and cultural efforts that encourage negentropy or the formation of increasingly complex structures, but aging and ultimately death are seen to reflect entropy, the lowering of the orderliness of structures that results when the effectiveness of these regulatory processes ceases. These processes are in part “natural” but across many of the aging subdisciplines, increasing emphasis is based on conceptualizing aging not merely as a normal process of deterioration and decline. Instead, increasing interest focuses on the mechanisms that may accelerate or slowdown aging and to understand ways in which deterioration can be prevented and or ameliorated, as well as competencies that may even improve in later life. A particular strong

current interest in the modifiability of patterns long associated with normal aging combines many of the subdisciplines, with an emphasis on the potentials and limits of the plasticity of the aging process.

Self-Identification

Science

The study of aging identifies itself as a science in the sense that it uses qualitative and quantitative research methods of the human and experimental sciences, such as biology, medicine, cognitive science, neuroscience, psychology, and sociology.

Religion

The study of aging includes research on the effects of religion and religious practices on such outcomes as psychological and physical well-being. As an example, one recent strong current interest is research on the effects of meditative practices on cognitive and emotional processes as well as health.

Characteristics

The study of religion and aging is part of the larger domain of religion and development (over the total life span) but interests itself primarily in the relationship between aging and religion, although some studies propose a view of a continuous process from birth to death.

Relevance to Science and Religion

This subdiscipline is interested in the scholarship of “Science and Religion” in the sense that it contributes empirical data about individuals’ religious beliefs and practices and their relationship to diverse outcomes, ranging from physical to psychological health. In that effort, a central question is to describe the specific forms and aspects or religiosity in elders that may foster or hinder well-being.

Sources of Authority

As is true of other sciences, the sources of authority are based on published research that is rigorously selected through a process of peer review in research funding and publications. A large variety of major scientific journals is devoted to or includes research and theoretical writings on aging; some of these journals focus specifically on aging and religion. A large number of regularly reissued handbooks further offer state-of-the-art reviews of the field.

Ethical Principles

Like other empirical studies, research of this discipline is subject to institutional ethical reviews which assure the safety, dignity, and entirely voluntary nature of research participation.

Key Values

The key values, like those of other scientific disciplines, focus on objective inquiry while at the same time respecting the rights, dignity, and safety of research participants.

Conceptualization

Nature/World

Nature and world are defined in terms of natural biological, psychological, social, and physical processes, and aging is seen as a natural process of biological, psychological, and social changes.

Human Being

The human being is seen in terms of genetic and physical dimensions and as encompassing psychological needs and propensities that lead him or her to construct meanings within complex social organizations; these psychological propensities are related to (i.e., in part derive from and in part influence) his physical and biological capacities, resulting in a basic view of evolving individuals equipped with plasticity.

Life and Death

Life is seen as a process of evolution that involves interaction of the individual with his or her social and physical environment and that is in part shaped by genetic mechanisms. Death is seen as a natural end of life but its quality is shaped by medical, social, and psychological dimensions. Psychologically, individuals' inner attitude toward and preparation of death, includes processes of grief related to the death of others or of one's own anticipated death.

Reality

Reality, like time, is in part subjective and constructed, in part objective and externally given.

Knowledge

Knowledge is seen to comprise not only quantitative accumulation, but also personal structuring of experience.

Truth

Truth is seen from both an objective perspective as consensus, and also from a subjective perspective as individuals' construal of beliefs, etc., held to be inalienable.

Perception

The field studies changes in the sensory perception (vision, hearing, taste, etc.) that are seen to be part of the process of aging, but perception is also used to refer to the personal and social construction of these meanings.

Time

Time is seen as a mere chronological passage but over and above mere chronology, also the way in which psychological-inner and physical-outer dimensions (e.g., social experience, environmental pollution) work to delay or accelerate time-related processes.

Consciousness

Consciousness refers to individual's awareness of self and others and their capacity to use reflection as a means of change. Consciousness is an

important area of study on many dimensions from psychological to neuroscientific.

Rationality/Reason

Reason refers to objective aspects as cognitive capacities and their changes with age as well as to more subjective aspects such as individuals' own reasoning on aspects of self and the world.

Mystery

This term is used little if at all in the field of Aging and Religion.

Cross-References

- [Aging, Psychology of](#)
- [Anatta](#)
- [Attachment: Theory and Patterns](#)
- [Bodhisattva Ideal](#)
- [Buddha](#)
- [Buddhist Meditation Practices](#)
- [Cognitive Psychology](#)
- [Cognitive Science of Religion](#)
- [Consciousness](#)
- [Developmental Psychology](#)
- [Emotion](#)
- [Empathy](#)
- [Epistemology](#)
- [Geriatrics](#)
- [Intelligence](#)
- [Philosophy of Mind](#)
- [Psychology in Buddhism](#)
- [Rationality \(Philosophical\)](#)
- [Truth](#)

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Aging and the Life Course, Sociology of

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The subfield of the discipline of sociology referred to as “Aging and the Life Course” is concerned with understanding the interplay between the development of human lives and changing social structures across the entire span of life. Human development is considered as a multidimensional and multidirectional phenomenon within a broad framework that extends across the entire life span, from conception to death (see Baltes 1987). Historically, the concept of “aging” refers to changes to individuals in older age that occur over time resulting from some combination of biological, psychological, and social mechanisms. The “life span developmental” perspective is a somewhat broader framework, as it considers ► [aging](#) to begin at conception and conceptualizes human development as multidimensional and multidirectional processes of growth (or change) involving both gains and losses across the life span. From this perspective, human development and/or aging are embedded in multiple contexts and are conceived of in terms of dynamic processes in which the ontogeny of development interacts with the social environment, a set of interconnected social settings, embedded in a multilayered social and cultural context. In addition, the uniqueness of individual biographies and the diversity of life patterns have encouraged a “life course” approach to human development within the social sciences.

The life course can be defined narrowly, focusing on the unique pattern of events, transitions and trajectories of roles, or social pathways, extending across the life span, such as entering and leaving school, acquiring a full-time job, marriage, divorce, retirement, and the like (Elder 2000, p. 1615). Social pathways are discrete trajectories of roles followed by an individual through particular life stages, or between life stages, through time, for example, the transition from adolescence to adulthood may follow a variety of different social pathways. Or, equally common, the life course perspective can be seen as “an approach to the investigation of the changing environment of the individual and its developmental implications (see above) . . . through an evolving concept of age-graded life course that is embedded in a matrix of social relationships, an active view of the individual shaping the life course, and an approach toward understanding the historical influences in lives and developmental processes” (Elder and Shanahan 2006, p. 968). A number of concepts have been applied interchangeably – life span, life course, life cycle, and life history – but each of these makes a distinctive contribution that often has different meanings across disciplines (see Elder 2000; Alwin 2012).

The purpose of the life course *approach* is to examine the interdependence between (a) human development over the life span as a process that includes socio-environmental (as well as biological) factors and (b) societies and groups as stratified by life cycle stages, often socially constructed, which give meaning to temporal sequences of roles, (c) with succession of birth cohorts as the link connecting the human development and age-statuses. This special field draws, not only on sociology, but on the disciplines of anthropology, psychology, economics, and history, with an multidisciplinary perspective that contributes to the reformulation of traditional emphases on process and change, on the multiple interdependent levels of the social system, and on the multidimensionality of outcomes of interest as they touch on related aspects between disciplines (see Featherman 1983). The field is concerned with both basic scholarly research on aging and human development, as well as the

implications of this body of work for public policy and professional practice.

One important focus of the life course approach is the study of the social pathways defined by events and transitions experienced by individuals and the sequences of roles and experiences followed by individuals over particular phases of their lives (see Mortimer and Shanahan 2003). Influences of development, maturation, and aging are usually identified with changes within individuals linked to their getting older, becoming more mature due to having lived more of life, having experienced a variety of different life course events, or due to physical, cognitive, or other kinds of developmental change. For simplicity, we often refer to all of these types of “within-person” change as the effects of (or consequences of) aging, but it is an important emphasis of the life course approach to understand that these changes occur in a *social context* defined by the individual’s unique configuration of roles and the nature of the social environment. Human development and aging do not necessarily follow exactly the same course for all individuals and the life course perspective presents an approach to studying the variety of life course patterns.

One fundamental aspect of the social context experienced by the individual is the historical location and/or participation of those born at the same time. Indeed, one important premise of the life course perspective is that individuals are both producers and products of a complex historical and socioeconomic context through which their life experiences are shaped and understood. The concept of *cohort* is essential to this perspective in that it provides a mechanism for identifying and interpreting the potentially distinct collective characteristics of individuals who share a common year of birth. These distinct characteristics are commonly referred to as “cohort effects,” and their empirical identification is a subject of considerable interest. In life course and human development research, the common time interval defining the cohort is often one calendar year, and the shared event is birth. Thus, a birth cohort (often shortened to just “cohort”) is the group of people sharing a common year of birth. Members of a birth

cohort have the distinction of potentially experiencing a shared history inasmuch as they are the same age at any given point in time and, thus, share a common set of political, social, and cultural events at approximately the same point in the life cycle.

Finally, another important element in the life course approach is that people's lives are uniquely shaped by the timing and sequencing of life events (both intended and unintended), and that early life events and exposures contribute in meaningful ways to later life outcomes. Various strands of individual life trajectories, (such as schooling, work, military service, marriage, family, wealth, and health) are interconnected to one another, and it is assumed that events occurring in one domain can affect outcomes in another. This is implied by the fact that lives are embedded in institutional structures and historical contexts, and distinctive birth cohort experiences are considered to reflect exogenous influences. Not only are lives linked across generations, they are also linked intra-generationally.

The Scientific Study of Aging and Life Course

To understand how earlier life events and exposures influence the present and future, it is important to have accurate information about both the past and the present. How do students of aging (human development) and the life course gather information in an effort to study the causes and consequences of within-person change within a socio-environmental framework? Several different approaches have been used by researchers interested in the causes and consequences of within-person change with respect to outcomes of interest, outcomes typically related to health, disability, psychological well-being, or cognitive functioning, but the emerging consensus among students of aging is that research designs that collect measurements on the same persons over time are a particularly valuable approach to studying the causes and consequences of aging. However, any research design that locates and

measures events and processes in time is referred to as *longitudinal*.

Table 1 (below) depicts four different types of research designs – three of which are clearly longitudinal designs – that can produce potentially valuable information about aging and its consequences. One-shot cross-sectional studies (upper left-hand quadrant) can provide information on critical differences of groups of persons of different ages, but such studies provide a weak basis for drawing inferences about the processes of aging. While the limitations of such designs are increasingly recognized, they are pervasive in inquiries on aging. Two types of studies are typical of this type of design: (a) surveys of a cross section of the population are undertaken in order to compare persons born at different times (i.e., persons of different ages) in order to draw conclusions about the role of age in association with other variables, such as attitudes toward certain social policies, and (b) laboratory studies of cognitive aging, where a group of subjects (usually students) representing “young” people are compared to a group of subjects (usually older volunteers) representing the “old” and on the basis of observed “age differences” conclusions are drawn about “aging.” In this case, “between group” differences are viewed as reflecting the nature of “within-person” change that occurs with age or development.

There is a variety of other kinds of longitudinal designs, including everything from complicated life-history calendars, which go to great lengths to date events, their timing and duration, on the one hand, to retrospective life histories presented in narrative form, on the other. Often these can be embedded in one or the other of these four major types of designs, including the one-shot cross-sectional study, so even this design can ultimately be construed as longitudinal if it captures events and processes retrospectively (see Belli et al. 2009).

One of the critical problems with the one-shot cross-sectional studies in drawing inferences about the influences of “aging” is that they confuse these with the influences of “cohort” factors (Mason and Fienberg 1985). Persons of a particular age at a given point in time are also

Aging and the Life Course, Sociology of,
Table 1 Designs for the study of aging

<i>Single cross-section design</i>	<i>Repeated cross-section design</i>
Multiple cohorts observed at one point in time	Multiple cohorts observed at multiple points in time
<i>Longitudinal single cohort design</i>	<i>Longitudinal multiple cohort design</i>
Single cohort of persons observed over time	Multiple cohorts of persons observed over time

members of the same birth cohort (i.e., persons born during the same year). Members of a particular birth cohort share the experience of the life cycle, that is, they experience birth, infancy, and childhood; reach adolescence; grow into early adulthood; and mature into mid-life and old age during the same historical time. In this sense, members of a birth cohort share a social history, that is, they experience the same historical events and the opportunities and constraints posed by society at a given time in history. A person's *cohort* membership may be thought to index the unique historical period in which a group's common experiences are embedded, and their behavior may have as much to do with their historical experiences as they do with their age.

It is important to realize that one-shot cross-sectional designs are *not* inherently limited, especially if they involve the replication of cross sections over time. The existence of *diachronic* cross-sectional data for the same cohorts (see upper right quadrant) can be used as a legitimate basis for separating the effects of aging and cohort effects under certain circumstances (Mason and Fienberg 1985). Another way to control for cohort differences is to study a single cohort (lower left-hand quadrant of Table 1). Eaton (2002) provides a strong rationale for studying a single cohort from conception to death. In this type of single-cohort study, age variation occurs over time rather than cross-sectionally, and this permits an explicit focus on within-person change. However, development and aging do not occur in a historical vacuum, and while studying a single cohort over time does

hold many variables constant, it is difficult to generalize about processes of aging because of the confounding influences of aging and history.

Having information on the same persons across a range of birth cohorts opens up several possibilities for analyzing the effects of aging across cohorts (see the lower right-hand quadrant of Table 1). The value of this type of longitudinal design is borne out by the vast number of research projects over the past few decades that locate and measure events and processes *in time* (see Kuh and Ben-Shlomo 2004). Indeed, we have reached a point where there are several longitudinal data sets that permit the study of patterns and processes of aging in different historical and cultural contexts. For example, in the United States, the series of panel surveys known as the Health and Retirement Study (HRS) provides a series of replicated longitudinal studies of a sequence of birth cohorts currently and in the future. The first of these began in 1992 as a panel survey of persons from cohorts born in 1931 through 1941 and reinterviewed biennially since then. The idea for the HRS derived from a growing awareness of the inadequacy of data available from the Retirement History Survey that began in 1969 and followed a set of cohorts of men and unmarried women born in 1906 through 1911 for 10 years. Basing one's inferences about processes of aging, it was argued, on such a limited spectrum of historical cohorts had obvious limitations, given, for example, the growing participation of women in the labor force and related changes in the family. The collection of data on health and other antecedents of work and retirement decisions for more recent cohorts was viewed as essential to understanding experiences related to processes of aging in the more contemporary social context. The HRS design is one that studies multiple cohorts over time, sometimes referred to as an *accelerated* longitudinal design.

The assessment of change over time is fundamental to the quantitative study of aging, and longitudinal designs are vastly superior to cross-sectional studies in their ability to reveal causal influences in social processes because they can better pinpoint the temporal order of events, conditions, and experiences. For example, consider

the explosion of research interest in the relationship between socioeconomic status and health (see Alwin 2012; Alwin and Wray 2005). Many of the existing studies on this topic are cross-sectional and not necessarily suited to the kind of causal analysis that is necessary to understand the SES-health connection. In cross-sectional studies, it is possible to observe a substantial association between indicators of SES and measures of health, but this research strategy is quite limited because it ignores the dynamic processes of social stratification. For example, few studies measure both health in old age and health status at earlier points in the life cycle; therefore, it is difficult to know the extent of “within-person change” in health status, or how stable individual differences in health are over the life span. Studies that measure health at midlife or old age rarely include measures of early health status, or of early socioeconomic life experiences and family background. It is well known, for example, that early educational attainment, which is influenced by parental socioeconomic characteristics, shapes later life occupational opportunities as well as the economic consequences of those attainments.

Using a life course perspective, along with longitudinal data which measures early family background and relevant childhood socialization experiences, it would be possible to better sort out the extent to which the SES-health linkage is largely causal, or in part spuriously due to a range of “selection” factors that index events and experiences occurring earlier in the life course. Of course, even the best longitudinal data are unlikely to firmly resolve many substantive issues of this sort, in that there will still be relevant variables that are omitted from the design, limitations of sampling, measurement imperfections, and other impediments to drawing causal inferences. On the other hand, longitudinal data permit one to address far more interesting questions than is possible with cross-sectional data. For example, continuing with the SES-health linkage: How do early health deficits affect life-long socioeconomic outcomes? Do the advantages and disadvantages linked to one’s family background differentially affect current

health status, and what processes transmit these effects? Does the linkage between SES and health change over historical time (e.g., are younger cohorts less disadvantaged by early health deficits)? Do changes in (physical and mental) health status contribute to the loss of social status or social capital? Do changes in cognitive and/or emotional well-being shape decisions to exit the labor force, or retire, and therefore influence one’s social status? These are just some of the types of questions that could be answered with data from longitudinal designs, about which one can only speculate from relationships observed in cross-sectional designs.

Longitudinal data are also essential for examining issues linked to life course theory, which focuses primarily on the developmental or age-related patterns of change over the life span that are embedded in social institutions and subject to historical variation and change. However, in research on aging and the life course, there are several major impediments to drawing inferences about change and its sources. Perhaps the most fundamental of these is to be able to locate events and processes in time and specify their causal relation to consequences or outcome variables, while taking other causal factors into account. Thus, in research on aging, virtually all the best designs for studying life course phenomena are *longitudinal* because they allow one to more accurately conceptualize the nature of the substantive phenomenon and locate lives in time. This requirement strongly implies the need for repeated longitudinal studies based on sequences of birth cohorts, or what is often referred to as the accelerated longitudinal design (see Alwin and Wray 2005).

Finally, longitudinal designs also fit well with the newer perspectives linking the demography of the life course to human development. If one takes a life span developmental perspective with respect to the study of processes of aging (including life cycle processes and life course events and transitions) and recognizes that human lives are embedded in social and historical contexts, it is clear that a range of ontogenic and sociogenic factors impinge on people’s lives in ways that affect their well-being. Capturing the

interlocking trajectories or pathways across the life span that are marked by sequences of events and/or social transitions which impact upon individual lives and relating them to measures of health and functioning (among other things), as well as linking them to underlying social processes, is an important focus of a great deal of research on aging, and these are the major theoretical concerns that drive the present discussion of longitudinal methods for the study of aging and human development.

Cross-References

- [Aging](#)
- [Causality](#)
- [Experience](#)
- [Religious Experience](#)
- [Time](#)

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Aging, Psychology of

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Related Terms

[Geropsychology](#); [Psychogerontology](#)

Description

The psychology of aging seeks to understand the regular changes in the organization of behavior and subjective experience that occur after young adulthood. Changes that occur earlier in life are typically categorized as development, with the differentiation of “development” and “aging” often popularly expressed through the metaphor of the hill of life. Historians note that with the rise of modernity, this metaphor of growth and decline replaced a circular view of human life that was expressed in religious iconography, showing the wheel of life from birth through death revolving around images of transcendence (Cole 1992).

Since the 1980s, psychologists have embraced a multidirectional model of aging, meaning that they view gains and losses as occurring throughout human life. Aging is commonly seen as a counterpart of development, with plasticity and opportunities for growth maintained throughout life, even as physical, psychological, and social losses accrue. These changes occur at different rates in different biopsychosocial

systems. Therefore, chronological age alone cannot be viewed as an explanatory variable.

The psychology of aging, which is sometimes called “geropsychology” or “psychogerontology,” emerged as a subdiscipline of psychology in the mid-twentieth century, although its roots reach back to ancient discourses on human longevity. Today, psychologists who study aging often collaborate with persons representing the many other fields that together form gerontology. These include scholars and researchers in the biomedical sciences, the social sciences, the arts, and the humanities, as well as practitioners such as nurses, social workers, neuro- and clinical psychologists, art and music therapists, and clergy.

The number of publications in the psychology of aging has increased exponentially in recent years. The 6th edition of the *Handbook of the Psychology of Aging* (Birren and Schaie 2006), published in 2006, illustrates the growth and diversity of this field. Like the previous volumes in this series of handbooks, chapters in this edition review earlier work and point out new developments in topics ranging from behavioral genetics to psychotherapy with older adults.

Although many people still hold negative views of aging and older adults, today there is greater emphasis in research and practice on healthy aging and resiliency. Researchers are documenting the ability of older persons to adapt to changing life circumstances, maintain positive affect, remain engaged with their communities, and cope with the stresses of late life, while practitioners are developing interventions to support older persons in making these adaptive responses.

Self-identification

Science

The psychology of aging primarily identifies itself as a science. Some research in the psychology of aging is barely distinguishable from biological research on topics ranging from gene expression to neural anatomy and function. Other research is situated within the social sciences. Regardless of

the focus of the research, the psychology of aging operates with the assumptions of modern science, including the necessity of ► **falsifiability** for hypotheses and theories.

Research designs vary according to the specific topics and populations being examined. For example, intervention studies of cognitive rehabilitation for memory impairment employ experimental designs with participants randomly assigned to treatment and control groups. Cross-sectional research compares persons of different ages and often analyzes effects of multiple predictor variables on various outcomes. Quite a few ongoing longitudinal studies throughout the world have contributed to the knowledge base about age change in psychological phenomena like speed of response, memory, intelligence, and personality. Occasionally, psychologists are interested in cohort differences and thus employ time-lag designs which compare cohorts on variables like grandparenting styles, attitudes about psychotherapy, and sexual behavior. Sequential designs enable psychologists to combine cross-sectional, longitudinal, and time-lag analyses in order to control for the varying effects of age, cohort, and time of measurement. One example of this type of research is found in ongoing analyses of data on primary mental abilities (i.e., aspects of intelligence studied through tests of verbal meaning, word fluency, number, spatial relations, memory, perceptual speed, and general reasoning), from the Seattle Longitudinal Study which began in 1956. These more complex designs enable psychologists of aging to explore both inter- and intraindividual change and stability in a variety of characteristics.

Psychologists who study aging also employ qualitative methods grounded in the human sciences, rather than the natural sciences. For example, interpretative phenomenological analysis is used to reveal the experiences of persons living with early-stage dementia. Interviews with aging persons, as well as narrative studies of their autobiographical writings, provide insight into the lived experience of old age in our time. Researchers continue to debate whether this type of work qualifies as scientific and whether

it meets the rigorous demands of science for reliability and validity of measures. Nevertheless, it has produced important insights into the phenomenology of old age experiences and has created a foundation for collaboration with artists, literary theorists, philosophers, theologians, and other scholars in the humanities.

Characteristics

One of the key distinguishing features of the psychology of aging is its awareness of time and the differential timing of biological, psychological, and social age changes. Although chronological age is a key index to time's passage, geropsychologists also must account for cohort differences and the effects of the historical period when data are collected. For example, current public awareness about the importance of a healthy diet for late life brain function may influence behaviors of older adults, making current research on diet and cognition hard to compare to studies conducted 20 years ago when there was less knowledge about diet and health.

Psychological research in general has mostly focused on young adults, especially those enrolled in the colleges and universities where research is conducted. Much of this research does not include a developmental perspective, and thus what we know about basic psychological phenomena like sensation and perception, attention, memory, learning, and problem solving is based upon observations of persons in their 20s. Much of this research implicitly assumes that as long as researchers control for variables like gender, education, race, and ethnicity, then observations can be assumed to have external validity. Geropsychologists also recognize the importance of controlling for the effects of demographic variables; in addition, however, they are aware that variable rates of change in biological, psychological, and social phenomena affecting aging persons produce increasing heterogeneity with increasing age. Thus, extra care must be taken in generalizing about research outcomes.

Because the psychology of aging is so intimately connected to gerontology, a broadly

interdisciplinary enterprise, geropsychologists tend to pay more attention than some psychologists to interconnections among genes, neurochemicals, brain systems, behaviors, perceptions and cognitions, personality traits, social relationships, and the cultural and historical contexts in which these are expressed. In particular, most psychologists of aging employ an ecological perspective to account for the dynamic, dialectical relationships between aging persons and their environments.

Finally, the psychology of aging examines a portion of the life cycle that is fraught with loss and inevitably closes with death. Intimations of loss and mortality elicit social stigma, adding to the burdens of old age. For these reasons, geropsychology engages more with existential issues of meaning and purpose than many other subdisciplines in psychology. This is illustrated in the growing literature on dementia that considers issues of self and identity as memory fades. Other areas of geropsychology that acknowledge existential issues include studies of terminal care, coping and resiliency, civic engagement, and late life religiousness and spirituality.

Relevance to Science and Religion

In general, psychologists of aging do not participate in contemporary debates about the competing truth claims of science and religion. Gerontologists have been conducting research on religion, spirituality, and aging since the 1980s (although some sociologists of religion studied older adults many decades earlier). This work has primarily addressed connections between religious beliefs and practices and the health of older persons (Koenig et al. 2001). In the 1990s, some researchers expressed concern that such studies harmed the tenure aspirations of persons in academia, but by the turn of the twenty-first century, enough studies had been published in respected journals to reduce that concern somewhat. In addition, funding from the federal government, as well as private foundations, became available for research on the relation of religion and health. This supported investigations

into what some psychologists called the “mechanics,” underlying the observed salutary effects of religious activities and beliefs. However, with the exception of a few persons working in the area of “critical psychology” or “critical gerontology,” scholarly study of the interface between science and religion is lacking.

Sources of Authority

Authority in the psychology of aging derives from systematic, repeatable observations that have been reviewed by peers and published in respected journals (usually those with high rejection rates). Longitudinal studies are accorded special respect, particularly if they include multiple cohorts, allowing for complex analyses and control for age, period, and time of measurement effects. Interventions tested with randomized, controlled trials are also highly respected. The psychology of aging tends to locate authority in the most recently published papers with the exception of highly cited “classic” papers by certain leading researchers.

The first generation of geropsychologists began their work in the 1950s and flourished in research universities in the second half of the twentieth century. Included among these elder “sources of authority” in geropsychology are Paul B. Baltes, James E. Birren, Irene M. Hulicka, Robert Kastenbaum, M. Powell Lawton, K. Warner Schaie, Lillian Troll, and Sherry Willis (Birren and Schroots 2000). By the turn of the twenty-first century, some had retired or died. However, others have continued to contribute to the field in the years following their first retirements, thus demonstrating the vitality of what some call the “third age” of life (the time between the first retirement and disability or death).

Ethical Principles

Research on the psychology of age (cross-sectional designs), older adults (descriptive and experimental designs), cohorts (time-lag

designs), and aging (longitudinal designs) must abide by the *Ethical Principles of Psychologists and Code of Conduct* of the American Psychological Association (APA). The APA Ethics Committee regularly meets to review violations of the code of conduct and recommend changes necessitated by evolving technology, forms of psychological interventions, and research protocols. Researchers must be competent to conduct the research, obtain informed consent from participants, and guard the confidentiality of participants’ responses. Research protocols must be approved by institutional review boards (IRBs) which usually consist of peers in the field as well as informed citizens and representatives of the institution where the research is to be conducted.

Some psychologists of aging provide various kinds of services to older adults, including cognitive rehabilitation and psychotherapy. They must also abide by the *Ethical Principles of Psychologists and Code of Conduct*, be competent practitioners, obtain informed consent, and insure confidentiality. Interventions must be evidence-based, meaning that they have been tested scientifically, preferably in randomized controlled trials. In addition to the *Ethical Principles of Psychologists and Code of Conduct*, the APA has also published guidelines for practice with older adults. This document details particular concerns that may arise in working with older persons, including questions about mental competency (Abeles et al. 1998). Researchers and practitioners working with persons along the dementia spectrum must carefully assess participants’ competence to provide informed consent. The Capacity to Consent to Treatment Instrument (CCTI) is one example of an assessment tool designed for and tested with older adults (Marson and Hebert 2006). If a person is incapable of providing consent, then it must be obtained from the legal guardian.

Key Values

As stated in the first issue of the *Journal of Gerontology* (1946) published by the newly formed Gerontological Society of America

(GSA), geropsychologists and other researchers and practitioners in gerontology seek to add life to years in a time when advances in medicine have added years to life. This goal continues to be central to gerontological research and practice. The GSA's mission statement adds that gerontologists promote and engage in multi- and interdisciplinary research that is widely disseminated to practitioners and political decision makers. Similarly, the American Society on Aging (ASA) states that its membership works to advance knowledge and skills that will lead to increased quality of life for older persons.

Psychologists of aging value the acquisition of scientific knowledge and the translation of that knowledge into practice. They employ a biopsychosocial approach to understanding older persons, including those with neurological impairments. While the biomedical interpretive framework regards older persons primarily in terms of their physical deficiencies, geropsychologists insist on considering the complex interconnections among physical conditions, psychological resources, past experiences, relationships, and cultural and historical contexts. This approach embraces what geropsychologist Paul Baltes called a "multidirectional" view of life span development, meaning that gains and losses coexist. Thus, an aged person might show multiple losses of physical functionality while at the same time demonstrating gains in effective coping strategies, meaningful relationships, and spiritual insight.

Increasingly, scholars in gerontology are critiquing traditional Enlightenment values of rationality and individualism. Those who work with persons with dementia are especially aware of the stigma these values attach to persons living with memory loss and cognitive confusion. Emphasis on personhood, as formed and rooted in relationality, has produced a new culture of dementia care and has inspired research on the lived experience of dementia (Kitwood 1997). The emerging discussion of relationality among geropsychologists has broadened views on older adults' spirituality, including persons living with dementia (Allen and Coleman 2006), and has invited dialogue with theologians.

Conceptualization

Nature/World

The psychology of aging conceptualizes nature/world objectively as matter that exists in space and time and subjectively as the felt experiences of older persons. The dialectical perspective on aging and development argues for the reciprocity between human actions and the world such that people influence their environments and environments influence persons. This occurs at multiple levels of analysis, from the genetic to the social. Geropsychologists generally accept the competence-press model first articulated by M. Powell Lawton, which argues that subjective well-being and adaptive behaviors are a function of the interaction of individuals' competencies and environmental challenges.

Human Being

A human being is a person, formed from birth until death through the interplay among individual characteristics, relationships with others, and the environment (both human created and natural).

Life and Death

Psychologists of aging accept evolutionary biology's perspective on the origins of life. They are more concerned with the ways death is defined biologically, psychologically, and socially. They attempt to counter the popular conception of the state of advanced dementia as akin to psychological death (e.g., the death of the self), a position that often leads to social death whereby others treat the individual as if he or she is already dead. This produces what Tom Kitwood (1997) calls a "malignant social environment" that elicits problematic behaviors.

Some geropsychologists conduct research on psychosocial conditions associated with morbidity and mortality. These include anxiety, depression, and social isolation. Some research has shown that religiousness functions as a stress buffer for older persons and is associated with better health and longer life. Geropsychologists also study predictors of mortality in aged persons, such as declines in measured intelligence and

changes in personality traits in the 6 months preceding death. Finally, clinical geropsychologists sometimes work with bereaved persons and with individuals in hospice care as they prepare for death (Oyebode 2008).

Reality

Most psychologists of aging do not debate the nature of reality and view it as what is presented through various stimuli that affect sense organs. In other words, psychology takes an empirical approach to understanding reality. However, under the influence of postmodern critical theory, some geropsychologists emphasize internal and external influences on the ways human beings interpret information. Gender, race and ethnicity, social class, culture, and language, as well as physical and mental health and well-being, are all seen by these persons as shaping older persons' understanding of reality.

Knowledge

The psychology of aging follows an empirical epistemology, meaning that reproducible observations are viewed as the source of knowledge. It should be noted, however, that geropsychologists who are open to the humanistic stirrings in gerontology are willing to entertain the idea that metaphor as expressed in the arts, literature, and religion yields another pathway to knowledge about aging and older people's experiences.

Truth

Truth in science is viewed as partial. All scientific assumptions must be subjected to procedures that have the potential to prove the assumptions to be false. What is held as true today may be refuted tomorrow by additional evidence. Psychologists do not debate the meaning of ultimate truth. When psychologists of aging study the religiousness of older adults, they do not evaluate the truth of the religious convictions held by elders; rather, they describe the effects of religious convictions on behavior and physical and mental well-being.

Perception

Perception refers to the organization and interpretation of information received from the

senses. Perception is viewed as being shaped by sensory acuity, by individual motivations and emotions, and by socially reinforced attitudes.

Psychologists of aging study various forms of perception. For example, they inquire about how younger persons' perceptions of older people are informed by social stereotypes. Another example is found in research on how changes in auditory sensation, the speed of neural conduction, and information processing in the brain affect older people's ability to perceive speech.

Time

Psychologists of aging differentiate physical time (measured by clocks and calendars), biological time (expressed in circadian and metabolic rhythms), psychological time (experienced subjectively as duration of present events, memory of the past, and anticipation of the future), and social time (normative expectations about the timing of important life events). Currently, a dominant geropsychological theory – socioemotional selectivity theory – emphasizes older people's sense of time passing and their awareness that the duration of their lives is limited. This awareness of the limitations of personal time influences them to select social partners with whom they feel most comfortable and from whom they receive support for positive affect.

In addition to conducting research on perceptions of time by older adults, geropsychologists are also interested in timing in terms of the speed with which the nervous system processes information. A robust observation in gerontology is that aging persons experience generalized slowing of neural transmission, a condition that affects multiple psychological systems including sensation, attention, and cognition.

Time is also important to geropsychologists in terms of how they design their research. For example, it is important for them to be aware of the confounding of age and time of measurement in a simple longitudinal design. This means that if the same persons are tested periodically over a period of years, the researcher cannot know if differences are due to increasing age or the circumstances of the time when the observations were gathered. Similarly, cohort

and time of measurement are confounded in simple time-lag designs.

Geropsychologists interested in older adults' religiousness and spirituality have noted that the experiences of aging often produce a greater appreciation of the meaning of time. This may be expressed through the practice of spiritual disciplines like meditation and a deeper appreciation of how religious rituals order time (McFadden and Atchley 2001).

Consciousness

Although psychologists have debated the nature of consciousness and its neurophysiological substrate since the founding of the discipline, psychologists of aging tend to focus more on subjective awareness which is sometimes called "autonoetic awareness." This name was given to the feeling of remembering one's own past experiences by the well-known cognitive psychologist, Endel Tulving. A more common term is episodic memory. Humans have the ability to engage in imaginative time-travel that can be personal, in terms of recalling one's past, and historical, as when people picture themselves living in former times. Autobiographical memory consists of narratives, or stories, about one's life. Researchers have found that in old age, the greatest number of autobiographical memories originated between ages 10 and 30, a phenomenon sometimes called the "reminiscence bump."

People also are aware of the things they know. As Tulving said, they have a feeling of knowing about "facts" about the world, including their own grasp of languages and knowing what words mean in different tongues. Tulving called this semantic memory. Sometimes the feeling is frustratingly incomplete, as when people describe the "tip of the tongue" phenomenon when they can grasp only partial knowledge about a word (e.g., number of syllables) or world fact (e.g., recalling that a city is in the northeast part of a country without being able to recall the city's name). The cognitive psychology of aging examines how episodic and semantic memories are preserved as people age, with

most research finding more robust maintenance of semantic memories.

In addition to differentiating episodic and semantic memory, psychologists of aging also differentiate explicit from implicit memory. Explicit memories are those that persons are aware of (or conscious of) recalling. Implicit memory is nonconscious, with no perceptible effort involved. Getting on a bicycle and riding it is an example of procedural, implicit memory. Those who work with persons living with dementia often observe implicit memory. For example, you might ask a person with dementia to recall the first line of Psalm 23 and receive no response. However, in a worship setting, even those who rarely if ever speak sometimes repeat this well-learned Psalm when the worship leader begins reciting it.

In the laboratory, psychologists sometimes use a method called "priming" in which they activate ideas implicitly and then observe how these implicit, nonconscious ideas affect behavior. For example, one group of elders might be asked to write a paragraph about how they envision their deaths. Another group might be asked to write about how they envision having a tooth drilled. Terror management theory predicts that the group that was "primed" with death thoughts will behave differently than those "primed" with pain thoughts, with the former group more inclined to protect their self-esteem and views of the world when asked to do a task like reading a paragraph about a crime and deciding on a punishment. Priming has also been used in studies of religiousness; when God concepts are implicitly activated, people show greater helpfulness to others.

Rationality/Reason

Psychologists of aging study reasoning capacity and style in older adults. Much research focuses on everyday problem solving as a way of preserving ecological validity in data collection and promoting greater generalization of findings beyond the research environment. In this work, older persons may be asked to respond to short vignettes by telling what they would do if, for example, they discovered that the electricity had gone off in the night. Scores on the task reflect the number of safe

and effective solutions to the problems posed. Sometimes these problems are practical, like electricity failure, and some are interpersonal, as, for example, when an elder is asked about advice she would give to a young pregnant granddaughter. Many researchers have noted that, compared to younger adults, older people tend to combine emotional coping strategies for managing feelings with practical behavioral solutions. In other words, they show an integration of reason and emotion.

Longitudinal studies show a gradual decline in inductive reasoning abilities with age. However, the Seattle Longitudinal Study, which includes a number of different birth cohorts, has demonstrated an increase in inductive reasoning ability in birth cohorts since the 1920s, which is probably due to greater educational emphasis on problem solving rather than rote memorization.

Since the Enlightenment, philosophers and psychologists have emphasized the primacy of reason over emotion, with rationality often cited as the defining characteristic of being human. This position, however, has been challenged by researchers whose work on the interface between reason and affect has demonstrated that without feeling, human beings cannot make good judgments. Moreover, the preeminence of reason in defining what it means to be human is also challenged by persons living with the progressive memory loss and confusion of dementia. Although they may no longer be able to reason about problems as they once did, they continue to express emotion, demonstrate agency, and respond to persons and things in their environments. An emerging new culture of dementia care locates personhood in relationships and not in individual reasoning abilities (Kitwood 1997).

Mystery

In the empirical psychology of aging, the closest researchers come to the notion of mystery is in their research on wisdom. Nearly all writing and research on wisdom in the last two decades has emphasized that one important characteristic of wisdom is the acknowledgment of the uncertainty of life. Thus, elders described as wise often say that aging has given them a greater appreciation for mystery.

Sometimes the felt sense of mystery merges with the experience of the holy. This need not be occasioned by religious rituals or settings. Gazing into the eyes of one's first grandchild, contemplating the twists and turns of life's journey, watching a strapping teen grandson fishing in the lake by the family cottage, and sitting at the bedside of a beloved spouse slipping into death – all these and many other experiences may envelop elders in a sense of mystery that some call holy.

Relevant Themes

1. Although psychologists of aging have begun to study late life religiousness and spirituality, much more work remains to be done, particularly in terms of exploring how elders experience spiritual development. They may not associate this development with the beliefs and practices of the world's religions, and in fact, studies of the baby boom cohort (born between 1946 and 1964) suggest that they will not engage with religious ideas and experiences in traditional ways as they grow older. As neuroscientific findings about the aging brain accumulate, there will be a greater need for scholarship that brings science and religion into dialogue about aging persons' experiences of all of the topics addressed above, especially time, consciousness, and mystery.
2. The scientist-practitioner model of geropsychology demands scientific evidence regarding the efficacy of activities undertaken to improve the welfare and well-being of older persons. Pastors and others who offer spiritual care to older persons generally do not subscribe to this model. Nevertheless, their work can comfort the bereaved, support those seeking forgiveness, challenge the complacent, and give hope to the despairing. Should these professionals submit their practices to the scrutiny of science? These are discussions that need to be conducted within an atmosphere of mutual respect between those representing sciences and those representing religions.

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behavior concepts, such as the crowd and the mass, by six characteristics: (a) voluntary participation, which distinguishes the agoral gathering from state-managed large-scale demonstrations where persons participate under coercion; (b) publicity, that is, the gathering is open to the public both directly and via the mass media; (c) mass scale, that is, a large proportion and cross section of members of society participate, and knowledge of the gathering and its effects reach virtually every member of the society; (d) higher-values-oriented, nonviolent behavior in participants, which distinguishes the gathering from mass-scale sports events, music performances, and violent demonstrations; (e) the message expressed in the agoral gathering is so universally congruent with the values/beliefs of the society that it facilitates a sense of identification among the participants; and (f) this leads to expression, clarification, amplification, and verification of values underlying the message and, for some participants, to the experience of horizontal self-transcendence (Biela and Tobacyk 1987).

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Agoral Gathering

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According to Biela and Tobacyk (1987), the agoral gathering is a large-scale public gathering inspired by some higher moral and social ideas. It is differentiated from other collective

AI

► [Artificial Intelligence, General](#)

Alchemy

► [Robotics and Religion](#)

Alchemy in Islam

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Related Terms

[History of chemistry in Islam](#); [Islamic alchemy](#)

Description

Alchemy is, in the strictest sense, an attempt at finding a process to transmute vile metals (such as lead and copper) into gold or silver. It was transmitted from Greece to the Arab world (probably through Syriac intermediaries) during the ninth century for the most part (even if some treatises had perhaps already been translated some time before). Alchemy appears as a discipline in its own right in various Islamic classifications of sciences, such as that of al-Fārābī. The subsequent development of alchemy in Islam was significant, and it is from the Latin translation of Arabic works that the medieval West owes to know of alchemy. Many trends in the Arab-Muslim science of alchemy can be traced back, ranging from purely metallurgical details to properly Gnostic or magic elements.

Unfortunately, the discipline as such has not been much studied up to now, and only some treatises have been edited.

Self-Identification

Science

Alchemy may be called a science in its modern acceptance especially when it is considered in its link to metallurgy: some classifications of materials, some practical operations, etc.

In the context of medieval Islamic thought, alchemy is a science of its own, since it is part and parcel of theoretical knowledge.

Transmutation was the subject of important debates and controversies during the Middle Ages of Islam. Some scholars, like Avicenna, denied the possibility of transmutation and were interested only in the very practical processes (such as dyeing metals).

Religion

Alchemy cannot be defined as a religion. It would be more relevant to underline the links it has with religion, as is often the case with Gnostic views. But some alchemists did mix up Islamic religion with alchemy to such a degree that religion may be considered the principle of their thought (see below).

Characteristics

The specific feature of alchemy is its attempt to find a process to transmute vile metals into gold or silver.

Relevance to Science and Religion

Many links between alchemy and religions can be traced back. For some alchemists, alchemy could be viewed as a purely religious fact. For instance, by mixing shī'ite interpretations with alchemy, many texts of the Jābirian corpus (see below) draw connections between man, world, and alchemical work. According to them, the alchemist, by transmuting lead into gold, is simultaneously purifying himself and leading his soul to God.

Sources of Authority

Two alchemists are representative of the two major trends in Islamic alchemy (this division is exaggerated here, all alchemists are mixing

different considerations, and it is difficult to classify them in so distinctive types). The religious point of view can be represented by many texts attributed to Jābir ibn Hayyān (a pseudographic corpus probably written in the ninth century, but the dating and attribution are subject to controversy). The other trend, based on more technical and empirical considerations, is represented by the work of Abū Bakr Muḥammad ibn Zakariyyā' al-Rāzī (865–925), the well-known philosopher. We may also mention the *Emerald tablet*, a very short text of Greek origin (contained in the *Kitāb sirr al-khalīqa* of Bālīnūs (pseudo-Apollonius of Tyana)), and Muhammad Ibn Umayl (first half of the tenth century), representing a more allegorical trend.

Key Values

In the scientific and practical trend of alchemy, the key values are accurate observation and experiment.

As for the religious trend, initiation (reception of the intellect) is the main principle, but, experiment has also a very important place (depending on the author).

Conceptualization

Nature/World

Object of the alchemical work and knowledge.

Human Being

In the scientific and practical trend, human being (i.e., the alchemist himself) is the subject of the alchemical work.

But in the religious trend, the alchemist is not only the of the alchemical work, but also its subject and object.

Reality

Cf. truth.

Knowledge

In the scientific and practical trend, knowledge is considered as theoretical and practical understanding of nature.

In the religious trend, knowledge is a revealed understanding of nature and man (i.e., result of a gift).

Truth

What is in accordance with nature. In Arabic, the word *ḥaqq* (truth) has an epistemological and ontological meaning: it does not only mean “truth”, but also “reality”.

Perception

Foundation of the alchemical knowledge, especially in the Aristotelian conception of knowledge acquisition (the neoplatonist trend basing the knowledge on divine illumination).

Mystery

In the religious trend, the alchemical work is considered a mystery, whose knowledge is given by God (via the prophet or the imām).

Cross-References

- Astrology in Islam
- Gnosticism
- Magic
- Mysticism in Islam
- Science in Islam, Classification
- Science in Islam, Transmission

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Algebra in Islam

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Description

Algebra is the only medieval numerical problem-solving method capable of resolving general quadratic problems (those involving the square of the unknown). The first written algebra books were lifted from the oral tradition in the early ninth century. Al-Khwārizmī, Ibn Turk, and Sanad ibn ‘Alī are all known to have composed books on algebra during the reign of al-Ma’mūn (813–833), though only al-Khwārizmī’s seminal *Book of Algebra* survives complete. In addition to books devoted to the method, algebra is also explained in chapters of many arithmetic textbooks.

The presentation of algebra is usually divided into two parts. First comes an explanation of the names of the powers, the six simplified equations and their solutions, and the rules for operating on polynomials and roots. This is followed by a collection of worked-out problems which illustrate the method. All texts were written out entirely in words, though some later texts use Hindī numerals.

There are three basic stages in the algebraic solution to a problem:

Stage 1: An unknown quantity is named (usually as a “thing”), and an equation is set up.

Stage 2: The equation is simplified to one of six canonical types.

Stage 3: The proper procedure is applied to arrive at the answer.

The first degree unknown, our x , is most often called *shay’* (“thing”), and sometimes *jidhr* (“root”). The second power, our x^2 , is called *māl* (“sum of money/property/wealth”). Units were counted in dirhams, a denomination of silver coin, or simply “in number.” So al-Khwārizmī’s equation “a hundred ten and two *māls* less twenty-two things equals fifty-four dirhams” corresponds to our $110 + 2x^2 - 22x = 54$.

The Arabic name of algebra, *al-jabr wa’l-muqābala*, literally means “restoration and confrontation,” the two fundamental steps of stage 2. For example, to simplify the equation “four things equal ten less a thing” ($4x = 10 - x$) Abū Kāmil must “restore” the ten, which has been diminished by a “thing”: “So restore (*ajbir*, conjugated from *al-jabr*) the ten by the thing, and add it to the four things. So it yields: five things equals ten dirhams” ($5x = 10$). Like terms on opposite sides of an equation are “confronted,” resulting in their difference on the side of the larger. To simplify the equation “a *māl* and four things equals five things and thirty dirhams” ($x^2 + 4x = 5x + 30$) Ibn al-Bannā’ writes “So you confront (*tuqābil*, from *al-muqābala*), so there remains [after the subtraction] a *māl* equals a thing and thirty dirhams” ($x^2 = x + 30$) (Oaks and Alkhateeb 2007).

At the end of stage 2 an equation of first or second degree has been simplified to one of these six forms:

Simple equations

1. *Māls* equal roots (in modern terms, $ax^2 = bx$)
2. *Māls* equal numbers ($ax^2 = c$)
3. Roots equal numbers ($bx = c$)

Composite equations

4. *Māls* and roots equal numbers ($ax^2 + bx = c$)
5. *Māls* and numbers equal roots ($ax^2 + c = bx$)
6. *Māls* equal roots and numbers ($ax^2 = bx + c$)

Medieval algebraists worked with six equations instead of our single $ax^2 + bx + c = 0$ because the algorithms for their solutions take

the numbers (coefficients) of the individual terms as parameters, and these must be positive.

There is a particular numerical recipe for solving each of the six types. Most books show the solutions in terms of specific examples, like al-Khwārizmī's solution to the sample type 4 equation "a half *māl* and five roots equal twenty-eight dirhams" ($\frac{1}{2}x^2 + 5x = 28$):

So you want to complete your *māl*, so that it becomes whole, which is that you double it. So double it and double everything you have which is equated with it. So it yields: a *māl* and ten roots equals 56 dirhams. So halve the (number of) roots, so it yields five. Multiply it by itself, so it yields 25. Add it to the 56, so it yields 81. Take its (square) root, which is nine. Subtract from it half the [number of] roots, which is five. There remains four, which is the root of the *māl* that you wanted, and the *māl* is sixteen and its half is eight (al-Khwārizmī 2009, 103 (my translation)).

Worked-out arithmetic problems often occupy more pages than the explanation of the rules. The enunciation of a typical problem from Abū Kāmil's latter ninth century *Book of Algebra*, is: "Ten: you divided it into two parts. So you divide the larger by the smaller. Then you add what results from the division to the ten. Then you multiply what results by the larger part, so it yields sixty-nine dirhams." Abū Kāmil begins the solution "Its rule is that you make the smaller part a thing." He then works out the operations outlined in the enunciation in terms of this "thing" to arrive at the equation "nine-tenths of a *māl* less two things and a tenth of a thing equals ten less a thing" ($\frac{9}{10}x^2 - 2\frac{1}{10}x = 10 - x$). This equation is then simplified to a type 6 equation and solved.

Algebra was used to solve textbook problems in branches of mathematics beyond arithmetic. By expressing lengths and weights as numbers, problems in geometry and metrology were also solved by setting up and solving an equation.

There are several aspects of the method of algebra which attracted the interest of mathematicians. Already in al-Khwārizmī's book the solutions to the composite equations and the method of adding polynomials with diminished terms were proven by geometry using lettered diagrams. These proofs were made rigorous

with explicit references to propositions from Euclid's *Elements* by Thābit ibn Qurra and Abū Kāmil later in the ninth century. Powers greater than the *māl* were introduced in Qusṭā ibn Lūqā's translation of Diophantus' *Arithmetica*, ca. 860. The third power is *ka'b* ("cube") and higher powers are written as combinations of *māl* and *ka'b*. In the early eleventh century the arithmetic of polynomials was expanded and explored by al-Karajī. Probably following Diophantus, he extended the range of powers to include their reciprocals (our negative exponents), and he applied the numerical method of root extraction to polynomial equations. His work was further developed in the twelfth century by al-Samaw'al.

Indeterminate analysis was part of Arabic algebra from the beginning. Many inheritance problems in al-Khwārizmī's book are indeterminate, and Abū Kāmil devoted an entire book to abstract indeterminate analysis without being aware that Qusṭā had recently translated Diophantus' Greek into the vocabulary of contemporary Arabic algebra (Djebbar 2005).

Geometers found in algebra a tool for problems not solvable by ruler and compass. In the latter ninth century al-Māhānī converted a problem of Archimedes into a cubic equation which he unfortunately could not solve. In the following century, Abū Ja'far al-Khāzinī reinterpreted the unknown "thing" in the equation as a line and transformed it back into a geometry problem. This way he was able to represent the solution by a segment extending to the intersection of two conic sections.

This potential for algebra to serve geometry inspired al-Khayyām (Omar Khayyam, 1048–1131) to write his *Treatise on the Proofs of Problems in Algebra*. In addition to numerical solutions, he gave geometric constructions for solving the 25 simplified equations of degree three or less. In his proofs of these solutions he reinterpreted the homogeneous unknowns *shay'*, *māl*, and *ka'b* as geometric magnitudes of degree 1, 2, and 3, respectively. Sharaf al-Dīn al-Ṭūsī (d. 1213) furthered al-Khayyām's work by specifying conditions on the coefficients which determine the number of solutions, and by providing algorithms for finding numerical solutions (Oaks 2011).

No work in this “geometric algebra” is known after al- Tūsī’s, but production of practical books and chapters on numerical algebra (usually without the geometric proofs) continued to be written down to the nineteenth century.

By the twelfth century an interesting notation had developed in the Maghreb in combination with Hindi numerals for working out problems by algebra (Abdeljaouad 2002). In some respects it is more symbolic than the notation of Italian abacus authors.

Algebra was sometimes invoked to solve problems in other branches of mathematics. In addition to the application of algebra to geometry in Archimedes’ problem, al-Māhānī (and others) also presented an arithmetical reinterpretation Book X of Euclid’s *Elements*, on the theory of commensurable and incommensurable magnitudes. Via algebra they found, for instance, that $\sqrt{9 - \sqrt{45}} = \sqrt{7\frac{1}{2}} - \sqrt{1\frac{1}{2}}$. Later, al-Khayyām solved problems in specific gravity using algebra, and al-Fārisī used algebra to manipulate prime numbers in Thābit’s formulas for amicable numbers. In the early fifteenth century al-Kāshī set up a cubic equation whose solution is the sine of 1° , and which he solved by a method equivalent to the Ruffini-Horner method.

Cross-References

- [Arithmetic in Islam](#)
- [Geometry in Islam](#)
- [Mathematics in Islam General](#)
- [Mathematics, Ancient and Medieval](#)
- [Science in Islam, Classification](#)

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Algorithm

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An algorithm, which is usually expressed in natural language or pseudo-code, is a step-by-step procedure to solve a problem. Pseudo-code is a mixture of words from the programmer’s natural language and constructs (similar or actual) from the target programming language. Note that a programmer should construct his or her algorithm before composing the actual code for the program.

Algorithmic Complexity

- [Computational Complexity](#)

Algorithms, Computer

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Related Terms

[Computer algorithms](#); [Computer programs](#); [Computer science](#); [Computer software](#); [Computing machinery](#); [Flowcharts](#)

Description

A computer algorithm is a computational procedure that describes how to perform a series of discrete steps to achieve a particular task and obtain a solution to a computational problem, such as sorting a bunch on integers in increasing order. Algorithms are described visually as *flow-charts* or textually in a natural language as *pseudocode*. A given algorithm is usually intended to be run by a digital computer, in which case it must be translated (or implemented) into a piece of software in a programming language, and is thus often confused with a “program,” especially when it is described in pseudocode closely resembling a programming language. Sometimes, the term “software” is used to refer to one or several programs that perform one or several related tasks (see “► [Software Engineering](#)”).

An algorithm consists typically of control structures and data structures. Control structures include *conditionals*, which allow instructions to be carried out in different logical conditions, and *loops*, which allow the same instructions to be repeated several times with slightly different effects. Data structures store data as they are being manipulated during the execution of an algorithm. Data structures can be quite complex and are designed to support specified types of operations efficiently. The word “algorithm” is a latin transliteration of the Persian mathematician’s family name *al-Khwārizmī*, to whom the origin of the most basic data structure (the decimal notational system) and algorithms (to solve linear and quadratic algebraic equations) can be traced in the 800 s A.D.

An algorithm can be described either abstractly and informally in a natural language or technically and formally at a lower-level machine language. In any case, an algorithm needs to be precise and unambiguous. Two essential attributes of an algorithm are *correctness* and *efficiency*. Although an acceptable algorithm must produce correct results for the problem it is intended to solve, recent advances on *probabilistic* or *randomized* algorithms focus on algorithms as strategies that are provably mostly correct, although they may

produce erroneous answers or none at all (but with low probability). In general, it may be very hard to establish the correctness of an algorithm. This is one reason why software is often buggy and in need of updates. Another essential attribute of an algorithm is its efficiency, i.e., how fast it will run on any computer, particularly as the size of the input data increases. Since an algorithm can be slow on one computer and fast on a more powerful one, the efficiency of an algorithm is formally defined as an *asymptotic intrinsic measure of the order of growth of the running time as a function of the size of the inputs* (e.g., the number of integers to be sorted), and not in absolute units. Asymptotic complexity allows efficiency of algorithms to be assessed consistently and independently of the underlying computer they may be eventually run on. Based on these measurements, algorithms are considered tractable if they can run in a time that only increases polynomially as functions of input size (e.g., linearly or at quadratic rate for quicksort). Many important problems in real-world applications (such as the Traveling Salesperson problem) are not known to be solvable efficiently by polynomial-time deterministic algorithms on conventional computers. Whether such solutions exist is considered one of the most important open problems in computer science and is known as the $P = ?NP$ question.

Researchers in this area have discovered that concepts from biological evolution can also be used as an inspiring strategy to develop so-called *genetic* and *evolutionary* algorithms, which are often used to optimize specific objectives (known as fitness functions, for example, the number of times a solution in the pool correctly sorts a number of inputs from a given number of cases). Using evolutionary strategies, these algorithms start with a population (pool) of approximate or imperfect solutions, which are then improved using *mutation* and *crossover* operators to generate better and better solutions through rounds of an “evolve-evaluate” cycle (Mitchell 1998). It is well known, albeit surprising, that after hundreds of such iterations, these algorithms usually and eventually converge to good solutions with very high performance scores. Further, some argue that these features should

be an integral component of every computational procedure (Garzon 2012).

Self-identification

The area of design and analysis of algorithms is definitely part of computer science. The efficiency of an algorithm is well defined and can be measured. Correctness of algorithms can be proven and tested. Repeatability is an essential feature of the study of algorithms. Published algorithms can typically be implemented and tested in most programming languages.

Characteristics

Algorithms are at the heart of computer science and increasingly of other sciences. The concept of “computational thinking” is spreading to many other areas of science in order to carry out complex tasks for which scientists increasingly rely on computers, and so scientists must describe their strategies in an algorithmic form.

Relevance to Science and Religion

Here, entries also may address practical implications the area “Science and Religion” may have for, for example, the teaching of a particular discipline, the career of the scientists/nonscientist, and the place of that discipline within a university/academic setting and in society.

There is no such interest among practitioners or theorists in this field.

Sources of Authority

For example, very recent journal articles (i.e., recent is more valuable), books, ancient manuscripts, a particular written text, a particular person, or influential figure (e.g., in the case of some religions/traditions, Elders, the Pope, or the Dalai Lama; in the case of some sciences, perhaps Newton, Einstein, etc).

There are many books, conferences, and journals focusing on the design and analysis of algorithms. Sources of authority in this area include (Cormen et al. 2009; Skiena 2008; The Art of Computer Programming 1998; Mitchell 1998; Garey and Johnson 1979).

Ethical Principles

Computers can be instructed to do good as well as evil. Certain algorithms can take the form of computer viruses, which are programs with unethical agendas. The programs exploit vulnerabilities in computer systems programs to steal private information and use them for unexpected purposes. Producing and/or using these algorithms is considered unethical and it is in fact unlawful in most countries.

Key Values

Computer science and technology have made significant advances in the past two decades due to breakthroughs in both hardware and software. The area of algorithms provides the framework, techniques, and processes for designing and analyzing complex software. As computer science keeps permeating the fabric of society, the role of algorithms and software remains essential.

Conceptualization

Natural/World

Algorithmic researchers continually borrow ideas from the natural world, including evolution (genetic algorithms), how ants form colonies (ant colony optimization), how birds fly in formation (swarm optimization), or how metals cool (simulated annealing).

Human Being

There are certain algorithmic strategies, especially in the area of Artificial Intelligence, aiming to simulate human behaviors, such as,

deduction, learning, languages, vision, and tact. The goals of these lines of research are twofold. By mimicking human behaviors, scientists aim to produce software embedded in robots and other structures that are effective at using these processes to perform tasks that ordinarily only humans could perform (such as playing chess, participating in games such as jeopardy, doing the dishes, or driving a car). Conversely, such studies help better understand human behaviors.

Rationality/Reason

The design and analysis of algorithms are based on reasoning.

Reality

Although not directly applicable, algorithms running on computer programs can control physical reality in very direct ways (such as automatic pilots to fly airplanes, controls for nuclear power plants, software to trade in the stock market, implants in humans to control prostheses, or cochlear implants to help people cope with disabilities).

Knowledge/Truth

The correctness of algorithms is based on mathematical truth in a model of objective reality.

Time

Efficiency is measured as running time and is usually conceptualized as the value of a counter (digital clock) on an electronic computer. Some problems require algorithms that may take billions of years to run and are not considered feasible or efficient.

Relevant Themes

Implementable algorithms are deterministic. Nondeterministic procedures are possibly beyond the capability of conventional computers, although quantum computers may be capable of running them (see “► [Quantum Computing](#)”).

Cross-References

- [Artificial Intelligence, General](#)
- [Computer Science in Human Learning](#)
- [Quantum Computing](#)
- [Robot Programming](#)
- [Software Engineering](#)

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Aliens

- [UFO Cults](#)

Allah

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Related Terms

[God; Modernity in Buddhism and in Islam](#)

Description

Allah, an Arabic word, means God, in the monotheistic sense. Allah is the center of the Qur'an

and Islam, as is reflected in the Islamic testament of faith, “There is no God but Allah.” He is *Rabb al-Alamin*, Lord of all Worlds – human, animals, the earth, the universe, angels, this world, and the next. He is the Creator of everything, the Provider, who gives life and death, and the ultimate Judge.

When looking to discuss the characteristics of Allah, the main source must be the Qur’an, Allah’s message to humanity, in which His characteristics are outlined. The picture the Qur’an gives of Allah appears to offer a fine balance of attributes: Allah is both before and after everything, the first and the last; manifest in His visible creation but also beyond sight: “*No vision can take Him in but He takes in all vision. He is the All Subtle, the All Aware*” (6:103), merciful and loving and turns towards those who repent, though His punishment is severe (40:3). When everything else disappears, “*all that remains is the Face of your Lord, full of majesty and bestowing honour*” (55:27). Allah transcends everything but observes everything, gives provision to every creature, and knows where each one is at any moment (11:6). He encompasses everything. He is closer to people than their jugular veins (50:16). He sends revelation for their guidance and every individual will stand before Him for judgment.

A crucial attribute is Allah’s Oneness (*tawhiid*). He has no child or equal or partner. Indeed the whole discipline of Theology in Islam is called the Science of Tawhiid. The Qur’an argues this concept repeatedly: “*If there had been in the heavens and the earth any god other than Him they would have fallen into ruin*” (21:22) “*each would have tried to overthrow the others*” (23:91); He is the One God of all. He is described in the Qur’an as the eternal Reality (*al-Haqq*). Everything else in creation is ephemeral, like plants that flourish then wither and disappear. Allah’s laws in the universe are unchangeable (35:47). *Al-Haqq* also means the Truth: “*If the truth were in accordance with their desires, the heavens, the earth and everything in them would disintegrate*” (23:71).

All these qualities and others mentioned in the Qur’an to describe Allah are summarized in the

well-known list of His 99 Beautiful Names. Muslims memorize and chant these, inscribe them on plaques, posters, and other public and private objects, to contemplate them and inspire themselves and others to emulate these qualities. Some of the attributes of Allah were debated at length, particularly from the time when the Muslim world expanded and came into contact with Greek philosophy and generations of Muslim philosophers tried to reconcile these attributes with the ideas of philosophers like Aristotle. The debate continued for centuries, culminating in a work written by Ibn Rushd (Averroes) (d. 1198 AD) known in English as *The Harmony of Religion and Philosophy*. In his Introduction, he says:

All that is wanted in an enquiry into philosophical reasoning has already been perfectly examined by the Ancients. All that is required of us is that we should go back to their books and see what they have said in this connection. If what they say be true, we should accept it and if there be something wrong, we should be warned by it. Thus, when we have finished this kind of research we shall have acquired instruments by which we can observe the universe and consider its general character.

As Ibn Rushd also notes, theological discussion has many characteristics of philosophical discourse. The Qur’an is an argumentative and rational text. From beginning to end, it provides arguments for all its beliefs and teachings. Nothing is assumed, even the existence of God. The Qur’an asks its audience to think on the nature of the Divine, posing the question for the disbelievers, “*Were they created out of nothing? Did they create themselves? Did they create the heavens and the earth?*” (Qur’an 52:35–36). The universe itself is presented as signs (*aayaat*) that prove the existence of a Creator and caring Lord. The word *aayaat* (sing. *aaya*) appears in the Qur’an 382 times, and it is through these signs that Allah makes Himself known, “*We shall show them Our signs everywhere and in themselves until it becomes clear to them that this is the Truth.*” (Q.41:53). The Qur’an urges people to observe, think, and find out about Allah’s laws in the universe; it then urges them to look as hard as they can at what is around them until they can look no more (67:7). They are even challenged to

“penetrate the heavens and the earth” if they can (55:33). The more they know, the more they will appreciate Allah, “*It is those of His servants who have knowledge who stand in true awe of Allah*” (35:28). Many examples of natural phenomena are given in the Qur’an to prompt thought. There are bodies of scholars now in Muslim countries who study the “scientific miracles” in the Qur’an, where they assert it is consistent with modern scientific discoveries, particularly obvious in embryology, astronomy, and geology.

Human beings are also frequently urged to study and learn from history, to travel the earth, see and learn; to think, reflect on themselves, and the world around them. They are told: “*Why do you not use your reason?*” This includes the faculty of conscience, or the “reproaching soul” (*al-nafs al-lawwaama*). Allah inspires the human soul “*with knowledge of what is right and wrong. The one who purifies it succeeds, the one who corrupts it fails*” (91:9–10). The limited time humans have on earth is their chance to do good deeds and make up for bad ones, “*before death comes to one of you and he says, ‘Lord, if you would only relieve me for a while I would give in charity and become one of the righteous’ God does not relieve a soul when its time comes. God is fully aware of what you do*” (63:10–11).

The Qur’an says that Allah created the first human being with His hands from “an essence of mud” (23:12), and breathed into him “from His spirit,” but this brief description is not to be understood literally or necessarily taken to contradict scientific facts, in the same way as Allah cannot be understood as having hands and a mouth to breathe with: “*There is nothing like*” (42:11). Muslim theologians say that when thinking about Allah, He is unlike any image that springs to mind. After the first couple, humans are created in stages in the womb, then through infancy, childhood, adulthood, old age, and death and another stage after death when eventually Allah will resurrect them (23:13–16; 22:5–7).

With this background, the theory of evolution did not seem to disturb Muslim scholars; in fact, long before Darwin, a theory of evolution by natural selection can be found in the works of

the Muslim scholar al-Jahiz (160–256 AH/776–869 AD) who said, in his *Book of Animals*:

Animals engage in a struggle for existence; for resources, to avoid being eaten and to breed. Environmental factors influence organisms to develop new characteristics to ensure survival, thus transforming into new species. Animals that survive to breed can pass on their successful characteristics to offspring.

However, in al-Jahiz’s work, this process remains subject to the will of Allah.

The Qur’an states that Allah created the heavens and the earth “in six days,” but that these are not days according to our reckoning. The Qur’an speaks of a certain day “*whose measure is 50,000 years*” (70:4). Days in this sense seem to mean stages; Allah’s time is different from time on earth. When people are resurrected to face Him, they will feel as though they have stayed on the earth/in the grave for only “*a day or part of a day*” (23:113–114), “*an evening at most, or morning*” (79:46).

In the earthly dimension however, “*Everything has its measure with [Allah]*” (13:8). “*He made the Sun a shining radiance and the moon a light, determining phases for it so that you might know the number of years and how to calculate time*” (10:5). This is true not only of time but of everything else. He has determined a time for each individual and a time when the world comes to an end (6:2) “*There is not a thing whose storehouses are not with us. We send it down only according to a well-defined measure*” (15:21). “*He keeps count of everything*” (72:28).

With all Allah’s exhortations and observations in the Qur’an about the universe and all it contains, it is not the aim of His holy scripture to be a repository of scientific facts. It is enough that it urges believers to think and reflect and find out more for themselves. Indeed it makes this an obligation on them. It says, “*It is Allah who brought you out of your mothers’ wombs knowing nothing, and gave you hearing, sight, and minds*” (16:78). The Qur’an condemns “*those who have hearts they do not use for comprehension, eyes they do not use to see, ears they do not use to hear. They are like cattle – no, even further astray: these are the ones who are entirely heedless*” (7:179). The first verse of the Qur’an

revealed to the Prophet Muhammad puts knowledge on a par with the creation of man. “*He created man, ... he taught man*” (96:1–5). God swears “*by the pen and what they write*” (68:1).

The Qur’an states that Allah honored human beings above many of His creations. He gave human beings the trust (*amaana*) of moral choice, *khilaafa* (stewardship) of the earth, and power over many of His creatures, instructing them, “*Do not corrupt the earth, after it has been set right*” (7:56). Yet “*Corruption has flourished on land and sea as the result of people’s actions and He will make them taste the consequences of some of their own actions so that they may turn back*” (30:41).

All humans are one big family, “*People, We created you all from a single man and a single woman and made into races and tribes so that you could get to know one another. In Allah’s eyes, the most honoured of you are the ones most aware of Him: Allah is all knowing, all aware*” (49:13).

Being aware of Allah includes worshipping Him, taking heed of His guidance, and putting it into practice in the world to establish justice, which is among the objectives of sending the scripture and prophets (57:25). The final Judgment gives purpose to our lives and actions here, without which the creation would be futile (32:115; 67:3). This is a central theme of Allah’s message in the Qur’an and it again uses rational arguments to persuade people of the possibility and reality of the Resurrection (36:77 ff; see also 22:5–7).

Because the Qur’an aims to convince people rationally in order to persuade them to accept its teachings, it urges them to reflect and condemns those who follow blindly what they find their forebears, their masters, or their chiefs doing. Words urging the use of reason, thinking, reflection, and consideration occur 183 times in the Qur’an.

However, there are limits to human perception. For humans there will always be an area of mystery (*ghayb*) – it is only God’s knowledge that comprehends everything (2:255):

He knows what is before them and what is behind them, but they do not comprehend any of His knowledge except what He wills. His throne

extends over the heavens and the earth; it does not weary Him to preserve them both. He is the Most High, the Tremendous.

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Altruism

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Related Terms

Agape; Empathy; Group altruism; Group theory; Kin altruism; Love; Morality; Reciprocal altruism; Reciprocity

Introduction

Altruism is a well-established concept in evolutionary biology, psychology, and theology. In biology, it refers to behavior, and any coincident motivations, in which one individual aids

another's survival and reproductive success at a cost to its own, whereas psychological altruism relates specifically to the motivational state in which the welfare of another is of ultimate concern. While biological altruism may be purely behavioral, psychological altruism is possible only by moral agents, those able to form conscious intentions. In Christian theology, altruism is usually understood within the tradition of agape – a self-giving love which has its ecclesial origins in the New Testament.

Within the science-theology discourse, the question is how these disciplines relate to one another and, specifically, the extent to which biological explanations can account for altruism within both nature and human culture, including psychological altruism and religious love. This entry proposes that these three forms of altruism are indeed deeply interrelated, although they are by no means equivalent. One problem for such a consonance has been the view of some biologists, most notably those within *sociobiology* and its related discipline of evolutionary psychology, that whatever appears as altruistic is actually selfish at some more foundational level.

Selfishness and Biological Altruism

In evolution, natural selection generally results in establishing and sustaining the traits (and corresponding genes) that enhance individual reproductive success, since the greater the individual's production of viable offspring, relative to others in the population, the more its particular characteristics and genotype will feature in the next generation. This relative fitness of individuals and their genes provides an explanation of physical and behavioral traits, including aspects of altruism. In *sociobiology*, natural selection is depicted as a competitive process in which individuals selfishly vie for resources and mates in order to outreproduce others in their population, and genes selfishly compete to outreplicate other genes (their *alleles*) in the gene pool. Altruism, like other evolved traits, is therefore construed as serving either selfish reproductive or genic ends, and sometimes both.

While there obviously is competition for food and mates, there is also cooperation in nature, especially among the higher mammals. Moreover, sexual reproduction itself is, for many animals, a demanding and risky task as parent individuals expend themselves in producing, and often providing for, as many progeny as possible. Courtship, nest building, birthing, feeding, and protecting the young are all costly ventures. So, if there is selfishness in pursuing reproductive fitness, there is also much sacrifice. Cooperation is even found at the genic level, since most genes which persist in populations are those that cooperate and coact with other genes (the nonalleles which form the vast majority) to produce functional and reproductive individuals – an outcome which is usually good for sustaining populations. So-called selfish genes are therefore cooperators that produce benefits beyond themselves; hence, the selfish metaphor is again evidently inadequate (Rolston 1999). Arguably, the key sociobiological concepts of individualism, selfishness, and competition are derived not from biological nature so much as from the culturally dominant ideology of Western capitalism.

Kin Altruism: Biology and Psychology

In kin altruism, individuals increase the probability of the survival and reproduction of genetic relatives at a potential cost to their own. As some of these beneficiary kin will also carry the genes for kin altruism, the behavior can be sustained through natural selection. While such actions are altruistic with regard to the individual's own body and reproductive interests, they are interpreted by sociobiologists in terms of genic selfishness – the genes in the individual are simply promoting the survival of copies of themselves in the bodies of kin (Dawkins 1989).

This description in terms of selfishness is inappropriate, however, since the genes that are sustained in populations are good cooperators and, in the case of kin altruism, lead to the aiding of other individuals over the self. In addition, kin altruistic acts often involve supporting

a substantial number of nonreplica genes as most species outbreed, i.e., mate with individuals that are not closely related. There is a recent debate about whether the altruism is thereby graded, as summarized in Hamilton's rule, such that there is a preference for nearer kin (those carrying more replica genes) over more distant kin and also whether there is a preference for the more reproductively fertile (those better able to pass on these replicas) over those less fertile. E. O. Wilson has argued that, at least in hymenopteran species such as bees and ants with which the rule was first established, individuals will sometimes assist colony members in ways beyond these gradations.

While the applicability of Hamilton's rule is somewhat disputed, kin altruism itself remains a widely accepted theory with evidential support from a number of species. An often-given example is the alarm calling among some mammals which warns family members that a predator is in the area but risks attracting the predator's attention to the caller. With regard to humans, kin altruism is said to explain the universality of kinship groups and the pervasive nepotism in societies, systems of favoritism that are supported by cultural norms including religious prescriptions on love.

Clearly, humans do form strong attachments to family members, in particular to those in the immediate family, and sometimes these alliances are nepotistic such that concern for kin excludes the rightful care of others. These bonds may be mediated through unconscious odor and visual cues such that individuals prefer those who look and smell similar to referential figures like parents. The primary means of kinship attachments, however, are probably the close associations forged around the parent-offspring unit. Both familiarity and similarity of situation, such as those naturally occurring in the familial setting, foster empathy; it is easier to understand and identify with the experience of those we know and who are like us in some way.

Empathy owes its evolutionary origins, to some extent, to the parent-offspring relationship. Although this relationship is properly part of individual reproductive fitness, it is sometimes

included in kin altruism, and it forms the core of family bonds. Since parental care is costly, especially in humans where it is intense and prolonged, empathy is critical, as such care could not have been supported solely by the self-regarding instincts involving innate aversion to uncomfortable or painful stimuli and attraction to pleasurable ones. Although these capacities are necessary for survival and even for empathy (we cannot understand another's pain and pleasure without first knowing our own), empathy itself is an other-regarding response which acts counter to self-concern. (The other-regarding character of empathy is seen in the psychological studies by Batson 1991). It enables the parent to vicariously experience the emotions and needs of their offspring and to place these needs beyond their own immediate gratification. This ability to identify with others is augmented by human reasoning and imagination, which also facilitate another important element in other-regard: the appreciation of the other as a subject, one who has a unique emotional and cognitive life and is capable of their own desires, intentions, and goals.

These other-regarding senses enable humans to express a psychological altruism toward their children and other kin which transcends Hamilton's rule. So for reasons very different to that of bees and ants, the human care of kin is not dependent upon the degree of shared replica genes. Humans can also exhibit egoism and hedonism which entail the pursuit of self-interested goals or pleasure, in preference to the care of others, including kin, and even at the expense of their own reproductive interests. Whether such instances of empathetic altruism and of egoism should be categorized as evolutionary mistakes and exaggerations, as some claim, or as capacities with particular moral obligations, is an ideological and not biological issue. Indeed, evolution has generated the human felt need for an ideological framework; it has forced humans to search beyond their biological natures for a metanarrative within which to resolve their mix of self-regarding and other-regarding motivations.

Kin Altruism and Agape Love

In the New Testament, *agape* includes the love of kin, and in its character resembles psychological altruism (The Holy Bible: New Revised Standard Version 1995). It requires a deeply attentive other-regard, which carries the potential for self-sacrifice on those occasions when the other's needs should be placed before one's own. It is contrasted with the self-interest of egoism and hedonism which are themselves explicitly prohibited. Yet *agape* also bears its own distinctive elements for, alongside the prohibitions and the *agape* commands, there is the transforming experience of humility and divine love. With the sense of awe before the greatness of the transcendent Deity, the self is compelled to acknowledge that it is not ultimate (suggested by Post (2002)). More profoundly, humility and love are experienced in the Divine's own immanent *agape* as revealed in the crucified Christ who died on behalf of humans to forgive their failure to love. In identifying with this divine act of grace the individual is thereby freed from self-preoccupation and enabled to respond with alterity and agapistic love toward others.

With regard to kin, the New Testament texts assume the appropriateness of familial bonds, particularly within the immediate family, which is perhaps indicative of an implicit recognition that these kinship ties are innate. Nonetheless, they are not just accommodated as presumed practice; they are also explicitly rooted in the divine will. This is evident in texts such as 1 Timothy 5:8: "But if anyone does not provide for his relatives, and especially for members of his household, *he has denied the faith*." The love for natural family is a basic element in the agapistic commitment of believers.

The constraints that are set upon this familial love, however, ensure that it does not amount to nepotism. The ultimate priority in love is not the natural family but Christ. In the Gospels, Jesus' teaching requires that believers should be willing to leave their families for his sake, a setting of priorities that is found in the practice of the early church. While this love for Christ takes precedence, its consequence is an enhanced regard for

others for, in accord with the divine will, devotion to Christ requires love for kin as well as nonkin. Thus, there is support for familial love but not nepotism, for the love of kin is both deepened and constrained.

Reciprocal Altruism: Biology and Psychology

In evolutionary theory, direct and indirect reciprocity are the two main forms of reciprocal altruism, the cooperation between nonkin individuals. Direct reciprocity entails exchanges of altruistic acts between individuals over a period of time, in which the overall benefits outweigh the costs of the altruism. As gains are invested into each partner's reproductive success, the behavior is perpetuated in the population through natural selection. Reciprocity can be observed in a diverse range of species from the food sharing among vampire bats that roost together to the primate exchanges in food and grooming services. Critics have suggested, however, that immediate individual gains are sufficient to explain nonhuman reciprocity, for example, perhaps the bats only feed hungry roost mates so that they can sleep without being pestered.

In indirect reciprocity, an individual cooperates or may even assist another without expected return, so long as an audience is present that will be induced into future reciprocal exchanges with the altruist. As this assumes an ability to establish a reputation and evaluate relationships – knowing and remembering who offers aid and who fails to repay debts – it is found only among the most social and cognitively able species, primarily in humans. Since reciprocity benefits an individual's reproductive and genic fitness, it is viewed by sociobiologists as selfish. There is also an expectation of widespread cheating (where individuals try to access the gains of reciprocity while minimizing their contribution or giving nothing at all) and of subsequent counter-reprisals. (The general features of reciprocity are given in Dawkins *op. cit.*, pp. 166–188, 202–233, (Trivers (1985) and Nowak & Highfield (2011)).

The existence of direct and indirect reciprocity is supported by human game experiments in which volunteer participants behave in a tit-for-tat manner in exchanges of money. Most players cooperate in equitable exchanges, and those that cheat (defect) by giving an unfair contribution are often punished by the other player's subsequent defection. When the past behavior of participants is made known, reputation becomes important, and players are more generous toward cooperators than defectors. Interestingly, however, some game participants (so-called strong reciprocators) go beyond reciprocity by punishing defectors and rewarding cooperators at overall cost to themselves – an evolutionary explanation for this behavior is still being discussed. Some biologists, including sociobiologists, assume that reciprocal game results reflect general human social behavior with nonrelatives. They interpret Christian moral teachings such as the golden rule, "In everything do to others as you would have them do to you," and the command to "love your neighbor as yourself" as advocating reciprocity, and they see the story of the Good Samaritan in terms of reputation building (discussed in Rolston, *op. cit.*, pp. 248–260, and also Ruse (1994)).

Reciprocity is also used to account for the wide spectrum of emotions and abilities in human psychology. Deception of self and others, for instance, facilitates cheating by allowing, respectively, the feigning and the realistic posturing of sincerity. Guilt is explained as a means of redress when one is found to be cheating, so that reciprocal relationships can resume. Shame indicates an individual's inferiority in reciprocal encounters which will be resolved either by appeasing superiors or by expressions of anger which preempt any exploitation. Contempt allows an individual to defect from reciprocal relationships that are not productive, and gratitude acts as an inducement toward further generosity by the donor. (Reciprocal explanations of human emotions can be seen in Fessler and Haley (2003)).

Although it is entirely reasonable that some human emotions and cultural norms have evolved to effect reciprocal relationships, nevertheless,

the explanatory power of reciprocity is limited. Certainly, the gains of reciprocity are not always invested in human reproduction, and with regard to its putative universality, while humans use reciprocity in exchanges of goods and money, a distinction is commonly made between this economic context and a relational one, such as concern for the welfare of a vulnerable person. The former will be motivated by reciprocal interests, but the latter will entail an other-regard that surpasses reciprocity. Similarly, while reputation building is permitted in an economic context, such as for being a fair tradesman, it is generally unacceptable within personal relations. Even in friendship, one of the most seemingly reciprocal of personal relationships, the ideal is not of returned benefits but a mutual psychological altruism. Indeed, the similarities in circumstance and interests which are common between friends ensure a deep empathetic regard. So it is hardly surprising that direct reciprocity and indirect reciprocity are found to be the primary modes of behavior in game exchanges of money, and while this shows that reciprocation is part of the human makeup, it does not indicate its comprehensiveness.

Moreover, how humans actually engage in both economic and personal relationships is somewhat open. In trade exchanges where the individuals are motivated by a concern for both self and others, the consequence will be fair reciprocity. In contrast, cheating and deception occur where there is an egoistic preoccupation with the self and simultaneous de-emphasizing of the other-regarding senses. These biases may be initially formed consciously, but, like all emotive responses, they may then become ingrained by habit. Even self-deception often has an initial conscious element in the repeated internal justification of the behavior. The specific meaning or content of human emotions also depends upon how the individual resolves their self-regarding and other-regarding propensities. So, for example, the expression of guilt may be entirely self-concerned feelings of unease generated only by what others may think, or it may be a genuine sense of contrition stemming from an empathetic awareness of how others have been wronged.

Thus, fairness and cheating, sincerity and deception, reciprocity, psychological altruism, and egoism are all possible within human nature.

Reciprocal Altruism and Agape Love

The New Testament assumes both the acceptability of reciprocation in economic contexts and its appropriateness in terms of fairness and justice – “the laborer deserves to be paid.” The ideal for personal relationships, however, is an agapistic love which transcends reciprocal interests. Even the appropriate *agape* love for self is ultimately other-regarding, as its final locus is thankfulness and love toward God who both created and forgave the self. Nonreciprocity is particularly evident in the golden rule, where the focus is not on returned benefits but upon treating others in the way that the self would want to be treated *regardless* of their response. Hence, in the Matthean gospel, it is required in “everything,” in all and every circumstance, an inclusivity which is emphasized by its setting within the love for enemies in the Lukan text. This love which transcends enmity, both in terms of nonretaliation and generous care, is also the context for Jesus’ parable of the Good Samaritan. Moreover, in the command to pray for one’s enemies, an empathetic regard is engaged as the believer takes up the enemy’s needs and welfare and acts as an advocate in presenting them before God. Prayer, in particular, makes it possible to transform the self-concern provoked by enmity into *agape* love.

Reciprocity is also very clearly transcended in the priority within *agape* love that is given to the weak – individuals without the means of returning benefits. This includes those who were marginalized and vulnerable in ancient society such as the poor, disabled, widows, and orphans. The care of such persons is not for reputation building, as such deeds are to be done in secrecy and even the self is not to dwell on the goodness of the action. This care for the vulnerable, however, necessarily involves potential conflict with those who oppress the weak, and there are indeed instances of confrontation with such enemies alluded to in the New Testament. This should

not be interpreted as an inconsistency within *agape* love such that the love for the weak supersedes that for the enemy; the purpose is both to protect the weak and to bring the enemy to a proper regard for God and others.

Such expansive *agape* love is often criticized as being motivated by the promise of reciprocated eschatological rewards. Certainly, the texts refer to rewards for those who love Christ more than their natural families, who love their enemies, and who show compassion to the vulnerable and do not reputation-build in the process. But these rewards are nonreciprocal in terms of both motivation and content. The only acceptable motive in *agape* love is the genuine concern for the other, not a focus upon the reward. This finds its most poignant expression in the exposition of love in 1 Corinthians 13 and in the Gospel tradition that the “first will be last, and the last will be first.” Paradoxically, the one who loves others receives rewards, while the one who seeks their own benefit, including rewards, receives little or no recompense. With regard to content, it is God who is the primary reward: the eschatological vision is that of being fully able to love and worship God, as well as participating in a completely united and agapistic human community. The reward is not concerned with reproduction, much less egoism, but with the consummation of agapistic love, its perfect and full expression.

Group Altruism: Biology and Psychology

Group selection theorists have recently proposed that groups can function like individuals, as adaptive superorganisms, that compete to outlast and outreproduce other groups. This relative group fitness may include differentials in birth and mortality rates, susceptibility to group extinction, or differences in their propagation of new groups. Among the traits subject to group selection are the prosocial ones such as altruism; for the groups containing altruistic individuals, those willing to partially forgo their own welfare and reproductive interests in order to aid group members are able to outcompete the groups which exhibit

less internal solidarity. There is a necessary ambivalence in group altruism as care must be expressed only within the group while toward outsiders there will be indifference or open hostility. As Elliott Sober and David Sloan Wilson say, “Group selection favours within-group niceness *and* between-group nastiness” (Sober and Wilson 1998).

While there is still debate about whether group selection occurs in nature, it has become an increasingly popular means of explaining the forging of groups in human society, including religious affiliations. It is argued that religions, like political parties, nations, and tribes, establish group boundaries that identify those who belong and those who do not. They provide instruction and sanction of ingroup altruism and outgroup apathy or hostility. These are particularly binding in theistic communities where they are endorsed by a moral deity, not least because this supernatural and invisible agent is ever watching. Such a vigilant divine presence is deemed particularly important during times of environmental crises when group solidarity is most fragile – a cited example of this is the frequent experience of water scarcity in biblical Israel. Religions such as Christianity are also said to be particularly effective in solving the problem of cheats or free riders – those who want to benefit from the group coalition without bearing the cost of contributing to group welfare. Costly signals such as rituals, prayer, charitable commitments, and especially virtues like self-giving love make extensive demands upon the individual. These deter cheats and also facilitate trust within the group; the signals are symbols of the individual’s genuine commitment to the group’s shared ideals and aims (Norenzayan and Shariff review group and reciprocal explanations of religious altruism – Norenzayan and Shariff (2008)).

Clearly, humans do associate in exclusive groups with resulting rivalries between religious communities, nation states, and even scientific laboratories. Most likely, these ingroup bonds are the result of the empathetic attachments that are formed between those who are familiar with one another or who share the same cultural background, ideological views or shared goals. These

are personal reasons, however, and need not be related to group survival and reproductive outcomes. In fact, just as some ideologies form exclusive group identities which legitimize intergroup conflict (group theory itself could be used in this way), others may choose to extend care beyond the group boundary. One often-given instance is the choice of some charitable individuals and organizations in the West to express empathetic care for, and provide aid to, poorer countries. Every group, therefore, must be evaluated by its own particular ideological commitments.

Group Altruism and Agape Love

The New Testament texts undoubtedly envisage a deeply bonded ingroup community, one in which the familial metaphor of brothers and sisters unites a culturally and ethnically diverse people. Such kinship terms mediate an empathetic altruism, for cobelievers are not alien but belong within the natural intimacy of the immediate family. This community is also demarcated from the rest of society – most pointedly in the Johannine description of them as “not of the world.” There are prescriptives for both communal love and group separateness. Yet the latter is primarily concerned with the internality of believers not being drawn away from their prior commitment to God and toward idolatry. That it is not about external human relations is evident in Jesus’ prayer in the Johannine gospel itself: “I am not asking you to take them out of the world, I have sent them into the world.”

Indeed, there is no expectation of intergroup rivalry as the community was not to displace other groups in society, such as kin and civic units, nor even to restrict the activities of other religious communities. There is, rather, a commitment to love all those outside the group boundary. Even the community’s ingroup love was intended both for the support of its members *and* for outsiders for whom it was a witness to the reality of Christ and the divine love. Those so drawn to Christ were, of course, welcomed into its communal life. This outgroup love cannot be considered a costly signal for, although its sheer

expansiveness may be a potent excluder of free riders, the agapistic commitment to outsiders transcends a group theory explanation.

Conclusion

Agapistic love evidently encompasses psychological altruism and some aspects of biological altruism, but it has its own distinctive character in a radical humility and self-giving which is formed around the nature of God as revealed in Christ. A criticism of such *agape* love is that it is too costly and universal to be bearable by its adherents – it surpasses the inherent limits of human capacity. Indeed, *agape* love is constrained for while there is a commitment to love all others, each individual's love is bound by both circumstance and calling, that is, to those within their normal realm of influence, as well as those who may be outside their immediate context but to whom they are particularly called. Encountered within both categories will be individuals and communities who are outside our kin, reciprocal and even group affiliations.

The more serious criticism is that this love bears no relation to reality, for even those who self-consciously adhere to such agapistic love fail to fulfill it. Certainly, love competes with egoism in human nature, and *agape* itself competes with other ideologies in human society, not least the self-interest espoused by contemporary Western culture. There is no reason to abandon the ideal, as through the New Testament tradition of received forgiveness for past failures, restoration of commitment and empowering by the Spirit of Christ, *agape* can be constantly renewed.

Cross-References

- [Agape](#)
- [Christian Ethics](#)
- [Cognitive Science of Religion](#)
- [Empathy](#)
- [Evolutionary Psychology](#)
- [Love \(Alterity, Relationship\)](#)
- [Natural Selection](#)

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- Examples of New Testament texts which relate to the themes discussed in this article are listed here: agape love and prohibitions of egoism–Mt. 20:25–28, 23:25–26, Lk. 20:46–47, Phil. 2:3–8, 1 Pet. 5:5–6 1 Jn. 3:16–17; love for kin–Mt. 15:3–6, Lk. 11:11–13, 1 Tim. 5:3–8; constraints on kinship–Mt. 10:37–39, 22:37–40, Mk. 10:29–30, 1 Cor. 7:32–35; fair reciprocity in economic exchanges–Lk 3:12–13, 10:7, Rom. 4:4, Jas. 5:4; nonreciprocity in agape–Mt. 7:12, Lk. 6:31–36, 10:27–37, Jn. 15:12–14, Gal. 5:13–14; love for the enemy–Mt. 5:38–48, Lk. 6:27–36, Rom. 12:14, 1 Cor. 4:11–13; love for the weak–Mt. 6:2–4, 25:34–36, Lk. 14:12–14, Acts 4:34–35, Jas. 1:27, 1 Jn. 3:17–18; promised rewards–Mt. 5:11–12, 6:1–4, 19:29, Lk. 6:35, 2 Cor. 5:10, Rev. 2:10; nonreciprocity in the motivation for rewards–Mt. 19:27–20:16, Mk. 9:33–35, 10:29–31, 1 Cor. 13:1–13; the content of rewards–Mt. 8:11, Jn. 17:1–3, Rev. 7:9–15; ingroup identity–Mk. 3:31–35, Jn. 15:19, 17:16, 2 Cor. 6:14–18, Heb. 2:11–12; group nonexclusivity–Jn. 17:15–18, 1 Cor. 5:9–10; commitments to kin and civic groupings–see above for love of kin, Rom. 13:1–7, Titus 3:1–2, 1 Pet. 2:13–17 (the only exception is prior loyalty to God–Mt. 10:37–39, Acts 5:29); group witness and love for all–Mt. 5:14–16, Jn. 13:34–35, 17:20–23, 1 Thess. 3:12, 5:15, 1 Pet. 2:11–12. Quotations and book abbreviations are taken from The Holy Bible: New Revised Standard Version (1995). Oxford: Oxford University Press.
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Alzheimer's disease

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A neurodegenerative disorder that leads to progressive dementia. First symptoms include impaired memory, but later on also thought and speech processes are affected, and finally patients become completely disabled and die. Its classical neuropathological hallmarks include intracellular neurofibrillary tangles and brain deposition of amyloid protein.

American Indian Studies

► [Native American Studies](#)

Amnesia

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Related Terms

[Memory loss](#)

Description

The neurobiology of amnesia is concerned with the way information is stored in the brain, and with what goes wrong when this process fails. In this sense, it largely overlaps with the study of memory (see ► [Memory](#)). It is mostly based on the study of normal and amnesic humans as well as animals, but also benefits from other sources of knowledge. It aims for a better understanding of the human mind, and to provide ways to help people with memory disturbances.

Self-identification

Science

The study of amnesia is a science. It is based on the scientific method and the systematic investigation of hypotheses. Nevertheless, since its object of study is also perceived subjectively, some of its questions are open for speculation based on this kind of experience rather than on objective data.

Characteristics

Research in amnesia is concerned with the very nucleus of identity, which is memory, leading it to offer privileged insights about the mind and the human condition. It is also an area of neurobiology which draws knowledge from a very wide range of subfields, ranging from cognitive psychology to molecular biology.

Relevance to Science and Religion

The neurobiology of amnesia, although not specifically concerned with religion, has implications for concepts such as *self* and *human nature*, as it provides clues on how personality and self-awareness persist when memory is disturbed. Also, the fact that memories can incorporate subjective meanings and even imagined experiences during their processing leads to

questions about the veracity of empirical knowledge. Such issues have implications for the Science and Religion debate.

Sources of Authority

Although memory has been a subject of philosophy for centuries, its experimental study largely started in the late nineteenth and early twentieth centuries with precursors such as Hermann Ebbinghaus, who started the study of association formation in humans, and Ivan Pavlov, who developed the first conditioning paradigms in animals.

The study of amnesia in human subjects gained impulse with the 1957 description of patient H.M., who underwent removal of the temporal lobes for the treatment of seizures and could not form new declarative memories after the surgery. This and other cases led to the distinction between anterograde (the failure or inability to form new memories in the long term) and retrograde amnesia (a dysfunction in the ability to retrieve established memories), leading to a distinction between memory acquisition, consolidation, and retrieval mechanisms. It also helped support the hypothesis that memories undergo late forms of processing which continue to occur over large periods of time (i.e., years) after their initial acquisition, such as systems consolidation.

Ethical Principles

Research in amnesia is usually guided by national legislation on research on human and animal subjects, as well as international research guidelines such, as the Declaration of Helsinki.

Key Values

The study of the neurobiology of memory and amnesia is driven by the principles of (a) alleviating the suffering of patients with memory dysfunctions (see ► [Dementia](#)) and (b) providing

knowledge about the mind to increase understanding of the human condition.

Conceptualization

Nature/World

Amnesia researchers tend to view nature in the usual way of the natural sciences (i.e., within the limits of what can be empirically observed); however, its findings are not particularly pertinent to such concepts.

Human Being

A human being is seen as arising from the interaction of a *genetic* background with the *environmental* events occurring during an individual's lifetime. These events affect the brain through synaptic plasticity to make up an individual's neurobiological structure. Synaptic plasticity is the phenomena through which synapses between neurons can change their efficacy, thereby encoding information which is thought to underlie memory.

Life and Death

Amnesia research sees brain function and consciousness as one of the key factors defining "life" in humans. As for the larger concept of "life" in nature, it is not particularly pertinent to such a topic.

Reality

Amnesia research tends to view objective reality in the same framework as the natural sciences. However, as other areas of neurobiology, it acknowledges that "empirical" reality is ultimately a subjective perception.

Knowledge

Amnesia researchers usually think of knowledge in a personal level as the abilities and information which can be retrieved from memory and used. However, they understand that knowledge can also be discussed in a collective scale.

Truth

Amnesia researchers usually believe that there is "truth" in understanding the functioning of

the physical world. However, truth is considered an abstract concept which we approach partially through scientific models, with no assumptions on the existence of an absolute truth.

Perception

Perception is the information which an individual acquires through the senses. It is thus a necessary first step for memory formation.

Time

Amnesia research views time in the general framework of physics and the natural sciences. However, it also acknowledges the existence of a subjective sense of time, which is part of the information contained in memories.

Consciousness

Consciousness is a very controversial concept in neuroscience, even within specific subdisciplines. Most definitions describe it as an organism's representation of itself and of its world, or as the feeling of awareness derived from perceptions and thoughts. Memory researchers acknowledge the existence of declarative memories, which can be consciously retrieved by a subject, but also of nondeclarative memories, such as abilities and reflexes, which can influence behavior through unconscious mechanisms.

Rationality/Reason

In amnesia research, reason is generally seen as the foundation of science. In neurobiological terms, it can also be an object of research, when viewed as the way in which an individual uses knowledge to solve problems and make decisions.

Mystery

As a natural science, amnesia research usually sees mystery as something about which we lack comprehension, not as an intrinsically incomprehensible entity. Some neuroscientists also study concepts such as "mystery" and "faith" as subjective perceptions arising from the brain.

Relevant Themes

As memory is a subject so vital for human experience, it has been constantly revisited by other sciences and arts, such as philosophy and literature. Amnesia is also a popular topic in literature and cinema, possibly because it allows one to discuss the limits of the human self in these conditions. However, the depiction of amnesia in such works is usually inaccurate, following poetic license rather than science.

Specific definitions of memory are also central for many religions. Spiritual beliefs in past lives, for example, has led some to hypothesize that memories might be transferred to future generations or unrelated individuals. However, this is also contrary to what neurobiology observes and predicts based on empirical evidence.

Cross-References

- [Biological Psychology](#)
- [Cognitive Neuroscience](#)
- [Cognitive Psychology](#)
- [Conditioning and Learning](#)
- [Dementia](#)
- [Memory](#)
- [Neuropsychology](#)
- [Neuroscience](#)

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Anastenaria

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Related Terms

[Nestinari](#)

Description

The term “Anastenaria” (from the Greek verb *anastenazo*, to sigh) is a plural noun which refers both to a tradition and the members of that tradition (singular: *Anastenari*). The Anastenaria are religious communities of Northern Greece and Southeast Bulgaria (where they are called *Nestinari*), known for their devotion to saints Constantine and Helen and the fire-walking rituals they perform in their honor.

This tradition was maintained in various villages of Eastern Thrace during the time of the Ottoman Empire by Greek-speaking populations. The most notable of those villages was Kosti, in the area of Strandja. After the Balkan Wars, during the first quarter of the twentieth century, when Bulgaria gained control of this territory, those populations were forced to migrate to Greece. Today, most of their descendents live scattered around Greek Macedonia and they perform their rituals in five villages: Ayia Eleni, Langhadas, Meliki, Mavrolefki, and Kerkini. A handful of Bulgarians still perform these *rituals* in their original location near the Black Sea coast of Bulgaria.

The origins of this tradition are unknown. Certain Greek scholars have argued that it is related to the ancient orgiastic Dionysian cults. However, this theory was ideologically motivated and lacks any evidentiary support whatsoever. It was constructed as part of a general effort on behalf of Greek nationalist folklorists to prove

the continuity of Greek civilization, from ancient to modern Greece. Nevertheless, it became the dominant view of the Anastenaria for more than a century, and caused a persecution of this tradition by the Greek Church, which is to this day very hostile toward it (Danforth 1989; Xygalatas 2011).

The Anastenaria are devout and practicing Orthodox Christians; however, in addition to church religious life, they observe an elaborate annual *ritual* cycle with several ceremonial events around the year, all of which are based on important days of the Orthodox calendar and are related to various saints. Special emphasis is given to saint Constantine, who is considered to be the founder of this tradition, and his mother, Saint Helen. According to one folk legend, at some indefinite time in the past, the church of saints Constantine and Helen in Kosti caught fire. As the church burned, the villagers heard the icons crying for help. The bravest rushed into the burning church to save them and neither they nor the icons were harmed by the fire. To commemorate this miracle, the people of Kosti organized an annual *fire-walking ritual*.

Each community of Anastenaria has its own sacred spaces, exclusively used for religious purposes: *Fire-walking* is performed within a fenced circular field of about 30 m in diameter. Most ceremonial activities take place in a rectangular building called the *conaki*. There is also a chapel (*parekklisi*) and a sacred well (*ayiasma*), from which holy water is drawn. The most important sacred objects of the Anastenaria are the icons of the saints, which are passed from one generation to the next. These icons are thought to carry some of the power of the saint they depict and to have miraculous properties.

The biggest events in the religious life of the Anastenaria are two festivals, that of Saint Athanasius in January and especially that of Saints Constantine and Helen in May. These festivals incorporate elaborate sequences of *ritual* actions, including processions of the icons around the village, purifications with incense and water, communal meals, and an animal

Anastenaria, Fig. 1 The Anastenaria dancing barefooted over the fire



sacrifice. Each festival lasts 3 days, and during that period, the Anastenaria dance ecstatically for many hours to the sounds of lyres and drums. The festival culminates with a *fire-walking ritual*, where the participants, carrying the icons of Saints Constantine and Helen, leave the conaki and continue their dance barefoot over glowing-red coals without getting burned (Xygalatas 2012) (Fig. 1).

Self-identification

Science

The Anastenaria do not in any case self-identify as a science. However, they often claim the ability to explain and influence the natural world with the use of their icons and the performance of their *rituals*. According to these claims, they can often predict the future, heal the sick, bring rain and fertility, etc.

Religion

The Anastenaria are a religious group. However, they do not self-identify as a separate religion. They are devout Orthodox Christians, who fully endorse the doctrines of the Greek Orthodox Church, participate in its *rituals*, and honor all its saints, but have a special place in their worship for saints Constantine and Helen. They also have a distinct *ritual* cycle, which

includes *rituals* that the Greek Church opposes and considers as pagan.

Characteristics

The Anastenaria are a distinct tradition in that they combine Orthodox Christian doctrine and liturgical life with *ritual* actions that are not part of Orthodoxy, such as animal sacrifice, ecstatic dance, and *fire-walking*. Furthermore, although the Anastenaria recognize the Trinity and all the saints of the Orthodox Church, their worship is mostly focused on two saints, Constantine and Helen, and particularly the former, to the extent that some observers have described it as a cult of Saint Constantine.

Relevance to Science and Religion

The Anastenaria themselves are not explicitly interested in the disciplinary relationship between science and religion, as they do not see a conflict between the two domains. However, scholars who study this tradition often debate about the priority of scientific or religious explanations of incombustibility. Scientists have asserted that fire-walkers do not get burned because of the poor conductivity of coal and short time of contact. They point out that those who perform fire-walking around the

world, whether religious or not, do not usually get burned. On the other hand, participants as well as various scholars argue that science cannot explain *fire-walking*. According to this view, *fire-walking* is a mystery, only explainable in terms of divine intervention, and nonbelievers who perform it will get burned unless they somehow manage to cheat.

Sources of Authority

The Anastenaria have no prophets nor sacred texts or any other form of written tradition, although as Christians, they accept the authority of the Bible and Jesus Christ (Danforth 1989, Xygalatas 2011). The official leader of the group is the *archianastenaris*, who initiates their *rituals*; however, he is rather considered as “the first among equals.” Important decisions regarding the tradition are often made by popular consensus, while the succession of an *archianastenaris* is decided by a form of council of elders, called “the twelve” (although the number is merely symbolic and in practice varies). In general, elders are seen as much more knowledgeable and therefore authoritative than youths on matters of tradition.

Ethical Principles

For the Anastenaria, the world is governed by the will of God and the saints, particularly Saint Constantine, who is the progenitor of the Anastenaria and has an active interest in their affairs, guiding and protecting them, helping the pious, and punishing the sinful. The icons of the saints contain part of their essence and have the power to heal the sick.

Key Values

The Anastenaria must serve the saints and look after their icons, lead an ethical life, and be good Christians. If one receives the saints’ calling in the form of a dream or other “*sign*,” one must become a fire-walker; failure to obey will cause the saints’ punishment in the form of misfortune.

Becoming an Anastenari is a life-long commitment, as withdrawing can evoke the saints’ wrath.

Conceptualization

Nature/World

As Christians, the Anastenaria see nature as God’s creation *ex nihilo*. As such, nature is not sacred in itself and it is not to be worshiped but admired and revered as God’s creation. Thus, those elements of the physical world that are considered as holy for the Anastenaria, such as their sacred wells (*ayiasmata*), are seen as such not because of some intrinsic property, but only to the extent that they provide some material means for the manifestation of divine properties.

Human Being

The Anastenaria accept the Christian view of human beings as created by God and consisting of a mortal body and an immortal soul/spirit.

Life and Death

As Orthodox Christians, the Anastenaria believe that life was created by God. Whether present life forms were created by a miraculous creative act (creationism) or through evolutionary processes (theistic evolution) is a wider debate in Christian theology, not directly relevant to the Anastenaria.

According to Orthodox doctrine, death brings the dissolution of the body, while the soul awaits the Final Judgment, which will take place at the Second Coming of Christ.

Reality

As Orthodox Christians, the Anastenaria believe that there is a physical reality that is knowable and finite as well as a divine world that is beyond the reach of human experience, unknowable, and timeless. However, God’s will is *manifested* in the physical world through His workings and those of the saints, who function as mediators between Him and human beings. Most important among them is Saint Constantine, who often performs miracles, appears in people’s dreams and visions, and sends them meaningful signs.

Knowledge

Religious knowledge within the tradition of the Anastenaria is orally transmitted and comes from two main sources. The first is personal experience and its individual or collective interpretation. Dreams and visions are seen as *manifestations* of the saints, while unusual events are often considered as divine *signs* or miracles performed by them. The second source of religious knowledge comes from oral narratives that get transmitted from one generation to the next by word of mouth. Those usually involve the myths and legends of the Anastenaria that talk about the origins of *fire-walking*, the lost homelands, and an idealized past, when the saints interacted directly with their forefathers, who were wise and pious. This transmission is not regular or explicit but rather occasional and even rare. Elders are generally considered as much more knowledgeable and wise, even if this knowledge is never displayed or challenged.

Truth

Truth can be the understanding of the physical or the metaphysical world. The former can be grasped by humans only in part, while the latter is unattainable by them. However, in certain occasions, the saints may reveal fragments of divine truth through their *signs* and other *manifestations*.

Perception

Human perception is limited to the physical world, while metaphysical things are beyond our perception. However, certain devout persons can often perceive things that are outside normal sensorial awareness, through the mediation of the saints, who send them their *signs* in dreams, visions, as well as in everyday life.

Time

As all Orthodox Christians, the Anastenaria have a linear concept of time, which has a beginning and an end. The beginning is the act of creation by God and the end will come with the Second Coming of Christ and the Final Judgment, which will bring the consummation of the world and time.

Consciousness

In addition to normal consciousness, certain people among the Anastenaria are thought to have a special kind of consciousness, which allows them to communicate with the saints, most commonly Saint Constantine. In particular, many Anastenaria claim that they enter this altered state of consciousness during the performance of *ritual* dance and *fire-walking*.

Rationality/Reason

As people of the modern Western world, the Anastenaria usually rely on reason and science for explanations of the world. However, rationality is not the only source of knowledge. There are things that are inaccessible to human reason, and for those things faith is a better guide. Religious explanations are not usually seen as incompatible with scientific ones. Especially when science fails to provide solutions to everyday problems (for example, when doctors fail to provide healing), religious explanations are sought alongside.

Mystery

The term “mystery” refers to that which is beyond human reason and understanding and can be made known only by divine revelation. The Anastenaria consider *fire-walking* as one such mystery. According to them, the fact that their feet remain unharmed by the fire cannot be explained except as a miracle. Only those who enjoy the protection of Saint Constantine can fire-walk successfully.

Relevant Themes

Fire-walking rituals are performed the world over, but there is no established connection between the Anastenaria and other traditions, with the exception of the Nestinari of Bulgaria, as the two originate from the same tradition.

Cross-References

- [Eastern Orthodox Christianity and the Sciences](#)
- [Experience](#)

- [Fire-Walking](#)
- [Religious Experiences](#)
- [Ritual](#)

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Anātman (Sanskrit)

- [Anattā](#)

Anatenaria

- [Fire-Walking](#)

Anatomy of the Brain

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Related Terms

[Brain anatomy](#)

Description

Brain anatomy is studied in a variety of ways from cyto- and chemoarchitectural studies to whole brain in vivo maps created using magnetic resonance imaging (MRI). Newer methods such

as diffusion imaging have revolutionized how circuits and structures are mapped in the human brain. The in vivo approaches have greatly improved our understanding of the normal trajectory of brain anatomy during maturational and development changes as well as normal aging. These in vivo anatomical techniques have also transformed clinical neuroscience in the diagnosis, care, and treatment of many neurological and psychiatric disorders. Brain anatomy varies somewhat and studies of populations have revealed variation by anatomic region, gender, handedness, and other demographic categories. Brain tissue can be examined postmortem using a variety of histological, immunohistochemical, and other approaches to identify and characterize its cellular and chemical composition.

The brain is a complex concentration of nerve cells in the central nervous system weighing approximately 3 lb and responsible for sensory perception of the environment, determining and effecting appropriate motor responses, as well as thinking and learning. The brain governs the functioning of all the body's other organs. It is also responsible for instinctual behaviors and integrates current information with past experiences. The brain makes us conscious, emotional, and intelligent.

In humans, the brain is made up of about 100 billion nerve cells, called neurons; supporting cells (glia); and vascular and other tissues. There are numerous neuron types differentiated by structure and function. Encased in the bony cranium, the brain's outward appearance is dominated by two large, almost symmetrical cerebral hemispheres located on either side of a central core known as the brain stem. The brain stem gradually becomes the spinal cord exiting the cranium through an opening at the base of the skull called the foramen magnum.

Self-Identification

Science

Anatomy is, by its very nature, descriptive science. Observing and documenting the structure of the human brain has fascinated students of

biology and medicine for centuries. It is a science that uses exquisitely sensitive instruments capable of dissecting the components of individual cells along with imaging machines capable of witnessing, in a living healthy human being, the neuronal and hemodynamic consequences of thinking and behaving. Both structural and functional anatomy can be defined as a harmonious partnership between a number of scientific disciplines including neuroscience, computer science, physics, and mathematics.

Since anatomy is a descriptive activity, morphological statistics such as shape, size, position, orientation along with reports of the overall cell type, packing density, and other features are used to label and quantitatively measure regions of the brain. Augmenting these descriptions are the neuronal fiber pathways that connect different regions of the brain. These too are compiled into atlases that document the accumulated understanding of brain anatomy. These days, mostly all this activity is done across populations and to compare one subpopulation with another. But more importantly, it is done digitally and computationally, enabling comprehensive statistics and visualizations to be computed and rendered quickly.

The science of anatomy is now often performed, in part, automatically using machine vision techniques whereby algorithmic feature extraction, identification, measurement, and modeling can be performed with little or no human assistance. This science is applied in basic and translational research to normal and diseased brain.

Historically, this field has always considered itself a science as it describes, following observation, features that can be seen and measured of an organ system found in all mammals. Its utility in medicine has only been realized relatively recently. The study of neurology includes comprehensive knowledge of brain anatomy coupled with an understanding of its component functions, diseases, and abnormalities.

Characteristics

Brain anatomy is often the foundation upon which other clinical neuroscientific disciplines

depend. The structure of the brain defines the machinery upon which our understanding of its functions and systems operate. As such, it is fundamental and often linked to many other disciplines related to the nervous system.

Brain anatomy is distinctive as it provides the nomenclature for communicating the location and relationship of structures relevant to the study of neurology and psychiatry and other specialties of medicine. Brain anatomy also classifies structures into systems establishing the relationship between parts of the brain and its functions. As such, it is critical in understanding the consequent deficits following insult from trauma, disease, or other causes.

The modern science of brain anatomy includes coordinate systems that have application in the care and treatment of patients by neurologists, neurosurgeons, and radiologists. Population studies are enabled by the utility of these coordinate systems and the sophisticated mathematical tools for averaging and comparing across subjects that accompany them.

In basic neuroscience, brain anatomy figures prominently in cognitive neuroscience, psychology, and other related fields. Relating behaviors to specific circuits and systems of the brain is a form of functional anatomy studied using MRI, positron emission tomography (PET), transcranial magnetic stimulation (TMS), electroencephalography (EEG), magnetoencephalography (MEG), and other methods. Hence, it is a science that is tightly interwoven with many other specialties of neuroscience.

Relevance to Science and Religion

The science of brain anatomy includes the study of its changes (both structural and functional) over time. The adaptive consequences present themselves in many brain areas across the life span influenced by many factors including experience. As such, a variety of experiential influences have been investigated including meditation and practices of certain eastern religions to determine if and to what extent brain changes can be measured. Functional anatomy

studies in the form of fMRI have been used to measure brain responses to moral and ethical dilemmas. Thus, the science of structural and functional brain anatomy may have relevance to the scholarly area called science and religion. Certainly the emergence of ever more sensitive methods will encourage this line of investigation to continue.

Sources of Authority

Illustrations of the brain underwent a dramatic leap in quality, along with general scientific inquiry, in the fifteenth century (Clarke, et al., 1996; Finger, 2000). Objective survey of brain anatomy along with considerable artistic skill produced increasingly accurate representations of the many of the structures of the brain. Examples include drawings made by Leonardo da Vinci (1498–1504) and Andreas Vesalius (1543). Created during the Renaissance and Age of Enlightenment, these are among the first illustrations of brain anatomy rendered following careful examination of cadaverous specimens. Andreas Vesalius is recognized as one of the greatest of the Renaissance anatomists, one only has to look at his illustrations in his book *De humani corporis fabrica*, 1543, to appreciate the quality of his scientific observation. In 1664, Thomas Willis published his book on the anatomy of the brain and nerves, *Cerebri Anatome*. *Cerebri Anatome* can be considered the first attempt at describing the functional anatomy of the brain. Willis proposed three areas in the brain: the corpus striatum, corpus callosum, and cerebral cortex responsible for the *sensus communis*, imagination, and memory, respectively. Perhaps one of the more important milestones was the functional anatomy mapping of Korbinian Brodmann in the early 1900s. His numerical catalog of cortical areas is still a valuable reference system utilized today.

In modern times, the study of brain anatomy transitioned from gross brain anatomy to cyto- and chemoarchitecture, mapped into coordinate systems and related to other modalities describing brain structure and function. Jean Talairach

(1911–2007) developed a system for stereotactic localization of human brain structures, creating human brain atlases that enabled quantitative comparison of brain anatomy across subjects. With the advent of imaging devices, the power of population studies and replication of findings by independent laboratories and studies defines the authority of this discipline.

Ethical Principles

There are general principles regarding the use of human subjects that are enforced by independent regulatory bodies. These review boards examine the ethics, methods, and usage of all data collected from human subjects to determine the value and risk of each study.

Key Values

Understanding the human brain is one of the greatest quests in science. This is the organ that makes us who we are and hence the value of this discipline is immeasurable. As this discipline is also fundamental to clinical specialties such as neurology, neurosurgery, psychiatry, and psychology, its value can be found in the care and treatment of patients suffering from diseases of the nervous system.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life. The world is where we are.

Human Being

Humans are one of a vast and diverse collection of living things on Earth. Humans are arguably the most advanced intellectually and hence dominate the food chain. We have created a sophisticated culture and environment for ourselves and extended our already highly developed capacity for communicating and thinking.

Life and Death

Life is the coordinated functioning of interconnected organ systems. There are many life forms, each with its own operational requirements. These range from single cell organisms to humans. Death is the extinction of this coordinated functioning.

Reality

Reality, for each of us, is what we can observe.

Knowledge

Knowledge is derived from information and enables understanding. We can communicate that knowledge now with countless media from verbal language to streams of digital bits.

Truth

Truth is perceived fact, indisputable, and absolute.

Perception

Perception is the processed from of signals detected by any of our five senses. Neurological and psychiatric disorders can alter, disrupt or impair perception.

Time

Time can be perceived from internal stimuli such as the last time one had a meal or slept and it can be perceived from external stimuli such as the apparent movement of the sun across the sky. Although we may use devices to quantify the passage of time linked to celestial movements, we also have genes in cells that cycle with time.

Consciousness

Consciousness is responsiveness to any external physical stimulus. There are different degrees of consciousness, some of which are modulated by internal conditions such as wakefulness and attentiveness.

Rationality/Reason

Rationality is appropriate behavior for the situation. In part determined by culture, rational behavior is considered appropriate and acceptable. Some diseases of the brain can render an individual incapable of rational behavior.

Mystery

Mystery is that which is presently unknown. The goal of science is to unlock that which at first appears mysterious.

Relevant Themes

The great challenge that is the human brain begs the question, is the human brain capable of understanding the human brain? This, most complex organ has such remarkable structure and function that many neuroscientists and other students of brain anatomy often marvel at how much we still do not understand. But the wonder of the human brain inspires every scientist who has taken up the journey of discovery.

Cross-References

- [Comparative Neuroscience](#)
- [Neuroimaging](#)
- [Neurology in Asia](#)
- [Neurology in Europe](#)
- [Neuropsychology](#)
- [Neuroradiology](#)
- [Neurosurgery](#)
- [Psychiatry in America](#)
- [Psychiatry in Europe](#)

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Anatomy of the Eye

- [Optics in Islam](#)

Anattā

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Related Terms

Anātman (Sanskrit); Not-self

Description

The teaching on the absence of a self is one of the most prominent characteristics of Buddhism, when compared to other religions. This distinctive feature of Buddhist thought has considerable relevance for placing Buddhism within the dialogue between science and religions, as Buddhist texts take the absence of a permanent self to be the evident outcome of a thorough investigation of all aspects of subjective experience. Such investigation is held to lead to the unavoidable conclusion that a permanent self cannot be found at all. Hence, the notion that such a self exists should be understood as mistaken.

Buddhist analysis distinguishes between twenty possible modes of construing a notion of a self (e.g., Trenckner and Chalmers 1888–1896, I 300), referred to with the term *satkāyadr̥ṣṭi* (Sanskrit) or *sakkāyadiṭṭhi* (Pāli). This analysis is based on the so-called five aggregates, which according to Buddhist thought are the chief constituents of an individual. These five comprise the aggregates of the body, feeling, perception, volitional reactions, and consciousness. Buddhist thought holds that a self cannot be found in relation to these five aggregates in any way, neither by identifying any of the five aggregates as the self, nor by postulating a self as the owner of an aggregate, nor by assuming that the aggregates exist in some way within a self, nor by locating a self within an aggregate.

The type of investigation that leads up to insight into the absence of a self is depicted in

a discourse that according to the traditional account was the teaching given by the Buddha to lead his first disciples to full awakening (Feer 1884–1898, III 66). As a first step in this examination, the discourse clarifies that none of these five aggregates are fully amenable to control, that is, neither one's bodily condition nor what one feels, what one perceives through the sense doors, how one reacts, and what one is aware of by way of consciousness will always be as one would like it to be. Hence, the notion of a self in the sense of an independent controller who wields complete mastery over experience is not empirically verifiable and thus should be considered as not existing in truth and fact.

A complementary line of investigation forms the next step in this examination. This complementary approach begins by inquiring if the five aggregates can be reckoned as permanent. Inspection shows that each of these five sooner or later is bound to change. Hence, the conclusion to be drawn is that each of the five aggregates is impermanent (► [Impermanence \(Buddhist\)](#)). Next follows the query if what is impermanent should be reckoned as unsatisfactory or as agreeable. Although what is impermanent might be agreeable for some time, due to its inevitable change, it sooner or later turns out to be unsatisfactory (► [Dukkha](#)), in that it fails to yield lasting satisfaction. This conclusion then leads to the third and final step in this investigation, according to which what is impermanent and unable to yield lasting satisfaction fails to fulfill the requirements for being regarded as a self.

The argument employed in this investigation serves to clarify what kind of a self the Buddhist teaching of *anattā* rejects, namely, a self that is permanent and endowed with complete mastery over its own field of experience. While the teaching of *anattā* clearly opposes the notion that an eternal core can be found behind the changing processes of the five aggregates that make up an individual, it does not deny the existence of this changing process as such nor the empirically verifiable fact of personal continuity.

An illustrative simile provided in one discourse compares the five aggregates to a chariot (Feer 1884–1898, I 135). The term

“chariot” is simply a convention used to designate a functional assemblage of different parts, like the wheels and the axles. Once taken apart, besides these constituent parts, no chariot as such can be found. Yet, the denial of the existence of an eternal chariot independent of its parts does not mean that it is impossible to drive with the impermanent and conditioned assemblage of parts to which the term chariot refers.

Similarly, although according to Buddhism what makes up the individual person are merely the five aggregates and besides these no eternal self can be found, to assume that the denial of a self leaves no agency for karmic responsibility is considered a mistaken conclusion (Trenckner and Chalmers 1888–1896, III 19). The five aggregates as a conditioned process continue and thus provide the required medium for the taking of decisions and the performance of actions, as well as for their subsequent karmic retribution (► [Karma \(Buddhist\)](#)). As the simile of the chariot shows, to combine the denial of an eternal self with personal continuity does not require invoking two different levels of truths, as is sometimes done in later Buddhist tradition, but merely involves a clear recognition of what is being denied with the doctrine of not-self and what is not being denied.

That the existence of an individual as a changing process is not being denied can be seen from various passages in the Buddhist discourses. These indicate, for example, that bad actions done by oneself will in due course affect oneself (von Hinüber and Norman 1994, Stanza 161) or else that it is by one’s own acts that one defiles or purifies oneself (von Hinüber and Norman 1994, Stanza 165). Even instructions on the practice of mindfulness as a key aspect of the path to awakening explicitly employ terms like “I am walking” or “I feel pleasure” (Trenckner and Chalmers 1888–1896, I 56). Elsewhere, the Buddha is on record for remembering his past lives in terms of “I was reborn” (Trenckner and Chalmers 1888–1896, I 22). In short, even a fully liberated one may still use terms such as “I” or “mine” (Feer 1884–1898, I 14), even though any notion of a permanent self has been forever eliminated.

In the early Buddhist texts, the teaching on the absence of a self appears to have been

predominantly directed toward the insight that no self can be found within an individual. With later traditions, apparently in opposition to what was perceived by some Buddhist thinkers as a tendency by others Buddhist thinkers toward a reification of elements (dhammas) as the basic constituents of reality, teachings regarding the absence of any permanent essence were explicitly applied to these elements. Expositions of the absence of an eternal self also increasingly tend to use the term “emptiness” instead of “not-self.” The notion of emptiness occurs, however, already in the early texts, such as in the dictum that “this world is empty of a self and what belongs to a self” (Feer 1884–1898, IV 54). Thus, the idea that emptiness is all pervasive – in the sense that a permanent essence or self cannot be found anywhere at all – can be traced to early Buddhist thought. As a stanza poetically sums up, by rooting up the view of self and by looking on the world as empty, one would be able to transcend even death (Andersen and Smith 1913, Stanza 1119).

Cross-References

- [Reality in Buddhism](#)
- [Religious Experiences](#)
- [Self](#)
- [Soul](#)

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Anatta: Non-self

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The doctrine of *anatta* (Pāli) or *anātman* (Sanskrit) is the central, most profound, and typical teaching of Buddhism and Abhidhamma.

Atta stands for “soul” or a permanent self, I, ego, or intrinsic core. *An-atta* is the negation of such a soul or self. The Buddha’s *anatta* doctrine teaches that neither within the five aggregates (*khandha*) – which constitute a being and are bodily and mental phenomena – nor outside of them, can be found in anything that could be regarded as a permanent, self-existing ego-entity, or soul in the ultimate sense.

Anatta, non-self, non-I, non-ego, soullessness, impersonality is the third of the universal characteristics of existence and all phenomena, not only of conditioned phenomena (*saṅkhāra*), but even of the unconditioned *Nibbāna*. *Anatta* can be understood through penetrating the Buddhist doctrine of “Dependent Origination” (*paṭṭiccasamuppāda*), and in more detail and clarity through “Conditional Relations” (*paṭṭhāna*), the seventh book of the Abhidhamma, which teaches the relations and connections of all mental and physical phenomena, which form a huge, complex net of causes, conditions, and effects. Everything one experiences happens because of conditions, and oneself, the subject including one’s observing mind, is conditioned too. There is no inner core, self or soul, that is not subject to

this unstable conditionality, which would be permanent, reliable, to cling to, and identify with. There are only void processes following their own natural laws according to conditions.

Anatta presents itself as uncontrollability. All things, phenomena, and experiences are conditioned and we do not have the power to control these conditions. Therefore, the effect of these conditions, our experience or whatever phenomenon, is not under our control. For example, we cannot make happiness or love stay forever, or sadness, pain, and decay disappear.

The contemplation of non-self (*anattānupassanā*) is one of the three main methods in insight meditation. It discards the clinging to a self. *Nibbāna* appears through the void aspect and the practice leads to emptiness emancipation (*suññatā-vimokkha*) with wisdom (*paññā*) as gateway to liberation.

Anesthesiology

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Related Terms

[Sedation](#)

Description

Anesthesia refers to a state where most sensation (primarily pain) is reversibly blocked to facilitate surgical procedures. The discovery of anesthesia was the most significant contribution to the advancement of health care in the world. The origin of the term is credited to Oliver Wendell Holmes, who introduced the word to describe the effect produced by inhalation of ether. The development of the specialty of Anesthesiology as a science began in 1846 after the first public demonstration of the effects of ether in treating

surgical pain by W.T.G. Morton (Smith and Bacon 2006). In the USA, Anesthesiology evolved as a specialty in its own right in the late nineteenth century and Europe followed suit. Today, the specialty of anesthesia encompasses taking care of the patient before, during, and after surgery. Anesthesiologists are experts in airway management, treating pain outside the operating room, and in managing intensive care units and researchers exploring the mechanisms of pain and methods to improve the outcomes of patients after surgery.

Self-identification

Anesthesiology is a scientifically based specialty in the field of medicine. It aims to achieve a deeper understanding of the mechanisms of awareness, consciousness, pain, and the human body's response to surgical stress. Anesthesiologists apply scientific methods of the natural sciences for clinical and basic research as well as for developing diagnostic algorithms and implementing therapeutic regimens. Two well-known methods of surgical anesthesia are General Anesthesia (GA), where the patient is rendered unconscious without arousal to painful stimuli for the surgery, and Regional Anesthesia (RA), where certain regions of the body are selectively rendered insensible to pain. The agents used include inhalational anesthetics, intravenous anesthetics, as well as adjuvant medications, which together can cause amnesia, analgesia, loss of consciousness, and muscle relaxation if needed. Anesthesiology has now branched into the subspecialties of Cardiac Anesthesia, Pediatric Anesthesia, Pain Medicine, Critical Care Medicine, Obstetric Anesthesia, and Neuroanesthesia.

The first American Organization of physician anesthetists was formed in 1905 and called the Long Island Society of Anesthetists. The apex body for anesthesiologists in the USA today is called the American Society of Anesthesiologists (ASA), which got its present name in 1945 (www.asahq.org). Its counterpart in the UK is called the Royal College of Anesthetists, which

was awarded its royal charter in 1992 (<http://www.rcoa.ac.uk/>).

The increase in knowledge in the different subdisciplines has resulted in the evolution of different societies, such as the Society for Education in Anesthesia (SEA), Society for Ambulatory Anesthesia (SAMBA), Society of Pediatric Anesthesia (SPA), and Society for Cardiac Anesthesia (SCA).

Characteristics

Anesthesiology is distinctive among the other specialties of Medicine. The specialty is focused on studying the mechanisms and effect of medications on consciousness, awareness, the changes that take place in the human body during surgery, and its response to surgical stress. Anesthesiologists undertake the complex task of managing the delivery of medications causing GA or RA, as well as monitoring and preserving the vital functions of the patients undergoing surgery while doing this in the safest possible way for the patient.

Relevance to Science and Religion

Anesthesiology has a rich tradition of scientific research both in the laboratory (basic sciences) and in the clinical arena (clinical sciences). It is based on knowledge derived from hypothesis-driven studies and promotes practice of evidence-based medicine.

Sources of Authority

The early authorities in the specialty of Anesthesiology were dedicated physicians who set standards in education and achieved proficiency in the administration of anesthetic agents (Sykes and Bunker 2007). John Snow (1813–1858), a respected British physician, was one of the first to study and calculate dosages for administration of ether and chloroform for surgical anesthesia and described the clinical stages of depth

of anesthesia. He set the scientific basis for the study of the art and science of anesthesia. He published two remarkable books, “On the Inhalation of the Vapour of Ether” (1847) and “On Chloroform and Other Anesthetics” (1858). He administered chloroform to Queen Victoria for the birth of two of her children and bestowed respectability to the science of anesthesia. His work on inhalers set the stage for the evolution of equipment for delivery of anesthetic agents in the latter half of the nineteenth century.

Arthur E Guedel (1883–1956) established himself as a pioneer in designing innovative equipment used to administer anesthesia in the USA. His textbook “Inhalation anesthesia” was published in 1937. He described and categorized physical signs that correlated with stages of ether anesthesia, which are described in major textbooks to this day.

Peter Safar (1924–2003) was instrumental in pioneering the science of cardiopulmonary resuscitation (CPR) (Safar 1959; Safar et al. 1959).

Virginia Apgar (1909–1974) developed a standardized scoring system for newborn babies that correlates with outcomes after birth and significantly reduced infant mortality throughout the world (Apgar et al. 1958).

In keeping with the evolution of the specialty of Anesthesiology as a science, original publications in peer-reviewed, scientific journals have become increasingly important in the current age. Based on the existing knowledge, the ASA and other subspecialty organizations have established evidence-based guidelines for good clinical practice, which are constantly updated.

Ethical Principles

As for other medical specialties, Anesthesiology is guided by the Hippocratic Oath, which is supplemented by the rules of the Declaration of Helsinki (1971). Anesthesiology is at the core of development of ethical principles in the practice of medicine and is intimately involved in developing guidelines related to end-of-life decisions. Henry Knowles Beecher, an anesthesiologist was instrumental in the implementation of federal

rules on human experimentation and informed consent by focusing world attention on unethical practices in medical experimentation (Best and Neuhauser 2010).

Key Values

The key value of the specialty of anesthesia is to alleviate human suffering and maintain life. This is done not only in the context of a patient undergoing surgery or painful procedures, but is also extended now to patients suffering from chronic pain as well as giving birth, and the acutely ill patient in intensive care settings.

Conceptualization

Nature/World

Nature is conceptualized as the biological and biochemical foundation of life on earth. The world comprises the material and interspersed space of the universe.

Human Being

The human being is considered a biological being equipped with a highly developed complex brain, and a complex functioning of organ systems giving them unique skills including emotions and abstract thinking, which differentiate them from the rest of the animal world.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems. In the human body, it includes functioning of the cells in different organs. Death is considered the cessation of such physiological functions.

Reality

Reality is considered the physical world around us that humans can observe or measure with their senses.

Knowledge

Knowledge is understood to have an *objective* dimension, such that it is the *wisdom* that can be

transferred in a verbal or textual form from one person to the next. Knowledge builds up from one generation to the next. All knowledge has a scientific basis.

Truth

Truth is defined as the ultimate reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal, which humans can grasp only partially.

Perception

Perception is the *conscious sensation* of the forces and influences the external physical world exerts on living beings. Anesthesia, whether general or local, may disrupt or impair this perception.

Time

Time is the fundamental unit of ongoing change in the world. Humans can measure time *objectively* and perceive it owing to the changes observed in the surrounding environment. The perception of time can be affected by the influence of sedative or hypnotic drugs or when a patient is under anesthesia.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of *sedation* ranging from minimal sedation to complete loss of consciousness. Consciousness can be altered by administration of medications. Under anesthesia, loss of consciousness is usually accompanied by amnesia.

Rationality/Reason

Rationality is a foundation of accountable and *responsible* human behavior and of understanding reason as ultimate authority. It is impaired under sedation and anesthesia.

Mystery

Often mystery is considered to be contradictory to modern medicine including Anesthesiology. In science, mystery is understood as potentially explainable after accumulation of adequate scientific knowledge.

Relevant Themes

Anesthesiology today is focused on meeting the challenges of modern surgical techniques. The role of novel drug administration techniques and target controlled infusion pumps are being explored. Research is continuing to develop drugs that can target specific areas of the brain with minimal side effects for the provision of anesthesia. New surgical techniques such as robotic surgeries and minimally invasive surgeries will make new demands on the anesthesiologist to tailor medications and techniques to suit the procedure.

Cross-References

- [Amnesia](#)
- [Pain Medicine](#)
- [Sedation](#)
- [Surgery](#)

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Anicca (Pāli)

- [Impermanence \(Buddhist\)](#)

Anicca: Impermanence

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Anicca (Pāḷi) or *anitya* (Sanskrit) is impermanence or transitoriness. According to Buddhist Abhidhamma, all phenomena, physical and mental, are momentary and transient only, they arise and dissolve. This impermanence is defined in ancient texts:

“Not existing before, they (the phenomena) arise.

Having arisen, they vanish forever.”

Anicca is not the slow change in things which one can observe. It is the constant, rapid arising, and immediate cessation of phenomena which can only be perceived by a well-trained, keen, and sharp mind in *vipassanā* meditation. According to the ancient Abhidhamma commentaries, arising and vanishing takes place at a tremendous rate of more than a 1,000 billion times per eyewink. In other words, the lifetime of phenomena is less than 1,000 billionth of a second.

In the Buddha’s teachings, the transience and constant renewal of phenomena is compared with dewdrops at sunrise, a bubble on water, a line drawn on water, or a lightning flash.

Anicca is one of the three universal characteristics of existence, of all conditioned phenomena (*saṅkhāra*), or in Abhidhamma terms, of all ultimate realities (*paramattha-dhamma*) except *Nibbāna*. In *vipassanā*, to penetrate and realize *anicca* of one’s meditation-object as well as of one’s observing mind (the subject), is said to be definitely necessary on the step-by-step stages of the insight knowledge (*vipassanā-ñāṇa*) which leads to disenchantment, equanimity, and final liberation of the mind.

The contemplation of impermanence (*aniccānupassanā*) is one of the three main methods in insight meditation. It discards the sign of perversion of permanence. *Nibbāna*

appears through the signless aspect and practice leads to signless emancipation (*animitta-vimokkha*) with faith (*saddhā*) as gateway to liberation.

Animal Learning

► [Conditioning and Learning](#)

Animal Magnetism

► [Hypnosis](#)

Animal Theology and Ethics

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Related Terms

[Cognitive ethology](#); [Interbeing](#)

Description

Animal Ethics is the conscious reflection on and the fundamental criticism of traditional ethical judgments and the prevailing, culturally validated moral beliefs in which (nonhuman) animals are dismissed from moral consideration or regarded as having little value compared with any kind of human interest. Animal Ethics challenges the anthropocentric, humanocentric, and instrumentalist view of animals held by Aristotelian (Aristotle, Thomas Aquinas) and Enlightenment philosophers (René Descartes, Immanuel Kant) and by many others. It contradicts those who regard animals merely as means to human ends, as machines, resources, commodities, and thereby reduce them to things to be

killed, eaten, and (ab)used arbitrarily. In contrast to humanocentric ethical concepts and to behaviorist psychology, but in accordance with the insights of contemporary *cognitive ethology* and neuroscience (Bekoff 2007), animal ethics proceeds from the scientifically substantiated assumption that (many) animals do have consciousness and emotions: Animals have mental experiences, they can perceive the things around them, they are able to think and to feel, they experience pleasure and pain, joy and fear, grief and various other feelings. Of course, it is important to remember that animals frequently use different senses than human beings do and that visual cues are not the only ones used in self-awareness.

The ability to experience pleasure and pain is commonly called *sentience*. Even though there are grey areas, because scientists cannot be absolutely certain which animals are sentient (and to what degree), it is safe to say that mammals and most other vertebrates (animals with a spinal column, i.e., mammals, birds, fish, reptiles, and amphibians) and even some invertebrates (e.g., octopuses), are able to feel pain and pleasure.

Animal ethics is based on the conviction that there is a link between sentience and the moral considerability or the moral status of a living creature. Animals' sentience therefore entails that how animals are treated by human beings really matters: Human actions must be evaluated as right or wrong, i.e., they are an ethical issue. The moral debate about animals at present mainly revolves around the following areas: animals being bred and killed for food, particularly under conditions that severely frustrate their natural needs (factory farming); animals used for medical experiments and cosmetic testing; breeding and killing animals for clothing (fur, leather); hunting, especially so-called sport or recreational hunting; the use of animals in education (biology, medical training, veterinary science), human entertainment (zoos, aquariums, circuses, horse and greyhound racing, bullfighting), military experiments and training; the welfare of companion animals (pets); genetic engineering and xenotransplantation (the transplantation of living

cells, tissues or organs from one species to another, e.g., from pigs to humans).

In contemporary Animal Ethics there are several ethical schools or theories that support the cause and the protection of animals: the utilitarian welfare theory, the rights theory, the feminist care tradition, and the generosity theory.

The utilitarian welfare theory goes back to Jeremy Bentham (1748–1832). Bentham demanded that human beings act in such a way as to maximize pleasure and minimize pain of both human beings and animals. Bentham was the mentor of Peter Singer, who in the 1970s initiated an animal liberation movement which has denounced the assumption of human superiority as arbitrary and “speciesist” and has compared it to the ideologies of racism and sexism (the term “speciesism” was coined by Richard Ryder, though). According to Singer (1995) all sentient beings, human or animal, have a basically equal claim to the recognition of their interests. Of course, as a utilitarian, Singer attaches great importance to the weighing of competing interests, not on moral and legal rights. In contrast, the animal rights theory (Regan 2004; Francione 2000) regards animals as intrinsically valuable, as “subjects of a life” who have certain individual rights which normally must not be infringed, even if it would benefit human beings to do otherwise. With regard to actual demands and concrete concerns, however, animal welfarists and animal rightists frequently agree. A large number of supporters of the contemporary animal protection-movement feel comfortable with a compromise position that regards animal rights as a long-term goal and an ideal state of affairs, yet accepts animal welfare measures as a short-time goal. This “new welfarism” proceeds on the assumption that there is some causal connection between cleaner and larger cages today and empty cages tomorrow. Both the feminist care tradition (Donovan and Adams 2007) and the generosity theory go beyond utilitarianism and animal rights: The former argues for attentiveness, sympathy, and emotional engagement in our relationships with animals and examines the links between species oppression and gender oppression (Carol Adams),

the latter contends that animals have an analogous status to that of children and therefore should be seen as having not equal claim but greater claim upon adult humans precisely because of their vulnerability and relative powerlessness. Its main proponent is the Anglican theologian Andrew Linzey.

It was also Linzey (1994) who first termed the phrase “Animal Theology.” Animal Theology is a theological approach that relates theology to contemporary debates about the status, the welfare and the rights of the (nonhuman) animals. It is not merely a study of animal ethics in the context of – in Linzey’s case – the Christian moral tradition (although, of course, it entails specific moral obligations), but rather a fundamental theology: Its content is the whole Christian doctrine read or reread from the perspective of contemporary science and its insight into animals’ minds and emotions and their consequent moral status. Animal Theology deals with three main areas of the traditional Christian doctrine: creation and the notion of human dominance, superiority or specialness; incarnation, the doctrine that affirms that God became human in the person of Jesus Christ; redemption, humanity’s reconciliation with God and its salvation by and in God through Jesus Christ. The traditional humanocentric bias of these fundamental Christian doctrines is reinterpreted by Linzey in a way that makes room for (nonhuman) animals: Human uniqueness is understood as a special responsibility to act not as the master but as the “servant species”; God’s becoming flesh in Christ affirms all flesh, both animal and human; animals are not excluded from God’s redemptive purposes, they are not without souls and will be granted immortality and supreme happiness after their earthly death.

Through his cooperation with Rabbi Dan Cohn-Sherbock, Linzey has developed his Animal Theology beyond the confines of the Christian tradition into a Judeo-Christian Animal Theology. An even more comprehensive notion of the term would suggest an examination and reinterpretation of all (major) religious traditions with regard to their theological understanding of animals, primarily Islam (as the third

Abrahamitic religion), Hinduism, Buddhism, and Jainism (all of which originated on the Indian subcontinent), Daoism, and Baha’i. In a comparative perspective, Hinduism, Buddhism, and especially Jainism seem to be more compassionate toward animals than the monotheistic religions. Yet a close theological scrutiny reveals that according to the tradition of these three religions it is frequently not the benefit of the animal that is the dominant factor for animal-friendly behavior, but the spiritual advancement of the practitioner or the belief that s/he himself/herself might be reborn as animal (reincarnation). Some contemporary interpretations of, e.g., Buddhism, however, emphasize the first Buddhist precept that prohibits all killing and calls for a vegetarian diet, and the Buddhist teachings of *interbeing* and of compassion toward all living beings (Thich Nhat Hanh, Phelps 2004).

Cross-References

- [Christian Ethics](#)
- [Ethics](#)
- [Utilitarianism](#)

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Anitya (Sanskrit)

► [Impermanence \(Buddhist\)](#)

Anthropic Principles

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Description

Popular accounts of the history of science contend that the Copernican revolution diminished humanity's opinion of itself and that the Darwinian revolution completed our cutting down to size. From being the embodiment of *Imago Dei*, with dominion over the other inhabitants of the central component of the universe, Earth, the human species came to see itself as an accidental product of chance forces, precariously clinging to a brief existence on the surface of a trivial planet, orbiting an insignificant star near the edge of one among billions of galaxies. However, equating centrality with importance has little logic, and anyway few modern cosmologists would consider that the universe *has* a center. Moreover, the concept that life, even perhaps conscious life, arose only as the product of an immensely improbable sequence of accidents, has been challenged on strictly scientific grounds, quite independent of theological ones, by many thinkers in the past century. The term “anthropic principle(s)” seeks to encapsulate the common spirit of all these challenges. As coined, it referred directly to cosmological calculations, but the lead had been taken, early in the twentieth century, by biologists.

For an organism to survive, its environment must be fit for it just as much as it must be fit for that environment. Most discussions of evolution focus on the latter aspect, but the physiological chemist, Lawrence Henderson, gave detailed and often quantitative recognition to the reciprocity in *The Fitness of the Environment* (1913) and later writings. Among Henderson's most telling examples are the exceptional properties of water – e.g., that its solid state is less dense than its liquid one, with the consequence that aquatic life can continue at the bottom of lakes whose surfaces are frozen. A remarkable range of other special properties is cited, with modern values, in Barrow and Tipler (1986).

Such thinking was taken forward by some other biologists, notably George Wald, two generations after Henderson; among his emphases were the extraordinary properties of chlorophyll. Nonetheless, the pioneering steps which followed Henderson's were taken by cosmologists. Among them, beginning in the 1930s and increasingly since the 1950s, recognition of an apparent “fine-tuning” of the universe for life has emerged. The features considered during this phase were on a very large scale. Most basic of all, the very age and consequent size of our universe, far from demonstrating our insignificance, became recognized as essential if stars were to have had opportunity to host the nuclear syntheses which produce carbon, nitrogen, oxygen, and phosphorus – elements at the core of life as we know it. That recognition seems to have been voiced first by J.G. Whitrow in the 1950s, but of course it depended on the earlier redshift observations of Edwin Hubble and the imaginative perception of George Lemaitre, out of which has come the modern acceptance of a universe expanding in a finite time from an initial singularity.

The concept of an *anthropic principle* was introduced in the 1970s by the cosmologist Brandon Carter (Leslie 1990), reflecting on a group of “large-number coincidences” originally noted 40 years earlier by the physicist P.A.M. Dirac. These (enormously) large numbers, extremely esoteric to the layman, were the dimensionless ratios of various physical constants, and the coincidence was that these ratios

seemed constrained to lie very close to $(10^{40})^n$, where $n = -1, 0, 1$ or 2 . The most easily stated of the figures is an instance of $n = 2$: it is the ratio of the mass of the observable universe to that of the proton or neutron, a ratio which is $\sim 10^{80}$. The additional realization during 1950–1975, associated particularly with John Wheeler, R.H. Dicke, and thence with Carter, was that Dirac’s coincidences themselves “were not random but conditioned by biological factors” – had the ratios not been close to those found, there would have been no cosmologists to observe them.

The phrase “anthropic principle” sought to express this recognition, and Carter formulated it in two ways (Barrow and Tipler 1986; Leslie 1990). The *weak anthropic principle* (WAP) merely noted the inevitability just expressed. This represents the situation as an example of a “selection effect” – the only kind of universe which can ever be observed is one which creates its own observers. Though inevitable, this is not trite. On the contrary, it indicates that many detailed aspects of the world’s makeup, which on other grounds would seem to have an immense range of possible values, could in fact have varied only a very little from those we actually find if we were to exist and observe them.

Aspects of fine-tuning recognized since Dirac include the perception that a term in Einstein’s extended formulation of general relativity, the “cosmological constant,” which influences the course of universal expansion, must be and is extraordinarily small – so small as to suggest that it may actually be zero – though values ranging over many orders of magnitude seem in principle possible. A second aspect is that the ratio of the forces of attraction and repulsion between nuclear particles (the “strong” and electromagnetic forces) could have differed only fractionally from those we observe if atoms were to form. A third is that the amount by which a neutron’s mass exceeds that of a proton must also be very small if anything like the chemistry we associate with life is to be possible. However, it is not enough to list the low probabilities that each individual factor would be in the right range for life to result because the probability of *all* of them being so is the product of the

individual estimates. To appreciate the strength of this point, consider that if a mere six factors would each permit life in as much as a tenth of its possible range, the overall probability of life being possible would be $1:10^6$ – one in a million. Actually, well over 20 factors have been identified, and many of the individual probability estimates are a great deal lower than one in ten. Indeed, one parameter has recently been estimated as having only one chance in 10^{120} of being right for galaxy formation, and therefore for life, were its value to have been determined by random influences (Davies 2006). Many cosmologists have thus concluded that the universe is enigmatically fit for life – “uncannily” so in Paul Davies’ phrase – or, in the words of the late Fred Hoyle, “a put-up job.”

Carter, apparently sensing this trend well before many of the calculations cited here, proposed a second and “strong” anthropic principle (SAP) that *the Universe must be such as to admit creation of observers within it at some stage in its history*. “Must” is ambiguous: deduction or imperative? As the deduction would merely restate the WAP, an imperative is normally presumed (Barrow and Tipler (1986); Davies 2006; c.f. Leslie 1990). This is a far more metaphysical statement, and the nature of the imperative it adduces is scientifically obscure. Its theological scope, however, is obvious.

Several developments of the SAP have subsequently been proposed: two will be mentioned. Wheeler, reflecting subjectivist interpretations of quantum theory, suggested a “participatory” anthropic principle (PAP) evocative of Bishop Berkeley: *observers are necessary to bring the universe into being*. The alternative, “many worlds” interpretation of quantum mechanics, first suggested by Hugh Everett and considered by Carter, leads to the proposition that there are countless parallel, independent universes, each with a random distribution of properties, one of which has happened to produce us. The overall complex has lately acquired the name “multiverse.”

The scientific value of positing a myriad, perhaps an infinity, of universes which we can, by definition, never know has been philosophically

challenged. Theists suspect that it is the last recourse of minds constitutionally incapable of accepting the idea of a creator – which seems to the theists immensely simpler and more satisfying. However, they must concede that a creator is not a scientific concept either!

Theistic implications apart, most commentators regard the family of anthropic principles as modern versions of the classical and medieval arguments from design (Manson 2003). It is questionable, however, whether this is a proper perspective on the WAP: no true design argument consists in pointing out the inevitable. By contrast, the SAP, as interpreted here and in Barrow & Tipler (1986) and Davies (2006), is clearly in the category, and a case can be made for considering the PAP as in it too. The multiverse concept offers a determinedly contrary view.

One final point: The physical and chemical considerations adduced in this field of theorizing combine to make a very strong case indeed for concluding that the universe we inhabit is predisposed to harbor *life*. But life is not consciousness: to move from one to the other is to make a metaphysical leap whose magnitude can scarcely be exaggerated. Yet every proposed anthropic principle refers to observers and so implies consciousness. This point was doubtless, not lost on Brandon Carter, though he did not expressly acknowledge it; it should not be lost on us.

Cross-References

- ▶ [Cosmology](#)
- ▶ [Evolutionary Theology](#)
- ▶ [Intelligent Design](#)

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Anthropological Behavioral Ecology

- ▶ [Biological Anthropology and Human Ethology](#)

Anthropological Genetics

- ▶ [Biological Anthropology and Human Ethology](#)

Anthropology

- ▶ [Biology of Religion](#)
- ▶ [Ecclesiology](#)
- ▶ [Ethnology](#)
- ▶ [Magic](#)

Anthropology and Biology

- ▶ [Biological Anthropology and Human Ethology](#)

Anthropology and Darwin

- ▶ [Biological Anthropology and Human Ethology](#)

Anthropology and Evolution

- ▶ [Biological Anthropology and Human Ethology](#)

Anthropology in Hinduism

- ▶ [Hinduist Anthropology](#)

Anthropology in Islam

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Related Terms

[Anthropology in the Muslim world](#)

Muslim/Islamic anthropology is not a fully developed social science discipline/subdiscipline in either Muslim or non-Muslim academic contexts. Articulated and advocated for in varying ways, by a range of authors, including Said Mohamed Mauroof (1981), Akbar S. Ahmed (1986), and Merryl Wyn Davies (1988), Muslim/Islamic anthropology remains at the level of a proposition. Common to such proposals are critiques of the epistemological assumptions, prejudices, and sociopolitical agendas that underlie Western (Euro-American) social science knowledge production in general and anthropological knowledge production in particular; use of concepts and ideas from the Qur'an, other foundational texts, and the works of classical Islamic scholars to construct an Islamic study of man; and appeals to Muslim scholars to advance an Islamic worldview and ethos through their investigations of human social and cultural life.

This entry surveys the proposals for Muslim/Islamic anthropology by the above-mentioned authors and some criticisms put forward about their ideas from scholars working in the discipline of Western anthropology.

Said Mohamed Mauroof's, "Elements for an Islamic Anthropology," is part of a volume on *Social and Natural Sciences: The Islamic Perspective*. Mauroof's main concern is with importing (wholesale) Euro-American anthropology and its accompanying assumptions and epistemological frameworks into institutions of higher education institutions in Muslim contexts (1:117ff). He argues that Euro-American anthropology has an epistemology, intellectual history,

goals, and values that are rooted in Western ideological systems that are influenced by Christianity. Islam has different sources, orientations, and approaches. For example, Mauroof states that "the World of Islam has known no parallel to the intense *religion vs. science* debates so characteristic of Euro-America" (1:136). He proposes that Muslims develop Islamic anthropology on the basis of Islamic sources such as the Qur'an and *hadith*, as well as the curricula, methods, and scholars of Islam's classical scholastic tradition. The Qur'an is primary for anthropology because it contains a theory of human history and "a conception of humankind" (1:123). In Mauroof view, the Qur'an also addresses issues of human diversity and the "nature of groups" and engages in a discussion about "natural bonds of mutual obligation" (1:123). It also contains appropriate theoretical and axiological categories for anthropological reflection. Most importantly, the Qur'an calls upon mankind to undertake "a scientific approach to the study of history" (1: 123). Thus, for Mauroof, there is no conflict between the God's Word and the social scientific study of man. In this regard, his views echo those of Isma'il R. Al-Faruqi, the coeditor and a contributor to the volume, who proposes that an Islamization of the social sciences would engender a "discovery and understanding of the divine pattern in human affairs," as God articulates in the Qur'an (1:16–18). For Mauroof, the scholarly efforts of classical Muslim scholars such as Ibn Khaldun (1332–1406), al-Biruni (973–1048), and Ibn Battuta (1304–1368/9) exemplify the best efforts Muslims have made in terms of the study of man. While not anthropologists proper, the texts of these classical scholars contain "proto-anthropological" strands. Indeed, for Mauroof, the "descriptive, analytic or comparative investigation of man" was part of the Islamic classical curriculum and should be considered part of contemporary teaching and learning. Mauroof also suggests that Islamic anthropology extends beyond social and cultural issues to biological anthropology and archaeology. His interpretation of the Qur'an's statements about history and human life are used to support these views. In sum, for Mauroof, it is

the introspective examination and use of this range of Islamic sources that can produce an anthropology that is distinctively Islamic in form, content, and intention.

Akbar S. Ahmed develops his fullest conception of Islamic anthropology in *Toward Islamic Anthropology: Definition, Dogma and Directions* (1986), a work written as part of “Islamization of Knowledge” series directed by Isma’il R. Al-Faruqi. From the outset, Ahmed states that his proposal “defends a metaphysical position, advances an ideological argument and serves a moral cause,” namely, Islam (2:13). Nonetheless, he argues, there is merit in developing Islamic anthropology in so far as it can seriously challenge the presuppositions and conclusions about Islam and Muslim societies that continue to be articulated by Western anthropologists and conduct studies that ultimately “illuminate God’s plan/path for humankind” (2:57–58). Thus, like Mauroof, Ahmed, who frequently refers in his essay to the sociologist Ali Shariati (1933–1977), stresses that in Islam, religious beliefs do not conflict with an anthropological study of Islam. Ahmed’s main concerns are with the prejudices and ignorance about Islam and Muslims that have proliferated in Western anthropology since its inception. Among these misunderstandings is the idea that there are “many Islams,” a view forwarded by A. H. El Zein (1977), a Muslim anthropologist working from within the Western anthropological tradition. In this regard, Ahmed categorically states that “there can only be one Islam” and therefore “we must attempt to place the multitude of Muslim societies within the framework of one universal Islam” (2:58). Ahmed argues that contemporary social anthropology is a branch of empirical, observational science focused on the study of man that developed in the nineteenth century as part of the European colonial project: “anthropology is, if not a child, a creation of the West and more specifically Western imperialism” (2:56). Its flaws lie in the ethnocentrism, orientalism, arrogance, and hostility toward the “other” of some of its practitioners. By contrast, Ahmed defines Islamic anthropology as “the study of Muslim groups by scholars

(Muslims and non-Muslims) committed to the universalistic principles of Islam – humanity, knowledge, tolerance – relating to macro village tribal studies in particular to the larger historical and ideological frames of Islam” (2:56). Such a project can serve to dispel some of the myths generated about Islam and Muslims and provide Muslims a way to examine their own history and societies. Thus, among the projects Ahmed proposes are a sociological account of the life the Prophet Muhammad and studies comparing “major social categories (e.g., peasants, tribes and cities) which would help us better understand and reach conclusions regarding Muslim society and its immediate contemporary problems” (2:66).

Merryl Wyn Davies’s book-length monograph *Knowing One Another, Shaping an Islamic Anthropology* (1988) defines Islamic anthropology as “the study of mankind in society from the premises and according to the conceptual orientations of Islam” (3:82) and “a social science, concerned with studying mankind in its social communal relations in the diversity of social and cultural settings that exist around the world today and have existed in past. The focus of its attention is human action, its diversity of form and institutionalization; it seeks to understand the principles that order, organize and give it meaning” (3:113). Like Mauroof and Ahmed, Wyn Davies locates the building blocks of Islamic anthropology in the Qur’an. But she goes much further in elaborating upon a number of Qur’anic concepts such as *nafs* (soul, the agentive force that binds and permeates humanity), *khilafa* (man’s role as vice-regent of the earth), and *tawhid* (unity of Being). She draws upon these concepts in a systematic manner to develop a rationale and impetus for her endeavor and a conceptual framework for her inquiry. For Wyn Davies, it is essentially the idea of “God’s purposeful ordered creation” through which one can undertake Islamic anthropology (3:86). That is, since all of creation, including mankind, is compelled to know God through His creation, the holistic study of humanity within creation is also an imperative. Wyn Davies elaborates upon the appropriate subjects of study for Islamic

anthropology. Chief among these is *umma*, “a range of units of community formation” that can refer to “a people, a society, a nation, a tribe, a culture, or a multi-social, multi-cultural community” (3:128). Wyn Davies goes further adding that implicit in the conception of *umma* is the “idea of diversity of communities” (3:128). Hence, to “know one another,” a Qur’anic imperative, is the logical outcome of an anthropological investigation, particularly in the context of undertaking ethnographic fieldwork, and provides further evidence of the Qur’anic basis for the study of humanity. Ultimately, Wyn Davies calls for Islamic anthropology to be renamed ‘*ilm al-‘umran*, the total science of social organization/civilization/culture elaborated upon by Ibn Khaldun. Here, the use of ‘*ilm* “firmly establishes the conceptual foundations as those of Islam, and therefore conditions the mind set of the Muslim scholar undertaking this branch of knowledge” (3:161).

These propositions have drawn a series of criticisms from anthropologists working on anthropology of Islam/Muslims, an emerging field in Western (Euro-American) anthropology. Scholars such as Richard Tapper (1995), Daniel Martin Varisco (2004), and Gabriele Marranci (2008) have argued, in different ways, that proposals advocating for Muslim/Islamic anthropology are not “scientifically objective” and are “theologically deterministic” (7:48). They question the extent to which such proposals can accommodate diverse expressions of Islam and plurality of readings of the Qur’an that are made by Muslims themselves; for example, they ask who decides which concepts and Islamic ideals are to be adopted into this science? To this, one could add that the proposals do not make clear the hermeneutics used to read and interpret the Qur’an, processes that are elaborated on at length in the classical Islamic tradition. Such proposals also have little new to offer anthropology and social science and simply replicate Western anthropological methods and theoretical concepts, often under the guise of an Islamic/Arabic/Qur’anic vocabulary (5:190).

While a number of these criticisms remain unanswered, it may be worthwhile noting that

scholars working in the anthropology of Islam/Muslims have presented critical examinations of knowledge production about Islam and Muslims in anthropology, as well as methodological propositions that aim to examine the epistemological frameworks from within which Muslim social actors express themselves (5, 6, 8, 9, 10). These studies are taking place at a time when Western anthropologists are exploring the possibilities afforded by the notion of “world anthropologies,” examining the whole arena of science and responding to the increasing presence of Islam and Muslim societies on the world stage (Hirji 2010). There may be the potential in these trends to renew a dialogue about Muslim/Islamic anthropology.

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Anthropology in the Muslim World

► Anthropology in Islam

Anthropomorphism

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Related Terms

Personification

Anthropomorphism may be defined as the interpretation of nonhuman things and events in terms of human characteristics. For example, we may perceive a stuck drawer as stubborn, think that a plague is a message, or see an upright garbage bag as a person. The term stems from the Greek *anthropos* (“human”) and *morphe* (“form”). Originally it meant understanding gods in terms of human physical or mental features, but by the 1800s it also meant a broader phenomenon that occurs not only in religion but also throughout secular thought and action. It is common in daily life, in the arts, and even in the sciences. Much of it is unconscious.

Following Francis Bacon (1561–1626), who noted that purposes and goals characterize humans but not nature in general, most commentators have said that anthropomorphism obstructs better understandings of the world. Nonetheless, it is persistent and indeed universal.

Humans everywhere have, for example, understood deities as humanlike, with such qualities as anger, vanity, and affection, and often with humanlike physical form as well (Harvey 1995). Even deities that look like animals or, that are invisible, are conceived as understanding prayer, offerings, and other human communications. Writers have noted such anthropomorphism in religion at least since the time of Xenophanes (c. 560 to c. 478 B.C.E.), who criticized conceptions of

humanlike gods. Theologians have sought to reduce religious anthropomorphism, but most say that we cannot eliminate it without eliminating religion, because we cannot relate to deities totally unlike ourselves. Deities must have humanlike language and symbolic behavior, for example, or we could not interact with them. Indeed, a classic theory of religion holds that religion itself is best understood as anthropomorphism (Guthrie 1993; Harvey 1995; Hume 1957).

As noted, anthropomorphism is not restricted to religion, but pervades secular thought and action as well, so that human features seem to appear throughout nature and even among artifacts (Anthropomorphism.org 2008; Caporael and Hayes 1997; Epley et al. 2007; Guthrie 1993, 1997, 2007). Stars, storms, oceans, mountains, the Sun and Moon, and the Earth itself are seen as alive and active. Similarly, humans everywhere have seen implements (swords and spears in antiquity, for example, and cars and computers at present) as volitional. In literature and graphic art, such depiction is often called personification, especially when the subject is an abstraction (such as Death or Liberty).

Anthropomorphism is common in science also, though often criticized there. For example, Isaac Newton (1642–1727) used love and hate, or attraction and repulsion, in his physics. Astronomers at first thought pulsar radio waves were messages. Neurologists speak of brain cells “talking” with each other; and Charles Darwin (1809–1882) said that Nature sought constantly to improve her creatures. (That some of these claims may be called metaphorical makes no difference, since metaphor is basic to all domains of human thought, including science.)

Nonetheless, most scientists see anthropomorphism as subverting good science, and they strive to avoid it. In the history of science, anthropomorphism has therefore diminished steadily and significantly. In religion, in contrast, anthropomorphism apparently cannot be eliminated and arguably is central. Thus, the different degree of

anthropomorphism found in science and in religion appears as a major dimension of contrast between the two.

If, as most scientists hold, anthropomorphism is a mistake, why is it so common? Established explanations are of two kinds, which may be called the familiarity and the comfort theories (Guthrie 1993). The familiarity theory, advanced by the philosopher David Hume (1711–1776) and others, is that our motives are intellectual: We wish to understand the world, which otherwise is uncertain and mysterious, and we do so by using the model most familiar to us, that of ourselves (Hume 1957). This theory is useful, but fails to show why humans also anthropomorphize things and events that are themselves familiar, such as the behavior of cars and computers, or why we see faces in accidental patterns such as those of clouds.

The second theory, held by Sigmund Freud (1856–1939) and others, is that our motive is emotional: to make the world less threatening. This theory is useful as well, but does not explain why we posit humanlike yet frightening features in the world, as when we mistake the night-time sound of a door closed by the wind for the sound of a burglar.

A third explanation, more recent and more general, agrees with Hume that we live in a chronically uncertain world that we need to interpret. This newer view differs, however, on the reason why we use humanlike models to do so. It is not because they are familiar or reassuring, but because they represent the most important possibility. If an actual human, a human message, or a human trace is present, we need to know it, since humans are uniquely powerful and important.

However, because our perceptual worlds are always uncertain and because humans may operate from behind the scenes, we can never be sure that they are not present. As the psychologist and historian of art Ernst Gombrich (1909–2001) notes, perception is interpretation and hence a bet. According to the third theory, those bets that may give the most information are the most valuable, and these usually involve humans. Therefore, we are unconsciously

disposed to see and hear the world in terms of human qualities.

Indeed, our evolved perceptual strategy is much like that of Pascal's Wager: better safe than sorry. When in doubt about what an event or something is, we tend to assume that it is human. If we are right, we are rewarded by being prepared, and if wrong, we lose little.

Analogy and metaphor, among other forms of abstraction and pattern recognition, underlie much of human thought and action. Through them, we often see humanlike qualities even where we see neither actual humans nor actual traces, as when we see "design" in organisms or see epidemics as punishments. Nevertheless, the interpretive impulse leading to anthropomorphism is not to make the world humanlike. Instead, it is to find whatever humans, or their messages or traces, actually are present. In a world of perceptual uncertainty, we inevitably overestimate these.

Our better-safe-than-sorry strategic response to uncertainty and our resulting anthropomorphism appear deeply rooted in our neurology (Anthropomorphism.org 2008; Farah and Heberlein 2007) and, in turn, in evolution. Hence it is unsurprising that our perceptual strategy is not unique to humans but appears also in other animals which, like us, seem on a hair trigger to perceive more animacy in the world than actually exists (Guthrie 2002; Foster and Kokko 2008).

Under any of the three theories discussed, when we first see something (e.g., a shadow in an alley) as human or humanlike but later see it as something nonhuman, we may call our earlier interpretation anthropomorphism. And under any of the three, anthropomorphism may be described as a category of interpretations retrospectively seen as mistaken.

Cross-References

- [Biology of Religion](#)
- [Cognitive Psychology](#)
- [Cognitive Science of Religion](#)

- Perception
- Psychology of Religion
- Religion, Theory of

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(Epistemological) Antirealism

- Constructivism (Philosophy of Mind)

Aphesis

- Transfusion Medicine

Apocalypticism

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A social system reflective of or emergent from apocalyptic texts, such as the biblical books of Daniel and Revelation. It is characterized by four chief features: (1) a dualistic view of the world in which good and evil contest against one another, (2) an experience of alienation caused by the present circumstances in which evil is apparently ascendant, (3) the expectation that a transcendent guarantor (usually a god) will soon rectify the alienating circumstances by creating a new and glorious world, and (4) the belief that humankind will take on glorious new bodies with which to occupy the transcendent new world. Apocalyptic beliefs have influenced science at least since the medieval period, where they encouraged European thinkers to develop technologies that could be used in war with the Antichrist. In the twentieth century, apocalyptic expectations have been relevant to a wide array of technological fields, including robotics and artificial intelligence.

Apodosis

- Eschatology

Apophatic and Cataphatic

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Apophatic theology or *negative theology* concerns the possibility and non-possibility of achieving knowledge of the divine. Apophatic

theology claims an absolute difference between the human being and the divine. This difference makes the human being incapable to employ either her natural faculties or her senses in her effort to achieving knowledge of the divine. In virtue of realizing this non-possibility, she has to enter into a dimension of non-conceptuality through which she understands the discrepancy between herself and the divine. She enters “the cloud of unknowing.” Hereby she gains the wisdom that the divine is beyond comprehension and is to be perceived by renouncing her natural faculties. The divine is commonly described as “hidden” and “secret,” and the human being perceives the divine through a mental darkness. Apophatic theology employs the idea of a qualitative difference, a difference in kind, between the human being and the divine.

Cataphatic theology or *positive theology* claims a similarity between the human being and the divine, which makes it possible to achieve knowledge of the divine. The knowledge is gained through using the natural faculties such as the five senses and reason. By using an analogical thinking, that is, making a comparison between the human being and the divine, it is possible to achieve a partial understanding and knowledge of the divine. Cataphatic theology employs the idea of a quantitative difference, a difference in degree, between the human being and the divine.

Apostolic Churches

► [Pentecostalism](#)

Application Security

► [Information Security](#)

Applied Logic

► [Logic, Informal](#)

Applied Mathematics (Mathematical Physics, Discrete Mathematics, Operations Research)

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Related Terms

[Mathematics and empirical sciences](#)

Description

Applied Mathematics is a discipline of Mathematics which deals with the application of Mathematics to understand and to solve the problems which appear in the investigation of the Physical World (Science, Technology, and Engineering) and Human Enterprise (Sociology, Business, and Commerce). This discipline also includes the studies and developments of the mathematical areas useful in the past to solve real world problems or promising for present problems.

Historically, Applied Mathematics has been largely reduced to ordinary and partial differential equations, continuous mechanics, numerical methods, and the calculus of variations. The numerical methods combined with the computers allow finding approximate solutions for explicit mathematical problems given, for instance, in terms of differential and/or variational equations when the analytic solutions are not available or cannot be obtained. Initially, the significant part of Applied Mathematics relied on the problems arising from physics and with the broad range from classical to quantum systems. On the other hand, Applied Mathematics has grown to include a large variety of areas or subdisciplines which take into account, for instance, the contributions of the algebra to particle physics as well as to the study of the genome. We will consider three of such subdisciplines: Mathematical Physics, Discrete Mathematics, and Operations Research.

In each case, we have to consider four cornerstones as the ground support of the Applied Mathematics:

- *Data* obtained from the observation and experimentation. They are the primary reference in the study of any problem. The Data Mining is a correlated area with a strong identity in its own.
- *Algorithms* which are used to analyze data and models. In many cases, we only have the data while in others we have data and equations. When we have equations, there is a good instrument of reference to study and to combine with the data. At the same time, we have to develop numerical methods to approximate the solutions of such equations.
- *Theories and Models* include the theories of Pure Mathematics and they are used to analyze the data and the ideas. The Applied Mathematics provides a basic ground test for ideas in which the strength of competing theories can be measured.
- *Computers* as instruments to implement the algorithms and carry out large and massive computations, which allow exploring the solutions of the models in unthinkable and unexpected regions.

Mathematical Physics

The objective of the Mathematical Physics is the application of the mathematics to problems in physics and the development of mathematical methods appropriate for such applications and for the formulation of the physical theories.

The theory of differential equations is perhaps the most closely associated with Mathematical Physics. This theory is related to many applications as celestial mechanics, acoustics, elasticity theory, thermodynamics, electromagnetism, hydrodynamics, and aerodynamics. On the other hand, the development of the linear algebra, the spectral theory of operators, and the functional analysis are the mathematical basis of the quantum mechanics and the theory of the atomic spectra. The group theory also played an important role in quantum field theory as well as in differential geometry, which turns out to be relevant for special and general theories of relativity. In the

mathematical description of cosmological and quantum field theory phenomena, the topology is playing an important role. Other separate field of the mathematical physics is the statistical mechanics, which is closely related to the mathematical ergodic theory and some parts of the probability theory.

Sometimes the Mathematical physics denotes the research addressed to study and to solve problems motivated by physics within a mathematically rigorous framework. In this sense, the Mathematical Physics covers a very broad area of topics with the common feature that they combine pure mathematics and physics. Related to the Mathematical Physics we have the Theoretical Physics which emphasizes the links to observations and experimental physics and which requires using heuristic, intuitive, and approximate arguments. We can say that rigorous mathematical physics is closer to mathematics and theoretical physics is closer to physics.

The field of Mathematical Physics is basically concentrated in four main areas:

- Quantum Field Theory devoted to precise construction of models
- Statistical Mechanics especially concentrated in the theory of phase transitions
- Nonrelativistic Quantum Mechanics including the connections to atomic and molecular physics
- Quantum Information Theory

Discrete Mathematics

The Discrete Mathematics is the branch of Mathematics that studies the mathematical structures that are fundamentally discrete rather than continuous. The discrete objects can often be enumerated by integers. In a formal framework, the Discrete Mathematics deals with countable sets, which have the same cardinality as subsets of the natural numbers. In this context, the set of objects studied in discrete mathematics can be finite or infinite. The term Finite Mathematics is sometimes applied to the parts of the field of discrete mathematics that deals with finite sets. The Discrete Mathematics excludes the Calculus and Analysis of the continuous mathematics

which is the branch of the mathematics dealing with objects that can vary smoothly. On the other hand, the analytic methods from continuous mathematics are often employed as well in Discrete Mathematics. This is the case of Discrete Calculus and Discrete Analysis, which cover the discrete version of concepts in continuous mathematics as the examples of difference equations, discrete Fourier transforms, and discrete probability distributions.

The development of the computer increased the research in Discrete Mathematics. The computers operate in discrete steps and store data in discrete bits. The concepts and notations from Discrete Mathematics are useful in the study and description of objects and problems in different branches of computer science, for instance, programming languages, software development, algorithms, and cryptography. Reciprocally, due to the computer we can apply ideas from Discrete Mathematics to real world problems as in Operations Research.

The history of Discrete Mathematics is involved with grand challenging problems. In Graph Theory, much research was originated to prove the famous *Four Color Theorem: All maps could be colored with only four colors*. This was stated in 1852 and proved by Kenneth Appel and Wolfgang Haken in 1976, by using substantial computer assistance.

In Logic, the second and tenth problems of David Hilbert's list of open problems presented in 1900. The second problem was to prove that the axioms of arithmetic are consistent. In 1931, Gödel showed that this was not possible, at least not with arithmetic itself. Concerning the tenth problem, it was proved in 1970 by Yuri Matiyasevich that we cannot determine whether a given polynomial Diophantine equation with integer coefficients has an integer solution.

World War II was the driving force for the advances in cryptography and theoretical computer science. The Computational Geometry is a basic component of the computer graphics incorporated into modern video games and computer-aided design tools. Other fields of Discrete Mathematics are very relevant to solve challenging problems in Bioinformatics

associated to understand the tree of life. This is the case of Combinatory and Graph theory.

We can summarize some of the relevant topics in Discrete Mathematics:

- Information theory
- Mathematical logic
- Set theory
- Combinatory: Discrete probability theory
- Graph theory
- Number theory
- Abstract algebra
- Discrete and computational geometry
- Discretization: Finite differences

There is special relevance of the Discretization which concerns the process of approximating continuous models and equations by discrete systems. The difference equations are similar to differential equations, since they replace the differentiation by incremental differences. That allows approximating the solutions of equations where the analytical methods cannot be applied. In this approach, we have different important issues as the relation between the discrete and the continuous solutions. It is high desirable that the discrete approach preserve the main features of the underlying continuous system, otherwise the numerical solution could not have nothing to do with the continuous solution.

Operations Research

The Operations Research is a discipline that studies the application of advanced analytical methods to help to make the better scenario for the decisions. This provides techniques for solving practical problems in business and other fields such the allocation of resources to maximize profit or the schedule project activities to minimize the risk. These techniques include areas of optimization as the linear programming, the queuing and scheduling theories, as well as the network theory. On the other hand, the Operations Research also includes continuous topics such as continuous-time Markov process, continuous-time martingales, and continuous and hybrid control theory.

Historically, and as a formal discipline, the Operations Research originated during World War II as a consequence to define strategies

to reduce the ships and airplanes losses in the different kind of actions. After the war, the operational research has expanded to be applied in business, industry, and society. It was extended to analyze equipment procurement, training, logistics, and infrastructure. Some of the addressed relevant problems are the following:

- **Network Organization:** For instance, optimize the network telecommunications in order to guarantee the quality of the service
- **Routing:** To determine the routes of transportation in order to minimize the costs and the time of transportation
- **Project Planning:** To identify the processes that affect the overall duration of the project
- **Allocation and Assignment:** To find the appropriate distribution of tasks, problems, and resources in order to optimize the project

The business use of the Operations Research was defined by Stafford Beer in 1967 as the Management Science which becomes an interdisciplinary branch of applied mathematics. It is devoted to optimal decision planning with strong links with economics, business, and engineering. The Management Sciences help businesses to carry out their goals by using the scientific methods of operational research.

Self-Identification

Science

Applied Mathematics is deeply related to the observation and experiment because the main objective is to quantify and solve, through the modeling, the problems which arise in the study of the physical world and the human enterprise. In this context, the studies of Applied Mathematics allow to make predictions about other regions of the involved parameters where either we do not have complete information and/or experimental data. That shows the relevance of the experiments. Moreover, the beauty of the Mathematical power lies in the possibility to connect different kinds of problems through the similar mathematical structures used to study them.

Religion

The oldest records about mathematics show it appears as the answer to practical problems in agriculture, astronomy, business, and industry. Such evidences are found in Egypt, Mesopotamia, India, and China. Later on, the Greek contributions introduced a deep change in the nature and approach to mathematics. Initially, the knowledge of the mathematical developments was associated to the religious environment of the temples. For instance, in old Greece some groups devoted to the study of different areas as Algebra, Analysis, and Geometry were tied to certain rules of life, which could be understood as practitioners of a religion.

The Applied Mathematics covers the development of new mathematical scenarios and instruments that can be applied to understand practical problems as well as the application of such techniques. We can say that the Applied Mathematics cannot be considered as a religion but as an approach to understand the reality, which is also an objective of the religion. A better approach to describe the reality implies better knowledge and more possibilities to interact with it.

Characteristics

The Applied Mathematics is transdisciplinary in the sense that the same approach of modeling and simulation can be applied to problems with very different experimental context in the Physical World and the Human Enterprise. On the other hand, the Applied Mathematics represents an interface between the world of the problems to be solved and the world of the computers that have to be used when the nature of the associated simulations and computations are very large and complex.

Relevance to Science and Religion

The Science and Religion are two fundamental dimensions of the human being related to the activity of the human brain. On the other hand, the Applied Mathematics as a part of the Science

activity has a great impact in technology for modeling and simulation. There is a large range and variety of applications of mathematics in industry and government, by involving fields as communication and optimization theories, design, medical diagnosis, development of financial products, as well as network management and weather prediction.

Sources of Authority

The authority relies on different sources as the publication of the results in peer-reviewed papers; and the nature of the solved problems of the physical world and human enterprise. Historically, the authority of the Applied Mathematics is the same of the Mathematics in general: the mathematicians from Egypt and Mesopotamia to our days.

Ethical Principles

The ethical principles are basically the disclosure of the designed mathematical methods and numerical algorithms such that they can be repeated and confirmed.

Key Values

The Mathematics and, in particular, the Applied Mathematics is a basic tool to educate the mind to design the mathematical and algorithmic strategy to approach the solutions of problems where the solution is unknown. To compare the solutions obtained with different strategies is fundamental to ensure the reliability of the solution. On the other hand, such strategies have to reproduce the available qualitative and quantitative knowledge of the system.

Conceptualization

Nature/World

The Nature is the Energy and Matter with their Physical and Biological manifestations that the Applied Mathematics tries to understand. The

World is the Nature plus the Human Enterprise through the Science, Technology, Engineering, Business and Commerce.

Human Being

The Mathematics and, in particular, the Applied Mathematics is a creation of the human being who starts to construct it as a response to practical needs in agriculture, business and industry.

Life and Death

The life in Applied Mathematics is associated to the possibility of exercise the singular capacities of the human brain activity. When such possibility is not anymore possible we have the death from the mathematical point of view.

Reality

The Reality is the Physical and Biological together with the Human Enterprise and the World of the abstract structures created by the human brain.

Knowledge

The knowledge associated to the Applied Mathematics is the wide range of studies with significant application in the empirical sciences.

Truth

The Applied Mathematics models are an approximation to the Reality under the context of the Mathematical Logic and Set Theory, which are in the foundations of Mathematics.

Perception

The perception of the Reality is associated to the model context. An important feature is that the models offer the possibility to enlarge the panoramic view of the studied problem and to find possible unexpected connections with other problems.

Time

The time is the fourth dimension of the Reality and plays a key role in the modeling of the phenomena that evolves in time. The time scales are fundamental to understand the dynamics of many systems. Precisely, the competition among the different scales of time and/or space is on the basis of the chaotic behaviors.

Consciousness

The consciousness is associated to a high mental state that in the framework of the panoramic view provided by Applied Mathematics could correspond to the whole possible set of relations with other areas associated to the studied problem.

Rationality/Reason

The rationality is the basic capability of the human brain to clarify the foundations of Mathematics, and the Applied Mathematics, through the Mathematical Logic and the Set Theory. Applied Mathematics is one way to translate our perceptions into rational and reasonable premises.

Mystery

The mystery is associated to the lack of knowledge and appropriated mathematical instruments to study a given problem. Any time we make a progress to model and understand a problem, we increase our knowledge in the broad sense. Sometimes the kind of mystery associated to certain codes or algorithms is related to the cost of their development and his restricted use. The fact of the existence of Mathematics confirms that there is a mystery we need to quantify and to explore. Maybe we can say that if Religion is "The Question," Mathematics (Science) is "The Answer."

Relevant Themes

The Applied Mathematics is understood as the use of Mathematics to solve and quantify the problems which arise in the investigation of the physical world and human enterprise. In this context, the Applied Mathematics has grown to include other issues associated to other areas as biomathematics, cryptography, economics, scientific computation, social networks, and finances among others. These areas increase every day the impact in our lives.

Cross-References

- Complex Systems
- Graph Theory
- Mathematics, Early

- Mathematics, Modern
- Model Theory
- Operations Research in Applied Mathematics
- Philosophy of Science
- Simulation Theory
- Space and Time

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Apraxias

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Related Terms

Inactivity

Apraxias are deficits of higher motor behavior that are not primarily caused by elementary deficits of the sensorimotor system such as paresis, ataxia, dyskinesia, or hypoesthesia. Nor do they represent impairment of language understanding or recognition of objects or dementia. Instead, the patients present with deficits of imitating meaningful or meaningless gestures, purposeful use of objects, or dexterity. The term apraxia (Greek: inactivity) was coined by Heymann Steinthal to describe failures in the performance of purposeful actions and the incorrect use of objects by patients with aphasia (Steinthal 1871, 1881). The different forms of apraxia originate from lesions of different levels/structures of the motor system, reflecting its complexity. Apraxias are caused by deficits in motor programs generated in the frontal motor areas (executive apraxias, e.g., limb-kinetic apraxia), in the modality-specific higher sensorimotor control (unimodal apraxias, e.g., tactile apraxia, optic apraxia), or at the highest level of motor planning and motor conception (polymodal apraxias, i.e., ideomotor and ideational apraxias). Polymodal apraxias typically result from left hemisphere lesions and are therefore often, but not necessarily, observed in combination with aphasia.

Historically, most influential were the definitions of complex forms of apraxia: the ideatory and ideomotor apraxia syndromes as defined by Liepmann (1920). They are caused by lesions of the language dominant hemisphere, though their manifestation is bilateral (i.e., contra- as well as ipsilateral). In rare cases, with a lesion of the callosal fibers, a unilateral form of ideomotor apraxia in the extremities ipsilateral to the language dominant hemisphere can be observed. In those forms of apraxia as defined by Liepmann, the disturbance of execution of complex movements results either from incorrect action planning (ideational apraxia) or from the incorrect conversion of correct planning into correct performance of actions or action sequences (ideomotor apraxia). Thereby, two main components of action planning and execution can be distinguished: (1) an action concept system, containing knowledge of the tool use and of the basic mechanical constraints (damage leads to ideatory

apraxia) and (2) an action production system, with information about the motor programs and their conversion into learned movement patterns (damage leads to ideomotor apraxia) (Roy and Hall 1992). Liepmann (1920) also differentiated a third component, this of the “kinetic memory” of the “sensomotorium” in which overlearned movement patterns are stored and whose damage leads to an isolated limb-kinetic apraxia of the opposite hand. Traditionally, the investigations of patients with such complex forms of apraxia concentrated on disturbances of the three most important domains of action performance: imitation of meaningless gestures, performance of meaningful gestures on verbal command (pantomime), and the use of tools and objects. Interestingly, isolated deficits can be observed in all three domains, and these deficits can dissociate from each other. In Liepmann’s terminology, deficits of imitation of meaningless gestures and in pantomime are characteristic for ideomotor apraxia, and object use is typically deficient in ideatory apraxia. Since the expression of deficits in the three domains can vary among patients with apraxia and the borders between the ideomotor and ideatory apraxia are blurred, in the modern apraxia research, there is a strong tendency to use the term limb apraxia for complex apractic disturbances within the three domains (imitation, observation, and object use). Although in the light of the modern research, the Liepmann model cannot longer be regarded as valid, it has had a strong influence on the development of apraxia research. The terms ideomotor and ideatory apraxia are still widely used in the clinical practice.

In clinical examination, apraxia can be found quite often in patients with stroke. According to De Renzi (1989), apractic disorders can be found in dependence of the applied testing in 30–50 % of left brain damaged patients and in 2–9 % of right brain damaged patients. Aphasia (a disorder of language perception and production) and apraxia may often occur simultaneously, but their grades of severity do not correlate. Some studies could demonstrate a (double) dissociation of impairments in language functions and practice, which suggests that the neural organization

of these two functions is organized in at least, in part, structurally different networks. The natural history of apraxia is quite heterogeneous – of those patients who were apractic in the first week post onset of infarction, approximately half were still apractic after 3 months and remained apractic in about 20 % of cases (Basso et al. 1987; Kertesz and Ferro 1984). The different types of apraxia differentially affect the activities of daily living and hence show marked differences in the prognosis of recovery and the need of physiotherapeutic treatment.

With reference to the work of De Renzi (De Renzi and Luchelli 1988) and Goldenberg (e.g., Goldenberg 1996, 2006), the following modern classification of apraxias can be proposed:

- Executive Apraxias

The executive apraxias are characterized by deficits in the execution of complex movement components. Representative forms are the limb-kinetic apraxia and the speech apraxia. They are the consequence of the disturbed “premotor” functions of the caudal frontal lobe which is acting as a store and a processor of complex actions. Lesion-induced interruptions of the parieto-premotor information flow often play an important causal role.

- Limb-Kinetic Apraxia

The limb-kinetic (also innervation or melokinetic) apraxia manifests itself as the inability to accomplish finely coordinated and precise hand movements (Kleist 1911; Liepmann 1920). The higher the demand on finely tuned motor control, the more awkward is the movement execution. This syndrome is rarely diagnosed, mainly because the distinction from paresis resulting from a lesion of pyramidal system is difficult. There is also, as of yet, no standardized test for limb-kinetic apraxia. The characteristic clinical diagnostic features are awkwardness of arm and hand movements, disturbance of fine motor skills, dexterity, coordination of exploratory finger movements, writing and of the joint coordination, all that which is associated with preserved force production and individual finger movements.

Limb-kinetic apraxia results in the most cases from lesions of the premotor cortex and manifests itself contralaterally. It may also develop with basal ganglia diseases such as corticobasal degeneration or the Parkinson’s disease (Leiguarda and Marsden 2000).

Limb-kinetic apraxia is well accessible to physiotherapeutic measures, much better than many forms of paresis. The patients profit very well from intensive structural exercise.

- Speech Apraxia

In speech apraxia, the composition of articulatory movements to produce language sounds and words is disturbed. Patient’s speech seems weary; it is slow and disfigured by phonetic deviations. When speaking, the patients give the impression that they must consciously control their mouth movements, the coordination of the speech apparatus, and respiration.

The diagnosis of a speech apraxia is based on analysis of the linguistic utterances of the patient, particularly with missing symptoms of aphasia or dysarthria. Advanced planning of speech movements is disturbed and sounds are poorly coordinated. With speech apraxia, individual movements of the mouth can be accomplished with normal strength and speed, but they cannot be coordinated for fluent execution of speech.

Speech apraxia results most frequently from left frontal lesions, in or around the gyrus precentralis (parts of Broca’s area), and subcortical structures may also be affected.

Patients, who are moderately to heavily affected, should begin the therapy with the exercise of pronunciation and intonation of simple syllables. Performance of correct movements of the lips and the tongue might be helpful. Some patients may improve their articulation by rhythmic knocking or clapping. The exercise of pronunciation should be aligned to the natural speech rhythm in order to improve comprehension.

- Unimodal Apraxias

Unimodal apraxias are localized within one sensory system and manifest themselves predominantly on the contralateral side to the lesion. Typical representatives are the tactile

apraxia and the optical (visuomotor) apraxia (also optic ataxia).

– Tactile Apraxia

In tactile apraxia (Klein 1931), explorative finger movements are mainly affected with simultaneous absence of paresis or sensory deficits. The finger movements are uncoordinated and inadequate in relation to size and shape of objects to be explored (Binkofski et al. 2001). Typically, the intransitive (not object-related) and expressive movements such as gestures are well preserved. Tactile apraxia is often accompanied by the inability to recognize objects by tactile exploration, despite the well-preserved basic sensory and motor functions which is called astereognosia (Binkofski et al. 2001; Wernicke 1876). Tactile apraxia results typically from lesions of the contralateral superior parietal lobulus and/or the more anterior part of the intraparietal sulcus. If the caudal parts of the gyrus postcentralis are affected, accompanying disturbances of somatosensory qualities can occur. Since the disturbed handling of objects is the central failure in tactile apraxia and frequently a concomitant disturbance of the tactile object recognition is present, the patients are often significantly impaired in daily life (Delay 1935; Binkofski et al. 1999). In particularly severe cases, the hand can be useless, despite intact motor and sensory function. Dedicated intensive physiotherapeutic measures and learning of alternative strategies can provide good results.

– Optic Ataxia

In 1909, optic ataxia was first described by Balint (1909) as part of a broader visuoperceptive deficit. Optic ataxia is characterized by an inaccuracy when reaching for visually located objects. The terms visuomotor ataxia or optic apraxia are being used synonymously. The typical behavior of a patient with optic apraxia includes misreaching toward objects, in particular when the objects are not centrally fixated by the patient. In some patients, misreaching is present only in one arm but in both hemifields (hand effect), in others in both arms in the contralesional visual field (field effect). The most frequent deficit is present in the

contralesional arm and in the contralesional hemifield. Typically, the patients are capable of reaching toward their own body parts or toward objects, which are localized on the body surface. For the diagnostics of optic apraxia, goal-directed reaching should be examined with each arm and in both peripheral hemifields under simultaneous central fixation. In many studies regarding optic apraxia, lesions of the superior parietal lobulus were reported (Ratcliff and Davies-Jones 1972). Newer studies localize the critical lesion site within the parieto-occipital junction and the adjacent intraparietal sulcus (Karnath and Perenin, 2005). The most severely affected patients show misreaching also for centrally fixated objects. These rather rare cases are usually associated with larger or bilateral lesions. These patients have difficulties getting along in unusual environments. Patients with smaller and one-sided lesions are often mildly affected. If the optic apraxia is limited to the periphery of the visual field, compensatory strategies can be practiced, in which the patients first learn to turn their gaze to objects and then to reach for them under central fixation.

– Limb Apraxias

The execution of simple movement components is not affected in limb apraxias; the deficits of action execution depend rather on the context in which the motor action is implemented. An important feature of limb apraxia is that the disturbance of action execution manifests itself on both sides of the body (ipsi- and contralateral to the lesion). The disorder affects mechanisms of action conception which are operating on a hierarchically higher level than the purely contralateral action execution and sensorimotor control. Such apraxia can manifest itself both in the extremities and in the face, in the latter case it is called buccofacial apraxia. Up to 80 % of all aphasic patients have a buccofacial apraxia. Limb apraxia manifests itself in three domains of motor behavior: imitation of meaningless gestures, execution of meaningful gestures on verbal command, and use of tools and objects. Since each of them can vary in dependence of localization and lateralization of the lesion, Goldenberg is proposing their separate examination

(Goldenberg 2006). In everyday life, patients with lighter forms of limb apraxia are rather inconspicuous, their deficit is revealed predominantly in the experimental situation, mostly if they are requested to perform a pantomime of object use after verbal or visual presentation of the object. Whereas most errors occur during the pantomime of the object use, the patients show clearly less remarkable findings during the real use of objects. The impairment of object and tool use is a cardinal symptom of severe limb apraxia. Patients with this type of apraxia are severely impaired in their daily life. Limb apraxia is typically associated with lesions of the language dominant hemisphere. The imitation of simple and complex movements can be affected after lesions of the left frontal and parietal cortex, this deficit can be seen more frequently after lesions of the parietal cortex (De Renzi et al. 1983). Many patients with lesions of the left parietal lobe seem to have difficulties to execute and to analyze movements, which refer to their own body schema (Halsband et al. 2001). The lateralization of the deficiency in imitation of meaningless movements is specific for the body part: Left brain lesions affect imitation of hand and foot postures more than of finger postures. Right brain lesions do not have an influence on hand and only slight one on foot postures, but may cause marked deficits in imitation of finger postures (Goldenberg 1996). Within the left hemisphere, lesions of the lower parietal lobe (supramarginal gyrus) are particularly important. Also, deficits of pantomime of transitive (object-related) movements can be seen predominantly after left hemispheric lesions. Conversely, deficits in the pantomime of intransitive (not object-related) movements seem to be distributed over both hemispheres (Haaland and Flaherty 1984). Patients with right hemisphere lesions do not have problems with the pantomime of meaningful gestures. Patients with deficits in object use have usually large lesions, which include the temporoparietal region in the language dominant hemisphere (Goldenberg and Hagmann 1998). Patients with left hemispheric lesions have difficulties to select objects fitting to such movements, which were shown to them as

pantomime of the object use (Vaina et al. 1995). They have also difficulties with pantomime of object-associated movements (Goldenberg and Hagmann 1998; Goodglass and Kaplan 1963) or with the selection of objects, which are to serve the same purpose (Rumiati et al. 2001). The integrity of the left hemisphere is crucial for establishing association of tools with purpose, recipient, and action, and the inference of function from structure. Many patients with limb apraxia need significantly more assistance than non apractic patients (Sundet et al. 1988). The deficit of imitation can also have a negative influence on motor learning in physical and occupational therapy. The inability to express the meaning of objects or actions by gestures reduces the ability of patients with severe aphasia to compensate their language deficits by nonverbal communication (Borod et al. 1989). Therefore, “gesture training” can provide positive results. A clear reduction of faulty actions and patients’ need for assistance could be found only after the direct training, in which concrete ADLs were learned. On the other hand, the patients could not concretely use the new insights about the object use they have gained from the exploration training. Apparently, only those patients who practice on a regular basis can keep the level of improvement high (Goldenberg and Hagmann 1998), patients who stop practicing deteriorate. The therapeutic aims for patients with ideational apraxia should be strongly orientated toward the domestic environment and on the desires of the patients and their family members.

Cross-References

- ▶ [Action Control](#)
- ▶ [Cerebrovascular Diseases](#)
- ▶ [Clinical Psychology](#)
- ▶ [Cognitive Psychology](#)
- ▶ [Neuroimaging](#)
- ▶ [Neurology in Europe](#)
- ▶ [Neuropsychology](#)
- ▶ [Physiotherapy](#)
- ▶ [Recovery](#)

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Aptitude

► Intelligence

Arab Indigenous Psychology

► Islamic Religious Psychology

Arabian Medicine

► Medicine in Islam

Arabic Astronomy

► [Astronomy in Islam](#)

Arabic Philosophy

► [Philosophy in Islam](#)

Architecture

► [Architecture in Islam](#)

Architecture in Islam

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Related Terms

[Architecture](#); [Structure](#)

Description

The architecture of Islam covers a very wide chronological and geographic expanse. The birth of this architectural tradition dates back to the first half of the seventh century, almost 1,400 years ago. Geographically, it extends across an expanse that includes considerable areas in Asia, Africa, and Europe, covering the Near East – where Islam was born, in the Arabian Peninsula – and extending into areas as distant and diverse as Spain, North Africa, sub-Saharan Africa, East and South Europe, Central Asia, South Asia, and East Asia.

The study of the architecture of Islam gradually emerged as an academic field of inquiry over the past two centuries or so and has been

primarily formed in the West. One of the difficulties associated with attempting to understand the field has been the stubborn preoccupation with bringing this diverse chronological and geographic architectural production under the umbrella of one unifying category, that of “Islamic architecture.” This has begun to change, particularly over the past two decades, as the field has achieved higher levels of specialization as a result of various factors including its maturing age and also because an increasing number of institutions and scholars have become involved in the field and a substantial number of studies have been published on it. Still, the legacy of a unifying single category remains very strong and present, particularly among those not specialized in the field, including architects as well as architectural historians and critics.

In attempting to understand the architecture of Islam as a field on inquiry, a point of departure would be to present it within the context of three simple and basic, but interconnected, systems of categorization: chronological, geographic, and typological.

There are a number of manners through which one may present the chronological evolution of the architecture of Islam. What follows is only one of a number of possible scenarios. The birth of the architecture of Islam symbolically may be traced to the construction by the Prophet Muhammad of his house and mosque in Medina in 622, which is the year of the *Hijra*, or the Prophet’s pilgrimage from Mecca to Medina, the founding of the first Islamic state, and the beginning of the Islamic calendar. The building activity that took place under the Prophet and his four successors (known as the Orthodox Caliphs) remained rather modest in its symbolic aspirations and made no pretenses at achieving any level of monumentality or grandeur. It was under the first Muslim imperial dynasty, that of the Umayyads (661–750), that a deliberate will for achieving such monumentality and grandeur in architecture came into being, as evident in their main constructions of the Dome of the Rock and the Aqsa Mosque in Jerusalem, and the Umayyad Mosque in Damascus, all dating to the late seventh and early eighth centuries.

The Abbasid dynasty (750–1258), which violently overthrew the Umayyads, continued this imperial tradition of architecture. Their earliest most prominent building effort was the founding of their capital, the city of Baghdad, in 762, which was designed as a circular walled enclosure with a diameter of about 2 km but quickly grew beyond its pure geometric confines. The Umayyad and the early Abbasid periods generally are considered to belong to the “early” Islamic architectural tradition. This was a formative period in which new architectural vocabularies were established through a process involving a considerable borrowing and transformation of prototypes from the architectural traditions of the two empires that ruled much of the earliest regions to become part of the Islamic world. The first empire is that of the Sasanians, which ruled Iran and Iraq and which the Muslims eliminated, and the second is that of the Byzantines, which ruled in Anatolia, Syria, and Egypt and which the Muslims greatly weakened. The Umayyads initially expressed a stronger reliance on Byzantine rather than Sasanian prototypes, but as the political and economic weight of the Muslim empire gradually shifted eastward, Sasanian influences increased considerably by the late Umayyad period to become overwhelmingly dominant by the advent of the Abbasids.

This formative early period of about two centuries is followed by what art and architectural historian Oleg Grabar identified as a “classical” period of Islamic architecture and this usually is marked by the construction of the expansive Abbasid royal suburb of Samarra outside Baghdad in 836. With the advent of this classical period, architectural references became primarily internal and no longer heavily dependent on outside prototypes. During that same period, the Umayyads, who managed to survive and maintain their rule at the western edge of their far-flung Muslim empire in the Iberian Peninsula (or al-Andalus in Arabic) until 1031, also concurrently developed their own unique, independent, and mature architectural vocabularies.

The Abbasid dynasty began to show serious signs of political weakening by the tenth century,

bringing about a period of extensive fragmentation, with a series of smaller and often warring, though, in many cases, culturally vibrant independent states coming into being in various parts of the Islamic world. With this fragmentation, however, also came a high level of diversity and richness of architectural production. The Saljuq dynasty and its vassals did manage to achieve some consolidation of authority in the central Islamic lands beginning in the late eleventh century, with much of its weight being located in Iran and Central Asia. They were among the earlier of a series of rulers of Turkic origins that eventually ruled much of the Islamic world. Another wave of territorial consolidation, though a brief one, came with the devastating Mongol invasion during the thirteenth century, which extended across Asia and brought vast areas under Mongol rule including Baghdad in 1258, which, in spite of the political weakening of the Abbasid dynasty, had managed to remain a metropolis of tremendous symbolic and cultural importance.

The Mongols were followed by a number of powerful dynasties. These included the Ilkhanids, the successors of the Mongol rulers who had converted to Islam, the Mamluks, who ruled Western Asia and the Nile Valley from the middle of the thirteenth century to the early sixteenth, and the Timurids, the dynasty founded by Timur in the late fourteenth century and that brought much of Central Asia under its control. Each established its own unique and monumental architectural tradition. Samarkand and Cairo particularly provided magnificent urban and architectural expressions of the glories of the Timurid and Mamluk empires.

The next phase is the founding of what historian Marshall Hodgson termed the “gunpowder empires,” which coincided with the age of gunpowder and the use of firearms. These great empires are those of the Mughals in India, the Safavids in Iran and Central Asia, and the Ottomans in Turkey as well as Eastern Europe, Western Asia, and North Africa. These empires, which reached their zenith during the sixteenth and seventeenth centuries, were among the most powerful in the world, ruled much of the Islamic world, and provided a consolidation of authority

as well as an expansion of territories under Muslim rule not seen for centuries. Their architecture provided a major and conscious expression of their glory, as can be seen in representative well-known monuments such as the Taj Mahal in Agra (1632–1653), the Royal Mosque of Isfahan (1611–1638), and the Selimiye in Edirne (1568–1574). The latter monument is considered the masterpiece of the Ottoman architect Sinan, the most celebrated architect of the Islamic world's long and varied architectural legacy, and its most prolific. The weakening of those empires during the course of the eighteenth century marked the initiation of the modern era, which was accompanied by growing Western influence, often expressed through direct colonialism. With that, the architectural production of the Islamic world enters a new period, but this falls beyond the scope of this entry.

Geographically, the Islamic world may be divided into a series of regions defined by various factors including natural borders as well as linguistic, sectarian, and overall cultural bonds, with each region developing rather unique architecture traditions. While the natural borders are fixed, the cultural ones are very elastic, resulting in a frequent shifting of borders defining those regions and strongly affecting the nature of relationships between them. Still, a certain level of continuity marks this regional division of the Islamic world throughout Islamic history. Moving from west to east, the Iberian Peninsula, or al-Andalus, emerged as a very important region of the Islamic world after it became a separate principality under the Umayyads in the mid-eight century and until the Iberian Peninsula began to fall to advancing Christian European forces from the north in the early thirteenth century, a process that was completed with the fall of Granada in 1492. In addition to al-Andalus, the other Arabic-speaking regions of the Islamic world consist of North Africa, Egypt and the Nile Valley, the Fertile Crescent (Greater Syria and Iraq), and the Arabian Peninsula, with each expressing a rather separate architectural character. The architecture of North Africa greatly interacted with that of al-Andalus, while the latter was under Muslim rule. The

architecture of Egypt generally expressed a clear independent character and often had a strong influence on the architecture of Greater Syria. This influence became increasingly strong after the Fatimid dynasty, which was established in North Africa in 909, advanced into Egypt in 969, reaching Greater Syria soon after that. While Greater Syria is the birth place of the Islamic world's first imperial tradition, that of the Umayyads, its architecture with time became more integrated with, and often subjected to, the architectural traditions of the main regional powers, including the Abbasids, Fatimids, Ayyubids, Mamluks, and the Ottomans. The same applies to the architecture of Iraq, which played a crucial and central role in the development of the Umayyad and Abbasid architectural traditions. Although Iraq generally managed to maintain a level of cultural autonomy until the fall of Baghdad to the Mongols, this autonomy later on succumbed to the influences of larger empires such as those of the Safavids and the Ottomans.

Turkey of course is a most significant central region of the Islamic world and, beginning with the growth of the Ottoman Empire in the second half of the fifteenth century, became the center of architectural influence that extended into the various areas under Ottoman control, including East Europe, North Africa, and West Asia. No less important than Turkey is Iran, which played a most crucial role in the development of Islamic civilization since the early days of Islam although its widespread cultural influence was somewhat curtailed under the Safavids, when it became the main center of Shiite Islam while much of the other parts of the Islamic world were ruled by Sunni dynasties. In fact, it is Iran, Turkey, and the eastern Arabic-speaking lands (extending from Iraq in the east to Egypt in the west) that form what may be referred to as the "central" regions of the Islamic world, and it is there where a good part of the Islamic world's political and cultural developments originated.

This still does not minimize the importance of regions falling outside this "central" core, most importantly Central Asia, or what until recently were the former Central Asian republics of the Soviet Union and also Afghanistan. A number of

very important dynasties such as the Timurids were based in Central Asia, and significant urban centers of Islamic civilization such as Samarqand, Bukhara, Tashkent, Nishapur, Merv, and Herat are located in that region. The Indian subcontinent of course forms an integral part of the Islamic world although its relation to the Islamic world is very much complicated by the fact that in spite of its enormous Muslim population and that it was ruled by various Muslim dynasties for centuries, most notably the Mughals, the majority of its population remained Hindu.

To the east are the regions of East Asia, and in fact, Indonesia is today's largest Muslim country. The Islamic architectural traditions of East Asia, however, are more closely affiliated with preexisting local traditions than with those of other regions of the Islamic world. Interestingly enough, even though one associates Islam with its central regions, the majority of the world's Muslims in fact reside east of these central regions, in the Indian subcontinent and Eastern Asia (primarily Pakistan, Bangladesh, India, and Indonesia). And of course, various parts of sub-Saharan Africa such as present-day Mali and the Niger produced their own unique and rich architectural traditions, even though their role in the overall political and cultural developments affecting the Islamic world remained peripheral.

One manner in which the architecture of these different regions may be differentiated is through the primary building material used in them, particularly stone and brick. One cannot and should not draw clear-cut lines of division. Still, stone generally is prevalent in the architecture of regions such as Turkey, Greater Syria, Egypt, and India, while brick is the common construction material in regions such as Iraq, Iran, and Central Asia. These two materials were used both for structural purposes and for sheathing surfaces. Another important surface-sheathing material is glazed tiles, of which impressive examples are found in Turkey, Iran, and North Africa. Mosaics were particularly common for covering surfaces in the early Islamic architecture of Syria and al-Andalus, and stucco was widespread in various parts of the Islamic world and at different periods.

Wood, while not common as a structural material, was widely used for specific elements such as wall and ceiling panels, as well as for screens and balconies.

From a typological point of view, a certain level of confusion has always evolved from the use of the term "Islamic architecture" as it gives a religious overtone to that architectural production even though it fully covers both religious and secular buildings. Of course, the most prominent building type of the architecture of Islam remains a religious building: the mosque. Every city was to have a main congregational mosque where the Friday prayers led by the ruler would take place, with the mosque and house of the Prophet in Medina being the first example. Many cities, however, early on became too large to be served by a single congregational mosque and had to be served by more than one. In addition, there are the smaller mosques that serve the various districts or neighborhoods of the city.

Other buildings with strong religious connotations include the mausoleum, the earliest surviving example of which is the octagonal al-Qubba al-Sulaybiyya in Samarra from the second half of the ninth century. In it, three Abbasid rulers were buried. By the middle of the twelfth century, mausoleums were often combined with mosques to form a unified architectural complex. Out of the mausoleum also developed the important building type of the shrine, or mashhad, which commemorated an important religious person. In this context, mashhads commemorating religious events existed since the early days of Islam, with two prime examples being the Ka'ba in Mecca, which is associated with events from the life of Abraham and marks the direction which Muslims face when praying, and the Dome of the Rock in Jerusalem, which is associated with Prophet Muhammad's night journey to heaven.

Another important structure with religious connotations is the madrasa, or the institution where religious scholars were educated. The earliest were built by the Saljuqs during the eleventh century, with the earliest surviving examples dating to the first half of the twelfth century. These too often were combined with the mosque or – by the twelfth century – the mausoleum (usually of

the patron), and it is not unusual to have complexes containing all three. Architecturally, some of the most magnificent surviving examples of these combined complexes are found in Mamluk Egypt, as with the mid-fourteenth-century complex of Sultan Hasan in Cairo. There also are other building types with religious connotations such as the Ribat, which essentially is a fortified enclosure for religious warriors, or the Khanqah, which is a hostel for sufis.

There of course is an abundance of public buildings of a secular nature in the Islamic world. Some were intended as philanthropic structures that provide services to the public, such as the *sabil*, or public water fountain. There also are other constructions connected to the theme of water, such as aqueducts and reservoirs, all incorporating sophisticated methods for collecting, conveying, and storing water. A unique water-related structure is the mid-ninth-century Abbasid-era Nilometer in Cairo, which consisted of a marked column located in the middle of well-like space that was connected to the Nile by tunnels. The Nilometer measured the level of the waters of the Nile for the purposes of determining taxes for a given year.

Another common building type is the public hospital, known as the maristan or bimaristan. A well-known and relatively early example is the mid-twelfth-century bimaristan of Nur al-Din in Damascus, which the Zangid ruler Nur al-Din built (the Zangids were one of a number of dynasties founded by governors appointed by the Saljuqs). Public baths, or hammams, were also significant urban public structures. Although the earliest surviving baths are private ones found in the palatial residences that the Umayyads built in the Syrian desert, they evolved into public structures and an integral component of cities in the Middle East and North Africa.

There also are numerous commercial structures and complexes that were developed in the Islamic world, which is not at all surprising considering the central role that trade played in its economic life. These include the *suq* (*souk*), or market, the khan, and caravanserai, as well as the wakala, the urban caravanserai that contained storage areas on the ground floor with accommodations units for traveling merchants above.

And there is no shortage of princely residences although these have not survived as well as religious buildings since succeeding dynasties were not particularly concerned with preserving the symbols of power of those preceding them, and in some cases deliberately destroyed them. What does survive, however, is spectacular, as evident in two of the best-known palaces of the Islamic world, the Alhambra in Granada and the Topkapi in Istanbul, both of which evolved over centuries, with the Alhambra coming into being in the thirteenth century and the Topkapi in the fifteenth. In addition, there is that most interesting and still not fully understood group of early palaces constructed by the Umayyads during the seventh and early eighth century in Syria, mainly along the edges of the Syrian desert, and which provide the first surviving examples of Muslim palaces.

Numerous examples survive of military architecture. Some had clear religious connotations as with the ribats. Although the ribats were located outside cities, many military structures, particularly the citadel, occupied commanding locations in cities, often along city walls. One of the most magnificent is the Citadel of Aleppo, which began to take its present shape during the Crusader period particularly in the second half of the twelfth century, under the rule of the Zangids, but evolved considerably over the next few centuries. The site, however, was used for military purposes as early as the third millennium BC. In this context, it is important to keep in mind that numerous important monuments in the Islamic world were built on the remains of pre-Islamic structures.

The various building types of the Islamic world of course often came together in many complexes. The Citadel of Aleppo, for example, not only housed military facilities but also had residential as well as religious ones, in addition to water collection, storage, and distribution facilities.

Finally, one cannot ignore the urban scale. Islam was very much an urban religion connected to urban centers, and the architecture of the Muslim world very much is an urban architecture. One expression of this emphasis

on urbanism is how Muslim rulers established numerous new cities in different locations and in different periods. Cities were established since the earliest days of Islam, as is the case with Basra and Kufa in Iraq, both of which initially were founded during the rule of the Orthodox Caliphs as garrisons for Muslim armies but quickly grew to become full-fledged cities. During their heyday, many of the cities of the Islamic world, such as Baghdad, Cairo, Cordoba, Isfahan, and Istanbul, were major cosmopolitan metropolises and great international centers of commerce, culture, and learning.

Clearly, there is considerable diversity in the architecture of the Islamic world. However, there also are certain visual elements that linked the architectural production of its various regions. The dome is common in many parts of that world and so are the minaret and the iwan (a vaulted space enclosed on three sides and entirely open on the fourth, often onto a courtyard). Calligraphy was a common feature for articulating buildings, providing documentary information on the buildings as well as presenting their symbolic significance. Certain decorative features, such as the muqarnas (also known as stalactite or honeycomb vaults) as well repetitive floral and geometric decorative patterns (known as the arabesque), can be found in regions as diverse as the Indian subcontinent and Spain. Still, it should be noted that if one examines the architecture of the geographic “edges” of the Islamic world, such as East Asia or sub-Saharan Africa, it is noticed that these various elements generally are not incorporated in their unique and impressive architectural traditions.

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Argument from Design

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- [Ontological Arguments](#)

Arguments from Perfection

- [Ontological Arguments](#)

Argumentum Ad Ignoratiam

- [God of the Gaps](#)

Arithmetic

- [Mathematics, Formal and Contemporary](#)

Arithmetic in Islam

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Related Terms

[Calculation](#); [Reckoning](#)

Description

Arabic arithmetic exhibits two interconnected currents, the practical and the scientific. Before the ninth century CE practical arithmetic was traditionally communicated orally by trade groups, with emphasis on calculation and problem solving. Here the concept of “number” is any positive quantity which arises in calculation, including fractions and irrational roots.

Three systems of practical calculation were taught in medieval Islam: finger reckoning, Hindī numerals, and the base 60 system of the astronomers. Merchants preferred finger reckoning. In this system calculation is done mentally utilizing clever shortcuts, and intermediate results from 1 to 9,999 are “stored” by positioning the fingers in particular ways. Different problem-solving methods were associated with finger reckoning, including double false position and algebra. Al-Khwārizmī’s lost *Book of Adding and Subtracting*, written in the early ninth century, was probably devoted to this method. If so, it is the earliest known *written* text on the subject. One famous book, which inspired many later works, is al-Karajī’s *The Sufficient [Book] of Arithmetic*, composed in the early eleventh century. The author covers practical mensuration in addition to arithmetic.

Our “Arabic” numerals 1, 2, 3, etc., were called by the Muslims “Hindī” numerals, because they acquired the system from India. The numerals were already in use in the Middle East by the seventh century CE, and the earliest known

Arabic text is al-Khwārizmī’s *Book on Hindī Reckoning* (early ninth century), which survives only in Latin translation. Originally, the algorithms for calculating in this system were devised for use on a dust board where erasing is easy. In the mid-tenth century al-Uqlīdisī presented new algorithms for use with pen and paper, partly to dissociate the method from the work of astrologers who calculated with the dust board. One Arabic contribution is decimal fractions, described for the first time by al-Uqlīdisī (tenth century) and later exploited by mathematicians such as Jamshīd al-Kāshī (early fifteenth century).

Since Babylonian times astronomical calculations were performed and recorded in base 60. In Greek texts the letters of the alphabet designate the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, etc. In this way 42 was written “MB,” where “M” represents 40 and “B” is 2. To write a hexadecimal number like “2; 13, 42, 0, 45” $\left(2 + 13\frac{1}{60} + 42\frac{1}{60^2} + 0\frac{1}{60^3} + 45\frac{1}{60^4}\right)$, a Greek text will have “B ΙΓ MB ο ME,” where a special symbol fills the empty place, and the order of magnitude is (usually) not indicated. Arabic astronomers learned the hexadecimal system from Ptolemy’s *Almagest*, and their *jummāl* system replaces the Greek letters with Arabic letters (Al-Uqlīdisī 1978).

Trigonometric tables and algorithms for calculating roots were composed for both the Hindī and the *Jummāl* systems. To give two late examples, Berggren describes al-Kāshī’s extraction of the fifth root of 44,240,899,506,197 in Hindī numerals and his calculation of 2π in hexadecimal, via trigonometric identities and the square root algorithm, to an accuracy equivalent to 16 decimal places (Berggren 1986, pp 20, 53ff).

In contrast to practical calculation, scientific Arabic arithmetic is an extension of Greek number theory, originating in the arithmetical books of Euclid’s *Elements* and in Nicomachus’ *Arithmetica*. Books typically cover number sequences, series summation, polygonal numbers, and perfect/amicable numbers. Following the lead of the Greeks, only positive integers were considered to be numbers in scientific texts.

Arabic mathematicians made particular progress in aliquot parts. Two numbers are *amicable* if each is the sum of the proper divisors of the other. The pair 220, 284 was known to Iamblichus in late antiquity. Thābit ibn Qurra (ninth century) derived and proved a remarkable rule for generating amicable numbers: if three prime numbers p_1 , p_2 , and p_3 take the form $p_1 = 2^{n+1} - 1 + 2^n$, $p_2 = 2^{n+1} - 1 - 2^{n-1}$, and $p_3 = 2^{n+1}(2^{n+1} + 2^{n-2}) - 1$, then the two numbers $2^n p_1 p_2$ and $2^n p_3$ are amicable. For $n = 4$ this generates the pair 17,296, 18,416, probably found by Thābit, and reported later by al-Fārisī (d. ca. 1320) (Hogendijk 1985). Later authors, beginning with al-Baghdādī (ca. 1000), introduced “balancing numbers.” Two numbers satisfy this condition if their proper divisors sum to the same number. The pair 39, 55 is frequently mentioned.

Many books give formulas for series summation. Al-Qābisī’s tenth century treatise on this topic includes both old and new results. One interesting example not known from any Greek source, and later proven by Ibn al-Haytham, is:

$$1^4 + 2^4 + 3^4 + \cdots + n^4 \\ = \left(n^2 + \frac{n}{2}\right)(n+1) \left(\left(\frac{n}{5} + \frac{1}{5}\right)n - \frac{1}{15}\right).$$

This and other results are expressed all in words, with no symbolism (Sesiano 1987).

Many practical texts give definitions and examples of perfect, amicable, and balancing numbers, as well as formulas for series summation.

Arithmetical Problem Solving

The different problem-solving methods illustrated in arithmetic textbooks including single false position, working backward, analysis (*al-tahlīl*), double false position, and algebra. Many books employ two or more methods for the same problem, like this one from an arithmetic text of al-Fārisī (early fourteenth century): “a quantity: you doubled it and you took away from it a dirham. Then you doubled the outcome

and you took away from it a dirham, leaving ten dirhams.” (We can convert this to the modern algebraic equation $2(2x - 1) - 1 = 10$.) Al-Fārisī solves it three ways, by algebra, analysis, and double false position.

For reasons of space I will describe only double false position here (algebra is covered in the entry “Algebra in Islam”). In this method two guesses are made for the value of the unknown, and the solution is found from the guesses and their errors. For this reason it was called the method of “the two errors” (*al-khaṭa’ayn*) in Arabic. Al-Fārisī’s solution to the problem posed above is:

And by the two errors, you suppose the sought-after [quantity] is ten. So its double less one is 19, and its double less one is 37. The difference between it and the known 10 is an added 27.

Then you suppose it is six, and its double less one is 11, and its double less one is 21. The difference between it and 10 is 11, also added.

So multiply the first guess, 10, by the second error, 11: you get 110. And multiply the second guess, I mean 6, by the first error, I mean 27, so it gives 162. And since the two errors are added, take their sum: it yields 52. And divide it by the difference between the two errors, I mean 16. It results in three and a quarter, which is the desired [quantity].

The method of double false position was proven to be correct by geometry by Qusṭā ibn Lūqā in the ninth century, but it seems to have attracted no further scientific interest.

Cross-References

- [Algebra in Islam](#)
- [Astronomy in Islam](#)
- [Geometry in Islam](#)
- [Mathematics in Islam General](#)
- [Mathematics, Early](#)

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Ariyasacca (Pāli)

► [Truths, Four Noble](#)

Arrow of Time

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This refers to the fact that, given a filmed sequence of events, it is more often than not possible to tell which way round the film should be shown. For example, it is much more likely that a chimney will collapse into a pile of rubble, rather than a pile of rubble will spontaneously assemble itself into a chimney. There is a tendency toward increasing disorder with time. It is closely associated with the operation of the second law of thermodynamics.

Cross-References

► [Time](#)

Art

► [Art, Studio](#)

Art, Studio

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Related Terms

[Art](#); [Fine art](#); [Graphic and plastic arts](#); [High art](#); [Museum art](#); [Two- and three-dimensional art](#); [Visual art](#)

Main Text

Description

Studio Art has historically been understood as a discipline involved with the practice of making paintings, drawings, prints, and sculptures for the purpose of aesthetic contemplation. Since the late nineteenth century, this definition has been continually expanded to include a variety of media and processes, including (but not limited to) photography, collage, computer imagery, conceptual art, performance art, earthworks, video, soundscapes, and installation art. While many artists continue to use traditional media such as oil paint, watercolors, engraving, lithography, stone carving, and bronze casting, others use the ordinary materials of everyday life to make found-object or welded-steel sculptures, mechanical objects controlled by computers, or all-encompassing environments which the audience enters rather than viewing from a safe distance.

At the same time that the materials and processes of Studio Art were expanding, the definition of Studio Art has been continually contested by artists, museums, galleries, schools, and theoretical-critical institutions. Throughout the twentieth century, a variety of movements and styles emerged, including futurism, constructivism, dada, formalism, expressionism, minimalism, photo-realism, pop art, and many others. Many of these movements and styles were accompanied by

manifestos and theoretical constructs that explicitly rejected notions of aestheticism and defined Studio Art in political, social justice, or spiritual terms.

The definition of Studio Art has also been contested by those whose work was not traditionally recognized as within the discipline. In the last few decades, practitioners of crafts such as weaving, quilting, pottery, glassblowing, and woodworking have sought, with some success, to have their work recognized as Studio Art. The discipline of Studio Art has also begun to recognize the works of artists not trained within the academy, naming it variously as Visionary, Outsider, or Primitive Art.

The most recent movement in Studio Art has been termed “Postmodernism.” It is characterized by the appropriation of elements from past styles and movements, references to contemporary pop culture, an ironic tone, and a blurring of the boundaries between high and low art.

Today, Studio Art may best be understood as the practice of making objects and experiences that externalize a particular way of viewing the world, express their cultural context, and reflect that context in a way that may affect the collective conscience of that culture (Danto 1981).

Self-Identification

Science

The discipline of Studio Art is not a science, although some artists use the language of science, or attempt to promote their art as science, often collaborating with scientists in experiments that involve light and/or sound. However, even when artists use scientific ideas and processes, or speak in scientific terms, they do so for purposes that are different from those of scientists. The purpose of Studio Art is, broadly speaking, the exploration and communication of ideas, feelings, or experiences through visual, tactile, spatial, and other media. While Studio Art is a way of knowing (*scientia*), it is not a science as that term has come to be understood.

Characteristics

Studio Art is distinctive in that it uses materials and processes, rather than words, to explore and communicate its discoveries and insights.

Relevance to Science and Religion

While it is virtually impossible to speak of the interests of Studio Art as a whole, there are many Studio Artists who are interested in science, religion, and the intersection between them, as subject matter for artworks.

Sources of Authority

The sources of authority for the discipline of Studio Art include the artworks and artifacts of earlier periods and cultures; the writings of artists about their own processes, materials, and intentions; and the ongoing tradition of critical-historical reflection on these artworks and artifacts. In the modern and postmodern era, specific authorities include curators at major museums of art, such as the Metropolitan Museum of Art, the Museum of Modern Art, and the Guggenheim in New York City; the Art Institute of Chicago; The British Museum, the Tate, and the Tate Modern in London; or the Louvre, the Centre Pompidou, and Musée d’Orsay in Paris; art critics, historians, or philosophers, such as Clement Greenberg, Harold Rosenberg, Lucy Lippard, or, more recently, Arthur Danto and James Elkins; influential art dealers, galleries, and collectors; and the artists, themselves. Publications generally recognized as authoritative include *Art Journal*, the organ of the College Art Association; *ArtNews*, a New York-based journal which is widely read throughout the world; *ArtWeek*, which offers thoughtful critiques and articles from the US West Coast; and *Art Monthly*, a well-regarded British journal on contemporary art. These sources become authoritative to the extent that they affect the subsequent discourse about and practice of Studio Art.

Ethical Principles

Since individual artists work from an enormous variety of cultural, religious, and personal viewpoints, it is virtually impossible to say that the discipline as a whole is guided by specific ethical principles.

There is a strong strand within artistic thought that values the traditions of the past and seeks to maintain continuity with those traditions. Concepts such as beauty, transcendence, and mystery

are often invoked, especially when the artworks are intended for religious or spiritual communities. The ethical principles guiding such artists often include reverence for God and/or nation, and respect for individuals as well as for social structures.

An equally strong tradition views art as an essentially subversive activity, whose task is to critique society. Such critique may take the form of apparently destructive acts, or images intended to shock the viewer, or experiences that are meant to distort perceptions. For those who see art as subversive, such destruction, shock, or distortion is understood as the necessary (and therefore ethical) means toward the desired end of a better world. Often, but not always, the implicit or explicit ethical principles of such subversion include world peace, ending poverty, promoting ecological harmony, and similar ideas.

A third view is that art stands outside of ethical considerations, existing only for its own sake as aesthetic experience. For those who hold this view, any attempt to force art to address ethical issues is to violate the integrity of art as such.

Key Values

Integrity, authenticity, creativity, innovation, cultural awareness, craftsmanship, design

Conceptualization

The discipline of Studio art, as a whole, does not directly address questions of Nature/World, Human Being, Life and Death, Reality, Knowledge, Truth, Perception, Time, Consciousness, Rationality, or Mystery, and does not have a consensus on how to conceptualize them. Many in the discipline simply accept the everyday definitions of the terms, without attributing any special meaning to them with regard to their work or that of artists generally. Others maintain that questioning any definition of any one or all of these ideas is central to the practice of Studio Art, making such questioning the implicit (and often explicit) subject matter of their work. Still others may make some specific definition, or set of definitions, of these terms foundational to their practice.

Relevant Themes

One of the issues that for some time has been marginal, but is currently becoming central to the discipline is the relationship between art and religious faith. There is a growing interest among studio artists in the question of how to make art that is considered excellent in the contemporary art world while maintaining the integrity of religious belief and practice. In the western world, the Reformation and the Enlightenment drove a wedge between Art and Religion, causing each field to be somewhat suspicious of the aims and practices of the other. Toward the end of the twentieth century, some artists and thinkers, on the one hand, and some religious bodies, on the other, have come to question this mutual antagonism, as they recall that Art and Religion have generally been allies throughout most of history. This issue is critical as artists of faith seek ways to communicate their religious understandings in works that are consistent with contemporary ideas and values in the art world generally; and as churches, synagogues, and other religious institutions seek ways to embody their insights and doctrines in symbols and images that are relevant to twenty-first century worshippers.

Cross-References

- [Aesthetics \(philosophy\)](#)
- [Visual Art](#)

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Artificial Immune Systems

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Related Terms

[Immunological computation](#)

Description

The field of artificial immune systems (also called immunological computation, or just AIS) is an area of study devoted to the development of computational models and techniques based on the principles of the biological immune system (BIS). Specifically, it is an emerging area that explores and employs different immunological mechanisms to solve computational problems.

The BIS is a complex, adaptive, highly distributive learning system endowed with several alternative and complementary mechanisms for defense against pathogenic organisms. The immune system learns, through adaptation, to distinguish between dangerous foreign antigens and the body's own cells or molecules. Clearly, nature has been very effective in creating organisms that are capable of protecting themselves against a wide variety of pathogens, such as bacteria, fungi, and parasites.

The powerful information-processing capabilities of the immune system, such as feature

extraction, pattern recognition, learning, memory, and its distributive nature, provide rich metaphors for its artificial counterpart. Since 1985, there has been an increased research interest in immunity-based techniques and their applications. Some of these models, however, are intended to describe the processes that occur in the BIS to have a better understanding of the dynamic behavior of immunological processes and simulate BIS's dynamic behavior in the presence of antigens/pathogens. In contrast, immune-inspired models have been developed in an attempt to solve complex real-world problems, such as anomaly detection, pattern recognition, data analysis (clustering), optimization, and computer security.

Theoretical models of immune processes have attempted to explain adaptive immune response. For instance, the immune system's ability to "remember" its encounters with antigens to achieve a faster response when the similar antigen is confronted at a later time has been modeled by immune networks and danger theory models.

In order to formulate theoretical and computational models, it has been necessary to develop general abstractions of some immune elements and processes. Accordingly, some standard procedures, representations, and matching rules have been adopted in most immunological models.

Some representative immunity-based algorithms include the following:

- T-cell algorithms, which include negative selection, one of the earliest immune algorithms, are based on the negative selection (NS) process that occurs in the thymus.
- B-cell algorithms, which are mainly based on immune network theory and clonal selection principles.
- Danger theory approach, based on danger Theory introduced by Matzinger (1994), which states that the immune system is activated on receipt of molecular signals, which indicate damage (or stress) to the body rather than by pattern matching of "nonself" versus "self."
- Dendritic cell algorithms, which intend to capture the way dendritic cells serve to communicate innate and adaptive immune systems.

In addition, a significant amount of work has been done in combining some of these methods with other computational intelligence approaches, such as neural networks, evolutionary algorithms, fuzzy logic and swarm algorithms.

During the last two decades, immunological computation (IC) techniques (or artificial immune systems) are increasingly used as problem solvers in a wide range of domains, such as optimization, classification, clustering, anomaly detection, machine learning, adaptive control, associative memories, etc.

IC techniques have also been used in real-world applications, such as computer security, fraud detection, robotics, fault detection, data mining, text mining, image and pattern recognition, bioinformatics, games, and scheduling.

Self-identification

Science

The field of artificial immune systems is not a science by itself. It may be considered as a scientific and technological discipline, since it involves theoretical and applied aspects of several sciences and technologies – mainly biology, chemistry, mathematics, statistics, medicine, and computer science.

AIS have been considered mainly as a subarea of computational intelligence, along with the main representatives, namely, neural networks, fuzzy systems and evolutionary algorithms, and swarm intelligence.

Characteristics

Although artificial immune systems field uses a general biological system and processes as an inspiration, just as in other bio-inspired areas, such as neural networks (after biological neural networks) and evolutionary systems (after evolution of biological systems), AIS is distinctive among other specialties of Computational Intelligence and Bio-inspired computing by having immune mechanisms as the focal point of study. However, it is important to note that models used

to study other biological systems have also been used in the AIS.

Relevance to Science and Religion

The field of AISs is involved in studying a particular biological system, the immune system, and those natural processes related to it, and to model the understanding of its elements and processes from a scientific point of view and also on developing technological applications using metaphors of the natural system. Although it is believed that, in some cases, some metaphysical aspects may influence the biological immune system's behavior, such as psychosomatic diseases, no work has been done on trying to understand and model any other than biological and chemical aspects of the biological immune system.

As a scientific/technological discipline artificial immune system is relevant to the scholarly area "Science and Religion" to some extent. By its nature, artificial immune system is related to science. Since this discipline deals with many evolutionary processes, so has it also a concern to the interaction of science and religion which is described by the "conflict thesis" (http://en.wikipedia.org/wiki/Conflict_thesis). Although this thesis is rejected in the present-day context, still it indicates an elemental relevancy between a scientific discipline and religion. Artificial immune system not only studies those evolutionary processes, but it strengthens the practical aspect of those concepts by applying them on real-life problems. Apart from this, there are religious practices, for example meditation, that are believed to take part in enhancing the immune system. Studies of BIS and AIS, as well, may reveal conflicting or collaborating concerns on this matter.

Sources of Authority

The authorities in artificial immune systems used to be scientifically interested computer scientists, engineers, and algorithm developers. As the

research work has been increasing on this field, several associations (research groups) have emerged to promote research in this area of study. Among the most relevant and well-known organization is the IEEE Computer Society Task Force on Artificial Immune Systems ([IEEE Computer Society Task Force on Artificial Immune Systems](#)).

Ethical Principles

This discipline does not directly deal with living beings, but rather uses metaphors of biological immune systems. Ethical principles are the general principles from applied and theoretical sciences to provide solutions to theoretical and technological problems of human kind.

Key Values

The key value of AIS is to provide solutions to different kinds of problems that remain unsolved or that could be solved in more efficient ways by providing better performance than existing solutions.

Conceptualization

Nature/World

Nature is conceptualized as the constituent physical and biological elements that form the universe. World is the set of all physical elements in the earth.

Human Being

A human being is considered as a complex biological being endowed with special features that make him very efficient in problem solving and understanding and changing his/her environment for his benefit and those of his/her own species.

Life and Death

Life is conceptualized as the presence of special functions in natural systems that allow them to remain in its environment by

performing these primary functions. Death is the event that happens on a living being when it is no longer capable of performing its basic functions.

Reality

Reality is considered as the set of all elements in the universe that exist and can affect and interact with each other in real time.

Knowledge

Knowledge is a set of data, rules, and facts known about a particular system or process. Knowledge can be individualized or collective.

Truth

Truth is some factual knowledge about the world that can be verified.

Perception

Perception is some partial knowledge that any life or artificial being acquires from its environment through some special components provided for such task.

Time

Time is a reference measure that is used to keep track of the changes that occur in the world.

Consciousness

Consciousness is a life being's ability to know about itself and its role in the world and of being aware of the consequences of its actions.

Rationality/Reason

Rationality is an ability of human beings to analyze situations and make what they believe is the right decisions under those circumstances.

Mystery

A mystery is something for which there is no formal or scientific explanation.

Cross-References

- [Immunological Computation](#)
- [Self](#)

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Artificial Intelligence, General

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Related Terms

[AI](#); [Artificial minds](#); [Computer science](#); [Machine intelligence](#)

Artificial Intelligence (AI) devotes itself to producing computer systems that act intelligently, solving problems in ways we would call intelligent if done by a human. One outstanding example was the AI system called Deep Blue in 1997, defeating world champion Gary Kasparov in a six-game chess match. Though running on a specially built computer and provided with much chess knowledge, Deep Blue depended ultimately upon traditional AI game-playing algorithms. The match with Kasparov constituted an AI triumph.

A second such triumph involved mathematics, which everyone would agree, requires intelligence. In a 1933 paper, E.V. Huntington gave a new set of three axioms that characterized a Boolean algebra, a type of formal mathematical system with important computer science applications. The third of these axioms was sufficiently complex as to be practically unusable. This motivated Herbert Robbins to replace this third axiom with a more usable one, and to conjecture that his new axiom set also characterized Boolean algebras. This Robbins conjecture soon became a famous unsolved mathematical problem that resisted the efforts of numerous human mathematicians for over half a century. The Robbins conjecture was finally proved correct, also in 1997, by a *general-purpose* AI automatic theorem prover called EQP (Equational Prover), producing a proof that mathematicians could read and agree to. In an area requiring intelligence where humans had failed, the AI system EQP, not designed for this particular problem, succeeded (McCune 1997).

A third such spectacular AI triumph occurred in 2011 when an AI system called Watson defeated three human champions on live TV in two rounds of the so popular intellectual game of Jeopardy. Watson's ability to answer complex questions posed in the same ordinary English heard by the human competitors depended heavily on its AI technology. Its AI natural language processing allowed Watson to understand the questions, as well as possible answers, from its knowledge base, while its AI heuristic search technology enabled it to find possibly correct answers more rapidly than its human competitors.

Less spectacular, but even more of a triumph for AI was the advent and wide commercial acceptance of knowledge-based expert systems, AI systems that captured and represented expert human knowledge and made it available to the user. Perhaps the earliest such commercially successful expert system was XCON (McDermott 1980), which saved millions of dollars for Digital Equipment Corporation by effectively configuring their VAX computers before delivery, rather than having DEC engineers solve problems after

their delivery. Other such applications followed, including diagnostic and maintenance systems for Campbell Soups' cookers and GE locomotives. A Ford Motor Company advertisement for a piece of production machinery stipulated that such a diagnostic and maintenance expert system be a part of every proposal. Expert systems constituted the first AI killer application.

The advent of video games led to a second AI killer application, the production of AI systems to control video game characters. The smarter, and more human-like, the characters, the better the game. Video game companies came to compete for the services of AI programmers.

Video game characters are one example of a type of AI system called software agents that are absorbing most of the attention of AI researchers. A software agent is autonomous in that, once programmed and turned on, it senses its environment and acts on it in pursuit of its own agenda. Autonomous software agents come in several varieties, most "living" in some kind of virtual, digital environment such as on the Internet. They autonomously perform a specified task, such as the "bots," that search the Web for new links to bring home to their search engine masters. Others, sometimes called avatars, have virtual faces or bodies displaying on monitors that allow them to interact more naturally with humans, as in intelligent tutoring systems. Still others, called conversational virtual agents, simulate humans, and interact conversationally with them in chat rooms, some so realistically as to be mistaken for human. Finally, there are the virtual agents as characters in computer and video games.

AI has come a long way since its inception in the summer of 1956. During its early days, AI researchers were intent of creating systems exhibiting human-level intelligence, including the ability to gather new knowledge on their own, to solve non-routine problems, and to learn new skills. It was not long before they discovered just how daunting and seemingly impossible such an enterprise really was. The field of AI rapidly changed course so as to devote itself to developing and implementing AI systems that produced intelligent behavior within some relatively narrowly defined domain such as those we have

described above. More recently (circa 2006), interest has reemerged in developing systems with a more general, human-like intelligence, and the research field of Artificial General Intelligence was born, with its own academic conferences and journal (Goertzel and Wang 2007). As yet, the enterprise still seems daunting, but no longer impossible, just difficult.

Since AI systems run on computers, AI can be considered a branch of computer science, and is typically found in computer science departments in universities. But the study of machine intelligence can also be used to shed light on human intelligence, giving AI a major intersection with cognitive science and cognitive modeling. A cognitive model provides a conceptual theory of how human cognition works, all the way from sensation and perception, through understanding and problem solving, to action selection and execution. Cognitive architectures, the computational implementation of such cognitive models are used on their science side to guide experimentations with humans, and on their engineering side, to control software agents and real-world autonomous robots.

So far, we have viewed AI as outsiders looking in. What can it do for us anyhow? If we changed perspective and view AI as would a student, a researcher, or a practitioner, we would find a world concerned with searching heuristically, with planning, with representing knowledge, with pattern recognition, with heuristic search, with natural language processing, with machine vision, with decision making, with machine learning, with autonomous agents, and with many other such arcane areas of study. AI is very much a technical field of study and practice (Russell and Norvig 2009).

Is AI a science? Well, yes and no, depending on how you want to use the word. In our often scientifically illiterate world, the term science is often, if mistakenly, used synonymously with technology. And as we have seen, AI is surely a technology. The insiders, the scientists themselves, would restrict science to empirical studies that seek knowledge from the real world through observation or experiment. Such usage would include such disciplines as physics, chemistry,

biology, psychology, and cognitive science, but would omit fields, such as mathematics, computer science, medical science, and the various engineering fields. Science pursues knowledge for its own sake and with the prescribed methods of observation and experimentation. These latter fields, while sometimes using science as a tool, have quite other aims and are not truly science. Where does AI fit within this scheme? In both camps. The modeling contribution of AI to cognitive science provides hypotheses, and thus guidance, for experimentation into human cognition, making this sort of AI a part of science. Chess players, expert systems, etc., belong to technology, but not to science.

AI is distinguished among other disciplines, and among other subdisciplines of computer science, by its major aims, to understand intelligence and to implement it in intelligent computer systems. Among other subdisciplines of computer science it can also be distinguished by its use of heuristics to seek good enough, rather than optimal, solutions to problems, and also by its willingness to take advantage of biological influences. The latter has led to such AI subdisciplines as artificial neural networks, genetic algorithms, artificial immune systems, and fuzzy logic.

AI is entirely concerned with science and technology and has nothing whatever to say concerning religion or AI's relevance to religion. The issue just never seems to come up. In the same way, AI is completely silent about the relationship between science and religion, or its relevance thereto, being only tangentially related to science and totally unrelated to religion. The relationship of science and religion seems to have no implications for the teaching of AI, for a career in AI, or for the role of the discipline in industrial information technology departments or in academic computer science departments. AI's role in the larger society is for the most part determined by commercial considerations, the usefulness, and value of AI systems. In addition, people most often find the very idea of an intelligent machine intriguing, and want to know more about it.

Though AI has produced its share of heroes, such as Alan Turing (the grandfather of the field), Herbert Simon and Allen Newell, John

McCarthy, and Marvin Minsky (collectively the parents), they are revered but not looked to as authorities. In its 50 years of existence, AI has always been a fast moving field, rapidly progressing both theoretically and practically. Its practical products are typically commercial and, thus, proprietary. The source of authority on this side of the aisle is the dollar. On the theoretical side, AI produces studies that are presented in numerous workshops and conferences, usually with published proceedings, and published in a wide variety of professional journals. One might say that this accumulated literature comprises the sole source of authority in AI, if there is any at all. Within AI, every assertion is subject to scrutiny, analysis, and question. Nothing is accepted by authority, because someone in authority claimed it, or because it was published in an authoritative journal. Textbooks, conference papers, journal articles may all be influential, but none are authoritative in the sense of being accepted upon its own say-so.

AI shares its key values with other academic and commercial disciplines. One must be honest in one's claims, one must not plagiarize, one must behave ethically, etc. Ethics also arises as part of the content of AI in two different ways. AI cognitive architectures model decision making in humans, which includes moral decision making. An entire issue of the journal *Topics in Cognitive Science* was devoted to "Cognitive Based Theories of Moral Decision Making," but made no mention of religion (Wallach and Franklin 2010). Also, during the formative AGI workshop (Goertzel and Wang 2007) a panel discussion seriously considered the ethical ramifications of creating an AGI agent with human-level intelligence or beyond.

AI takes a naturalistic and scientific world view, considering human beings as one species of animal when used to model either humans or other animals. AI does not speak of life, except to have given rise to the now quite separate discipline of artificial life. Of death, it does not speak at all.

AI does not concern itself with epistemology, the philosophical study of knowledge. It is,

however, vitally concerned with the representation of knowledge in computer systems, with knowledge representation being a major subfield of AI. How best to represent and use the various sorts of knowledge, perceptual, declarative, procedural, etc., is a primary occupation of many AI researchers and a secondary occupation of almost all of them. Not only knowledge-based systems, but AI systems of every variety, must employ representations of knowledge.

As is the case with knowledge, AI is concerned with truth not in a philosophical sense, but as it is employed in AI systems based on mathematical logic. Many AI systems use symbolic logic for knowledge representation and, so, face the issue of machine determination of the truth or falsity of propositions expressed within such systems. All these considerations are quite formal, being concerned with truth within the system and not with truth in the real world.

The situation is quite similar regarding rationality/reason. Many AI systems, using mathematical logic for knowledge representation, employ reasoning algorithms to derive new true propositions from the existing ones within the system, or in the case of AI agents, to optimize the selection of its next action. Such agents are referred to as rational agents.

The situation is again much the same with respect to time, concerns with which occur mostly in AI systems using temporal logic for knowledge representation. These systems are used primarily in the AI sub-areas of planning and scheduling. Time is typically to be reasoned with within the system.

Perception, the understanding of sensory input, is a central concern of that branch of AI called computer vision. Machine vision systems must recognize objects, identify individuals, understand events, etc. Also, AI agent systems face these problems with respect to their built-in sensory modalities. Of course, an AI-controlled autonomous real-world robot will have quite different sensors than an AI software agent. The digital senses of the latter may not even seem like senses at all.

AI agent systems are also occasionally concerned with consciousness, which is used

mostly in the sense of functional consciousness, almost synonymous with attention (Franklin 2003). Phenomenal consciousness is mostly ignored except for a new subfield of AI called machine consciousness, which has its own workshops and journal.

When producing broad, comprehensive architectures, the cognitive modeling subfield of AI often concerns itself with perception, knowledge, and reason, as well as occasionally with time and consciousness.

The term “mystery” never arises in the AI literature. There is simply no such issue to be considered. Nor do there seem to be other issues, themes, or concepts used in AI that are relevant to a discussion of the relationship between science and religion. With the exception of cognitive modeling, AI has little to say about science, nothing to say about religion, and nothing at all to say about their relationship.

Cross-References

- [Affective/Emotional Computing](#)
- [Artificial Immune Systems](#)
- [Attention](#)
- [Brains, Artificial and Computational](#)
- [Computational Memories](#)
- [Formal Logic](#)
- [Natural Language Processing](#)
- [Philosophy of Mind](#)
- [Robot Emotions](#)
- [Robotics and Religion](#)

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Artificial Life

- [Robot Societies](#)

Artificial Minds

- [Artificial Intelligence, General](#)
- [Brains, Artificial and Computational](#)

Artificial Neural Network

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An artificial neural network (with acronym ANN), usually addressed as neural network (with acronym NN), is a model used in the field of mathematics or computer science that is inspired in the structure and/or functional aspects of biological neural networks or human brain. A neural network consists of an interconnected group of artificial neurons or nodes, and it administers the information using a connectionist approach to computation. In most cases, an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Modern neural networks are nonlinear statistical data modeling tools. They are usually used to model complex relationships between inputs and outputs or to find patterns in data.

Artilects (Artificial Intellects)

- [Brains, Artificial and Computational](#)

Aryasatya (Sanskrit)

- [Truths, Four Noble](#)

Associative Learning

- [Conditioning and Learning](#)

Astrology

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Related Terms

[Horoscope](#); [Prediction](#)

Description

Astrology claims that there is a relationship between celestial patterns and earthly events. The astrological world view holds that all things in the universe are interconnected, whether psychically, physically or both (Campion 2012a). Within this inclusive definition there are different philosophical rationales, religious affiliations, technical procedures, and attitudes to what the study or practice of astrology can achieve. Arguments about astrology's validity focus on the extent to which general principles of cosmic interconnectedness can be used to extrapolate the detailed rules which allow astrologers to reach precise judgments on human affairs. Astrology claims to yield different kinds

of information, from the correct times to plant crops or perform religious ceremonies, the diagnosis and treatment of disease, information about personality, knowledge of the future or the means required in the quest for personal meaning or salvation.

The principle justifications for astrology view it as functioning via either (a) a set of signs, usually sent by a divine entity, which may be read by the astrologer, (b) influences or causes, which might themselves be of divine origin, though manifesting in the natural world, or (c) correlations, in which events on earth may correspond in time to those in the heavens, but possess no causal relationship in the modern sense. The first justification may be defined as divination, the second as natural science, and the third finds textual authority in Platonic and Aristotelian philosophy, and the psychology of C.G. Jung, in which it is described as “synchronicity.”

Most cultures have an astrology in the sense that they endow the celestial bodies with meaning or use them for timing significant events (Campion 2012a). However, there are only three mathematically complex systems, which claim to be able to either predict the future or manage the present with exact detail. These are (a) the Meso-American (Mayan and Aztec), (b) the Chinese, and (c) the Western/Indian. The latter draws on Babylonian antecedents, with probable Indian, Greek, Persian, and Egyptian contributions, and reached its current level of technical complexity in Hellenistic Egypt in the first and second centuries BCE. In the modern world, only India, in which astrology is one of the six vedangas, the subjects necessary to a proper understanding of the Vedas, remains home to a popular, complex tradition which dates back in an unbroken lineage to the ancient world.

The primary technical tool of Hellenistic astrology was the horoscope, strictly defined as the degree of the zodiac rising over the eastern horizon but, in a looser sense, the entire diagram of the heavens cast for a particular moment: the earth is placed at the center, surrounded by the planets and selected other features, sometimes including stars, themselves located in the zodiac,

and 12 other divisions known in modern astrology as “houses” (Campion 2009a). Modern newspaper and magazine astrology columns are also known as horoscopes.

There are four primary divisions of practical astrology (Campion 2009b): (a) natal, in which a horoscope is cast for the time of birth, (b) electional, in which auspicious times are arranged to perform appropriate acts, including sacred rituals, (c) horary (previously interrogational), in which a horoscope is cast for the time that a question is asked, and (d) mundane (previously revolutions), in which history is analyzed and political events are forecast.

Prediction has, in most traditions, been practiced only in the context of a desire to change the future; determinism in astrology has usually been qualified by the notion that destiny can be negotiated. The active participation of the astrologer in the manipulation of time and space may be seen as a species of magic. The most recent innovation in the western tradition has seen the application of depth psychology and counseling to natal astrology. In contemporary psychological astrology, character analysis and advice-giving are seen as more important than predicting the future.

Self-identification

Science

Within the tradition opinion is divided. Some practitioners reject the term “science” altogether but, for those who use it, it can have two meanings. For some, astrology-as-science implies that it has a body of rules that are founded in self-evident truth. The term “divine-science” is sometimes used in this sense, pointing to a belief that the “science” can reveal the individual’s relationship with the divine, or that its rules are divinely sanctioned. For others, astrology-as-science suggests that astrology should be based on testable claims and empirical data. Among historians Babylonian astrology is often defined as a science on the grounds that it used rules of interpretation based on a clear logic. The term is less frequently applied to the astrology of later periods.

Religion

Opinion is divided. While many western astrologers would agree with historians that astrology originates in ancient religion, there is a profound hostility to the term among many modern practitioners (Campion 2012b). There are two main reasons. The first is that religion is commonly identified with belief and many astrologers are aware of skeptical arguments that objects of belief are automatically false. They prefer to justify their use of astrology on the grounds that they “know” it works, such knowledge being based on personal experience, a species of gnosis. The second reason is that many astrologers share the modern western rejection of “religion” as negative and repressive, in favor of “spirituality,” which is viewed as positive and liberating.

Characteristics

Astrology’s distinctiveness is rooted in its claim that its frequently intangible assumptions are based in the measurable motions of the stars and planets. As a practice which lacks any necessary belief in a Supreme Being, sacred text or single set of dogma, it can attach itself to any religion or ideology. There are few atheist astrologers, but there is no bar to being one.

Relevance to Science and Religion

Modern western astrology exists in a state of tension with science and religion.

Although the terms “science” and “religion” are usually rejected by astrologers, most feel that orthodox science and mainstream institutional religion would benefit from the astrological world view and, in some deterministic accounts, will, in the near future, recognize its value.

Sources of Authority

Astrologers derive their authority from personal experience and a body of literature mainly handed down since Hellenistic times. There are

respected authors but no “scriptural” or sacred texts. Most texts are teaching manuals, which give instruction in reading horoscopes but there is very little philosophy. This is usually gleaned elsewhere, from whatever ethical or religious tradition with which the individual astrologer is affiliated.

Ethical Principles

Astrology’s interpretative rules have no inherent morality, although modern astrology tends to be guided by the New Age “self-ethic,” assuming that personal spiritual or psychological development of necessity leads to a higher standard of ethical behavior. Classical and medieval astrology was heavily influenced by notions, inspired by Platonism and Stoicism, that acts of either prediction or magical engagement with the cosmos are only possible if a virtuous life is followed.

Key Values

Astrology generally holds that harmonization of individual and collective behavior with cosmic patterns is inherently desirable and bound to bring beneficial consequences.

Conceptualization

Nature/World

Astrologers generally see the world as alive and a source of wonder. Nature tends to be romanticized as special, spiritual, and possessing healing qualities.

Human Being

Human beings are thought of as a “microcosm” of the celestial “macrocosm” containing an inner cosmos, often represented through planetary or zodiacal correspondences with parts of the body.

Life and Death

The majority of modern practitioners accept the reality of reincarnation and the wheel of death

and rebirth, a belief which was also present in Hellenistic astrology through Platonic influences and is standard in Indian astrology.

Reality

Reality is often perceived as being “psychic” rather than material, evidence of the legacy of Platonic Idealism in the tradition.

Knowledge

A high value is placed on personal experience and “intuition” as sources of knowledge. Many (but not all) modern astrologers claim that the techniques of astrological interpretation have no intrinsic objective validity but that each astrologer finds the techniques which work for them.

Truth

There is a general belief in the existence of absolute spiritual truths, but modern opinion is divided on whether astrological “truths” are themselves absolute, or only relative.

Perception

Astrologers generally believe that astrology can help them perceive truths which are concealed from non-astrologers.

Time

Time is perceived as broadly cyclical in that general conditions recur in complex patterns and in line with celestial movements, but usually without exact repetition.

Consciousness

Most (but not all) astrologers are Idealists, in the Platonic sense, believing that consciousness is prior to matter.

Rationality/Reason

Although the use of reason was a key feature of the Platonic and Stoic schools of thought in Hellenistic astrology, modern astrologers tend to polarize “intuition” with rationality, regarding the former as a reliable source of knowledge and the latter as likely to obstruct self-knowledge.

Mystery

The function of astrology is to give mystery a daily relevance by using symbols to relate feelings of mysterious, numinous, cosmic wonder to specific conditions, from spiritual states to daily activities and physical objects. Astrologers report that the experience of astrology “working” can itself lead to a sense of numinous wonder, and an awareness of the mystery of the cosmos.

Special Themes

Natural and Judicial Astrology

An important distinction between two kinds of astrology separates Natural Astrology from Judicial Astrology (Campion 2009). Natural Astrology is based in natural influences, seasonal effects and cyclical phenomena which can be understood as objective phenomena. Judicial Astrology assumes that the astrologer’s interpretation is necessary in order to judge the outcome of any scenario. At its extreme there can be no astrological phenomenon without the presence of the astrologer to interpret it.

The distinction between Natural and Judicial astrology is paralleled by that between two theories about the construction of the rules of astrological interpretation (Brown): either they are based on empirical observation of the coincidental repetition of terrestrial and celestial events, or they are derived from systems of imaginative word-association, metaphor and metonymy. In the majority of cases the two theories are combined.

Associated with the distinction between Natural and Judicial astrology is the question of whether astrology investigates the objectively real world, measuring personality and predicting events, or whether it is a symbolic language concerned with the construction of meaning (Campion 2012a).

Pseudoscience

The term pseudoscience is applied to astrology in two different senses. One is that its claims are untestable and hence non-falsifiable. The other is that its claims have been tested and have universally been falsified. However, there are two

problems with these assertions. The first is that they are mutually contradictory: the former claims that astrology is untestable, and the latter that it has been successfully tested. The second is that the results of scientific testing are mixed and, while some results are negative, others are positive and have not been refuted. The description of astrology as a pseudo-science may therefore be applicable in specific instances but cannot be applied to the practice as a whole. Protagonists for astrology, like critics, are divided between those who think that astrological claims are testable and those who argue they are not. Claims of testability are based on the idea that astrology exhibits a deterministic order in the cosmos (which, however, does not contradict the presence of variety and individual choice). The challenge to testability rests on a number of claims: (1) all astrological phenomena are unique and replicable experiments are therefore impossible, (2) individuals have free-will and the manner in which astrological indicators at birth manifest in life events is therefore inherently uncertain, (3) some traditions of astrology, sometimes characterised as magical, require manipulation of the world, rendering experimental testing impossible, (4) astrology is a system of interpretation which has no necessary basis in astronomical measurement and (5) astrology may include divine intervention, as in India, rendering testability inherently impossible.

Scientific Research into Astrology

The earliest known systematic attempt to gather empirical data on astrology dates back to Assyria in the seventh century BCE in the compilation of the co-called “Diaries.” The first attempts to test astrological claims date to Johannes Kepler’s (1571–1630) experimental political and meteorological forecasts. Consistent attempts to test astrology date only to the 1950s–1980s. There are three notable examples. The Eysenck-Mayo research (1982) matched zodiac signs to the Eysenck Personality Inventory and concluded that individuals born with the Sun in Aries, Leo, Sagittarius, Gemini, Libra and Aquarius exhibited extroverted qualities, while those born with the Sun in Taurus, Virgo, Capricorn, Cancer, Scorpio and Pisces

were introverted. It was later concluded that the positive results were due to self-attribution in which participants rated themselves in Eysenck’s system according to their astrological profiles. The Carlson research (1985) asked astrologers to match individuals to the California Personality Inventory. The results were negative for astrology but Carlson’s methodology and results have since been challenged (e.g. Currey 2011). The Gauquelin research (1988) had three components. First, the “Character Trait-word Hypothesis” identified astrologically-appropriate descriptions for notable individuals in reference books. This has been challenged on the grounds of selection-bias. Second, the “Heredity Hypothesis” proposed that children tend to be born with the same prominent planets as were their parents. Gauquelin concluded that the phenomenon ceases when birth is induced and the Heredity Hypothesis has neither been replicated nor refuted. Third, the “Eminence Effect” demonstrated that individuals who achieve eminence in sport, politics, the army, theatre, science and literature tend to be born with certain planets rising or culminating. Only the “Mars Effect,” which links sporting achievement to the planet Mars, has been replicated, with claims of both negative and positive results (Ertel and Irving 1996).

Substitute Religion

Both religious and secular critics have defined astrology as a “substitute” or “quasi” religion. The argument is problematic because it assumes that it is possible to identify a “true” or “genuine” religion as opposed to a “false” one. In India, where astrology is one of the vedangas, necessary for the understanding of the Vedas, the sacred texts, and the planets are still linked to gods and goddesses, astrology is an integral part of religion.

New Age

Astrology is often defined as a New Age religion (Campion 2012b). However, while modern astrology is popular in New Age culture and has been shaped by New Age ideology, the term should only be applied in particular circumstances, such as the impact on recent developments in astrology of the belief that a New Age is imminent.

Cross-References

- [Astrology in Islam](#)
- [Astronomy](#)
- [Christian Cosmology](#)
- [Determinism and Indeterminism](#)
- [Free Will](#)
- [History of Ideas \(Intellectual History\)](#)
- [Myth](#)
- [New Age Religions](#)
- [Time](#)

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Description

The discipline featuring as “science of the stars” (*‘ilm al-nujūm*) in medieval classifications of knowledge in Islam actually consists of three parts: (1) astronomy (*‘ilm al-falak*, literally “the science of the sphere” or *‘ilm al-hay’a*, “the science of the exterior shape”), which is concerned with the observation and the mathematical description of the celestial bodies and their movements; (2) a science, otherwise unnamed, to do with tables, calendars, and the calculating of eras; (3) astrology (*‘ilm aḥkam al-nujūm*, literally, “the science of the celestial decrees”), which deals with the prediction of events on earth on the basis of indications from the celestial revolutions (Kennedy 1998; Nallino 1944; Saliba 1982).

Like most other fields pertaining to the “rational sciences,” Islamic astrology is largely indebted to ancient traditions, especially from India, Persia, and Ancient Greece as these traditions were introduced into Islam as part of the translation movement of scientific works initiated in early Abbasid times (Caiozzo 2003). Ptolemy's *Tetrabiblos* remained for long the great model of astrological treatises.

Although it is characterized by a high level of sophistication in its form and a certain abstruseness in its methods of computation, astrology as developed in Islam by its most famous representatives (Māshā'allāh, Abū Ma'shar, the Ikhwān al-Ṣafā', among many others) lays on a few basic assumptions inherited from the Greeks: the geocentric representation of the world, the cyclicity of time and the circularity of all celestial movements, the conception of man as a microcosm and, conversely, that of the universe as a big man, the general sympathy between all elements in the creation, the ontological barrier between the perfect, divine and uncorrupted world of the spheres, and the sublunary world regarded as the place of coming to be and passing away (Sezgin 1979; Ullmann 1972). It appears that the Neoplatonist theory of emanation, by postulating the existence of a process whereby all beings are said to have flowed or “emanated,” like a light, from the original principle, largely contributed to the acceptance of astrology among the philosophical and scientific circles of Islam. From Sassanid Persia,

Astrology in Islam

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Related Terms

[Science of the stars](#)

Islamic astrology borrowed an important theory of conjunctions between Saturn and Jupiter, supposed to induce replacements of individuals on the royal throne, shifts of dynasties from one nation to the next, and changes of empires and religious confessions (de Callatāy 1996; Pingree 1968).

Relevance to Science and Religion

Along with other occult disciplines in Islam such as divination or magic, astrology occupies an interesting position in the scholarly area called “science and religion.” Although not explicitly condemned by the Qu’rān, the practicing of astrology was constantly perceived as dangerous and therefore rejected by the traditionalists of Islam, most notably by Ghazālī and Ibn Taymiyya. In his “On religions and sects,” a well-known treatise of heresiography, Shahrastānī despises as followers of a pseudo-religion all those who, like the members of the pagan sect of Ḥarrān, vowed a cult to the heavenly bodies and thought our lives are influenced by them. In spite of this, astrology never ceased to be practiced and regarded as a genuine science by many (Lemay 2000). To various Shī’ite branches, especially among the Ismailis, the theory of astrological cycles was used as a powerful instrument in order to justify Messianic expectations. But astrology also appealed to those who were supposed to impersonate the strict Sunni orthodoxy. Thus, for instance, al-Manṣūr asked a team of astrologers of his time to cast the horoscope of the foundation of Baghdad to make sure the new capital was founded under the best possible circumstances.

Sources of Authority

Ancient and modern works in the field and their authors.

Cross-References

- [Astrology](#)
- [Astrology in Islam](#)

- [Cosmology](#)
- [Philosophy in Islam](#)

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Astronomy

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Related Terms

[Astrophysics](#); [Cosmology](#); [Universe](#)

Description

Astronomy is the study of luminous celestial objects, of the dark intervening regions of space, and of the observable Universe as a whole. It is primarily an observational science, seeking to

measure and quantify the physical properties of the known constituents of the Universe, and to discover previously unknown celestial objects or phenomena. Astronomers investigate how cosmic objects originate, change, interact, move, and radiate. Theoretical studies, analytical models, and numerical simulations with computers are also employed to help understand these processes. Most significant astronomical discoveries have been accidental and serendipitous. They are the result of using new technology and novel telescopes that extend our vision to places that are not accessible to direct observation, enabling us to “see” the invisible and permitting us to look at the Universe in new ways. Larger and larger optical telescopes, operating at the visible wavelengths we detect with our eyes, have pushed the boundaries of the known Universe beyond our stellar Milky Way, resulting in the discovery of the expanding galaxies, rushing away from us and each other with speeds that increase with their distance. None of these receding galaxies can be seen with the unaided eye. Modern optical telescopes permit detailed scrutiny of the composition, distance, mass, size, position, and motion of the stars and galaxies, in conjunction with spectroscopy and digital detectors, such as the charged-coupled device. These instruments have also recently been used to detect miniscule, periodic stellar motions caused by large planets revolving in unexpected closeness to nearby stars. Smaller telescopes and cameras aboard spacecraft have been hurled past the moons and planets to reveal diverse and unexpected worlds. Ground-based radio telescopes have been used to discover and characterize interstellar hydrogen atoms, giant molecular clouds, pulsars, radio galaxies, quasars, and the cosmic background radiation. X-ray telescopes, lofted above our obscuring atmosphere with rockets and satellites, have been used to discover ten million-degree radiations from objects such as the Sun’s corona, black holes, and intergalactic space in galaxy clusters. Satellite-borne telescopes operating at gamma ray and infrared wavelengths are also making new discoveries, such as the extraordinarily energetic gamma-ray bursts and the infrared heat of protoplanetary disks.

Self-identification

Science

Modern astronomy self-identifies as a science that observes, measures, and quantifies the known physical constituents of the Universe outside Earth, often looking at them in new ways. It assumes that these celestial bodies obey identical physical laws to those on Earth, and uses these laws to explain them. Such explanations are tested and verified through predicted observable consequences.

Religion

Although modern astronomy is not identified as a religion, it has aspects that might be called religious. Astronomers believe, for example, that there is much more to the Universe than is presently known, and that there are hidden patterns and unknown phenomena that await our discovery. Astronomers participate in an endless search for these vast, previously undiscovered aspects of the Universe, often with a sense of awe and wonder. Like religion, astronomy provides us with a sense of something larger than ourselves, transporting us to distant realms far beyond our immediate material world and hectic lives and helping us connect with the immensity of the Universe.

Characteristics

Astronomy is a nonexperimental science in that celestial bodies cannot be taken apart or manipulated by controlled experiments in terrestrial laboratories, and astronomical explanations of cosmic phenomena can only be verified by passive observations. Astronomers study matter in the Universe under extreme conditions of temperature, pressure, or density that cannot be achieved on the Earth.

Relevance to Science and Religion

Astronomy operates under a faith that objective physical laws, which are verified by experimental and observational tests on the Earth, can explain

physical objects throughout the Universe. Like religion, astronomy often seeks a deeper understanding of phenomena that can operate beyond the range of known perception.

Sources of Authority

The ultimate source of authority in astronomy is peer review by repeated observations and predictions. Any astronomical discovery, or explanation of it, must be tested and verified by decisive observations of predictable consequences that are shown to be true or false.

Ethical Principles

Astronomers are skeptical, taught to question any discovery and to test it by significant observations, and they are trained to employ personal detachment and uncompromising honesty. They focus on the predictable, repeatable aspects of the observable Universe, and their results are either right or wrong, either verified or falsified by new observations.

Key Values

The key values of astronomy are the discovery and physical explanation of celestial bodies throughout the observable Universe.

Conceptualization

Nature/World

Astronomers regard nature as equivalent to the observable physical world outside Earth, although the natural terrestrial world is used as a foundation for physical laws thought to be applicable throughout the Universe. Astronomy uses telescopes to investigate all detectable celestial bodies, which most likely amount to just a modest observable fraction of nature, of the vast Universe. Nature is supposed to include both known and currently unknown cosmic objects and phenomena, either perceptible with

today's astronomical instruments or now unseen and detectable by future instruments.

Human Being

Astronomy does not normally consider either human beings or the pains and pleasures of human life. Such topics are thought to be outside the domain of astronomical inquiry.

Life and Death

Astronomers and astrophysicists have shown that our planet and everything on it are composed of elements synthesized either in the nuclear crucibles of stars that exploded into space before the Earth and Sun formed or before that, during the first moments of the Big Bang that gave rise to the expanding Universe. Despite our ability to pry living things apart, identifying their atomic, chemical, and molecular constituents, which can often be found outside Earth, no one has discovered the spark of life, showing how inanimate matter could have been transformed into a living thing, either on our planet or elsewhere. Astronomers forecast that life on Earth will not last forever, and that the entire human race is scheduled for extinction in a few billion years when the brightening Sun will vaporize the Earth's oceans.

Reality

To an astronomer, the real Universe consists of the currently observable one, but they often believe in a yet undiscovered, invisible reality that lies beyond the visible one and includes all that exists. Known celestial bodies, with well-defined, observed physical characteristics, are thought to be real, but so are other ill-defined celestial phenomena such as dark matter, dark energy, and supposedly empty space.

Knowledge

Astronomers regard knowledge of the Universe as a cumulative, ongoing process of the discovery of its ingredients and behavior, and coin new terms to describe newly discovered celestial objects, such as black holes, blazars, pulsars, and quasars.

Truth

Astronomers believe in an objective, scientific truth verifiable by decisive observations and

significant tests. To them, truth in the extraterrestrial world consists of celestial bodies or phenomena that may be repeatedly and consistently observed.

Perception

Astronomers use new technology and novel telescopes to extend the capacity of their physical senses, thereby perceiving, becoming aware of, and eventually understanding otherwise invisible physical objects that lie outside the Earth and are inaccessible to direct observation. These perceptions are repeatable, and can be obtained by anyone using the same or similar instruments.

Time

Because light travels at a finite speed, astronomers look back into time when observing distant objects. As long as light passes through empty space, encountering no atoms or electrons, it can persist forever, bringing its message forward from the beginning of time to the end of the Universe. Powerful telescopes are therefore used as time machines to see objects as they were in the past, when their light was first emitted. They are seen as they were then and not as they might be now. The expanding Universe has a history, which astronomers decipher, but this only applies to times after the Big Bang. No astronomer, astrophysicist, or cosmologist knows for certain what happened before the Big Bang about 14 billion years ago, and time might have even begun with this creative event.

Consciousness

To an astronomer, consciousness is the mental awareness of the surrounding Universe, involving the perception of any physical object that exists, both visible and invisible.

Rationality/Reason

An astronomical concept is rational if it is grounded in direct, verifiable observations of celestial bodies, and explained using accepted physical laws. Speculative explanations of cosmic phenomena, including those based on mathematical equations, may not be fully rational in an astronomer's sense if they have not been decisively tested by significant observations.

Mystery

The entire Universe is regarded as a great hidden mystery awaiting discovery and understanding, and its known constituents may also have mysterious aspects that remain to be examined and understood.

Relevant Themes

There are many critical, unexplained aspects of the Universe that lie outside the domain of direct astronomical observations, and are concerns of religion. They include the origin and fate of the Universe and life within it. No astronomer, astrophysicist, or cosmologist knows for certain what happened before the Big Bang, or how the observable Universe came into being, and they do not know if life originated from inanimate matter, or exactly what might have provided the spark of life on Earth. And owing to the recent discoveries of dark matter and dark energy, which we know almost nothing about, the eventual fate of the observable Universe remains unknown, despite the fact that distant galaxies are now accelerating into invisibility.

Cross-References

- ▶ [Astronomy](#)
- ▶ [Astrophysics](#)
- ▶ [Geography in Islam](#)
- ▶ [Physics in Christianity](#)
- ▶ [Physics in Judaism](#)
- ▶ [Physics in Protestantism](#)
- ▶ [Science in Buddhism](#)
- ▶ [Space](#)
- ▶ [Space and Time](#)
- ▶ [Time](#)

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Astronomy in Judaism

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Related Terms

[Cosmology in the Jewish culture](#); [Jewish cosmology](#); [Jews and the study of the universe](#); [Judaism and the study of the universe](#)

The opening chapters of the Book of Genesis in the Hebrew Scriptures draw a very general but simple picture of what the universe looks like. It is that picture that frames subsequent interpretations of the narratives within the Jewish Bible and guides their interpretation. The cosmology of Genesis divides all of space into two distinct regions, one governed by light (called “day”) and the other guided by dark (called “night”). Similarly, this occupied space is divided into two regions. There is a central disk of earth, surrounded by a ring of water, above which is a ring of fire. The one deity, named “Elohim,” is the sole active agent in this story of creation. He wills divisions in the space of the earth forming waters below the disk of the earth as well as waters above the disk (called “seas”). Furthermore, he stretches out something called a “firmament” (raqiya’ in Hebrew, which literally means a stretcher) to isolate between the earth and its upper waters on the one hand and the ring of fire on the other hand a bubble (so to speak) of air, called “the sky” (ha-shamayyim in Hebrew, a word that suggests a compound substance of fire and water). The sky divides the upper waters into “seas” and rests upon a now waterless surface of earth called “dry lands”. Together, this two-part rotating space (day and night) houses two distinct spatial territories (earth and sky) that are home to all living things. The inhabitants of the sky are those objects we would recognize as celestial bodies – stars as well as planets, while the inhabitants of the earth include living things that swim

in the waters, fly above the earth, and either crawl or walk upon the surface of the earth.

The above conception of the cosmos undergoes radical change as it is interpreted by the early rabbis in their commentaries on the biblical text. These commentaries are called “midrash.” Without explicitly referencing their scientific sources in the Greco-Roman world, scientific sources (i.e., sources from natural philosophy) are used to transform biblical cosmology into a rabbinic cosmology that reflects a form of synthesis of the early Hebrew culture with the contemporary Hellenistic culture. With respect to cosmology, the rabbinic view of the cosmos has the following distinctive features: First, the original light of creation disappears from the cosmos and is seen rather as something reserved for a world to come when this world comes to an end, a light that early modern utopians and messianists will identify with “enlightenment.” Second, to the three elements of the biblical cosmos – earth, fire, and water – the rabbis add the fourth element of Greco-Roman science – air. Third, the two regions of reality – earth and sky – coalesce into a single region called “this world,” which is opposed to a hoped for vision of another, presumed better “world to come.” Fourth, the mover of the biblical cosmos, called “God’s wind,” becomes two distinct entities – God (Elohim) and spirit (Ruach) of God, and the spirit increasingly becomes associated with aspects of God through whom communication between God and humanity is transmitted. Whereas the biblical text speaks only of God, who rules all creation through commandments, the rabbis increasingly diversify God’s functions, each reflected by different divine names – God (Elohim), the Lord (YHWH), the Presence (Shekhinah), the Place (ha-Makom), etc. What are the ontological references of all of these names will become a major theological issue for subsequent rabbinic Judaism no less than it is for the offshoots of this early Judaism – Islam and Christianity.

It is the medieval Jewish (as well as Muslim and Christian) philosophers who work out in detail this synthesis of biblical and hellenistic cosmologies that becomes the authoritative view

of the cosmos in subsequent Jewish, Muslim, and Christian philosophy. This synthesis is formulated between the twelfth and fourteenth centuries. It reflects the best of Aristotelian-based empirical astronomy synthesized with the best of Platonic-based natural theology as the context for a radically non-literal interpretation of what the creation accounts in the Hebrew Scriptures really mean. The composites of the now four elements are defined by what they are rather than by what they do, and while their function in a sacramental food chain continues to describe them, it is no longer part of the expression of who and what they are. In other words, although sacramental food continues to have special importance in the spiritual life, it ceases to be in any sense near as important as a scientific category of animal classification. Finally and possibly most importantly, “nefesh” ceases to mean just breath and comes to mean a nonphysical entity called “soul.” The study of “nefesh” defines a radically distinct field of scientific or naturalist study, the field of psychology. Whereas physics and astronomy study objects that are material, psychology studies objects that are spiritual or mental, where material and physical are closely associated and spiritual and mental are closely associated, but increasingly the two intellectual fields of study are seen to share little in common.

This medieval synthesis of rabbinic dogma is shattered by the new sciences of modernity. In fact, it can be argued that the demands for conceptual synthesis between the past and present science are so radical that, unlike the transition from biblical to Hellenistic, no synthesis is possible. Whatever is the case in theory, in actuality, no synthesis has yet succeeded. Rather, the tendencies are to affirm one over the other (the modern scientific over the traditional Jewish cosmology or vice versa), to radically separate the two (claiming that cosmology is a scientific question for which Jewish thought has no relevance or that rabbinic tradition guides our view of the cosmos and in this context what science says is irrelevant) into absolutely distinct epistemic domains. The most dramatic separations between the two cosmologies have to do

with (1) the age of the cosmos, (2) the nature of the cosmos, and (3) the causal principles of the cosmos.

First, if Biblical time references are taken literally, then the age of the cosmos will turn out to be something like what the rabbi’s calendar marks as the age of the universe, which as of 2009/2010 A.D. is 5,770 years old. In contrast, physical cosmology suggests something like what is called a “hot big bang model” according to which the universe is 13.7 billion years old. Now this is a quantitative difference so great that it suggests that the two conceptions of the universe are different qualitatively.

Second, all premodern views of the cosmos posit a universe sharply distinguished by kinds. Things are not all the same; there are real principled differences between entities. However, in modern cosmology, the distinctions collapse. In fact – in a spirit totally coherent with modernity’s adoption of an inherent value in democratic forms of government – everything is in fundamental, natural components the same. Irrespective of the particular cosmology employed – be it biblical or medieval – there is a persistent belief that differences matter – between humans and other species as well as between Jews and other nations. However, according to modern physical cosmology, everything that has ever existed in the past, or exists in the present, or will exist in the future, has its origin in a vast sea of totally undifferentiated plasma. In the moments following the beginning of everything, as the universe gradually cools and expands, forces emerge – first gravity and the strong force (at about 10^{-43} – 10^{30} of a second after the big bang of creation), followed by the weak force and electromagnetism (at about 10^{-12} – 10^6 of a second after creation), followed by the first physical entities. At 3 minutes and 20 seconds after the creation, atomic nuclei emerge from energy soup, leading to distinct fundamental particles. Some 150 million to 1 billion years after creation, there form stars and galaxies. Some 8 billion years ago, our solar system formed out of the particles in our galaxy, which, in turn, gave rise some 2.3–2.4 Ma ago to the first members of genus homo on planet earth,

and then, a mere 400–250 thousand years ago to the first *Homo sapiens*.

Third, and probably most importantly, the kinds of causal principles admissible in explaining change within the cosmos are different. Aristotle had listed four kinds of causes – formal, material, efficient, and final – and insisted that any valid scientific explanation would involve a synthesis of all of them. The biblical narrative is easily adaptable to Aristotle’s classification for the biblical text speaks of efficient causes wedded to final, i.e., teleological causes (viz., distinct divine speech acts as efficient causes wedded to proclamations that what God says is “good” (tov) as final causes). But modern cosmology, like modern science in general, admits only mechanical causes. Whereas the biblical and rabbinic cosmology interpreted all events as purposeful, modern cosmology interprets all events as purposeless, viz., as expressions of natural accidents.

All of these differences can and have been reconciled in Jewish religious thought in one way or another with one single exception. Whereas the standard scientifically oriented interpretations of the cosmos consistently tend to see the universe as a product of mechanical forces operating on what is ultimately a cosmic accident, the rabbinic understanding of the universe as God’s creation demands that the cosmos be understood as something “good,” i.e., that exhibit an ordering that is subject to moral judgment.

Cross-References

- [Cosmology](#)
- [Creation in Judaism](#)
- [Historical Theology](#)
- [History of Ideas \(Intellectual History\)](#)
- [Judaism: An Overview](#)
- [Natural Sciences in Judaism](#)
- [Philosophy in Judaism](#)
- [Philosophy of Science](#)
- [Physics](#)
- [Physics in Judaism](#)
- [Space and Time](#)

- [Theology in Judaism](#)
- [Time](#)

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Astronomy in Islam

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Related Terms

[Arabic astronomy](#); [Astronomy in Islamic civilization](#); [‘Ilm al-falak](#); [‘Ilm al-hay’a](#); [‘Ilm al-nujūm](#); [Islamic science](#)

Description

Civilizations in which Islam was the religion of either the rulers or the majority of the population were the cultural context for several hundred years of remarkable achievements in astronomy. While astronomy was sometimes in a conversation with Islamic law, speculative theology (*kalām*), and *Qur’ān* commentary and

while at other times Islamic astronomy served clearly religious applications (such as the determination of the direction and times of prayer (*qibla*)) (King 2004/2005, Vol. 1), Islamic astronomy was driven by more than religious concerns. Astronomy in Islam aimed at an increasingly precise description of the universe, whether in the domains of physical consistency of observations, more accurate observations and tables, or theories' predictive accuracy.

There is evidence of astronomical activity and translation of astronomy texts under the Umayyads (661–750); both activities intensified under the Abbasids (750–1258). Recent scholarship has attributed the rise of science in Islam to practical considerations rooted in the engineering, architectural, and computational needs of the expanding empire as well as the political prestige associated with patronizing science and using astrology publicly (Saliba 2007, pp. 25–72). Older accounts had paid more attention to wholly intellectual motivations, including religious exhortations to seek knowledge. The earliest astronomical texts to be transmitted and translated were astronomical handbooks with tables (Ar. *zīj*, plural *azyāj*).

Frequently, practical applications spurred theoretical advances and further translations. For example, in the ninth century, the practical application of *qibla* calculation led to developments in trigonometry. And after the al-Ḥajjāj ibn Maṭar translation of Ptolemy's *Almagest*, the caliph al-Ma'mūn (d. 833) patronized observations that assessed and improved parameters such as the length of the solar year, the obliquity of the ecliptic, and the precession of the equinoxes (Sayılı 1960, pp. 51–87; Charette 2006, p. 125). All of these observations had applications in calendar calculations and astrology and affected the physical models proposed to represent celestial motions. A subsequent *Almagest* translation included improved values for those parameters; even Ḥajjāj's translation had improved Ptolemy's parameters (Saliba 2007, pp. 79–80). Major observational work continued in the tenth century. As was the case previously, rulers' interest in astrology, an application of a *zīj*, was a motivation. For instance, the Buyid ruler 'Aḍud al-Dawla (d. 982)

studied astronomy and patronized astrology, along with his descendants, an impressive program of observations (Sayılı 1960, pp. 105–109; Charette 2006, pp. 127–128 and 133). Beginning in the tenth century, astronomers in Andalusia and North Africa began to develop models for precession and variations in precession (trepidation) (Comes 1996).

The prominence of astrology in Islamic civilization among political, intellectual, and, occasionally, religious elites elicited various reactions. Some of these reactions addressed astrologers' inability to produce accurate predictions. But others targeted astrology's theoretical dependence, particularly after the ninth century, on *falsafa*, philosophy in the Hellenistic tradition. Astrological predictions also had religiously objectionable implications for personal responsibility and understandings of divine foreknowledge. As a result of these debates about astrology, astronomers began to distinguish their science (increasingly known as '*ilm al-hay'a*') from judicial astrology and refashioned astronomy's relationship with *falsafa* (Saliba 2007, pp. 78–79, 174–176).

The need for patronage meant that astrology never disappeared as an application for astronomy. Even al-Bīrūnī (d. c. 1048), an astronomer who paid little heed to *falsafa* (Ragep 2001, pp. 58–59), wrote a text on astrology for the daughter of his patron. Bīrūnī's most famous work was his *al-Qānūn al-Mas'ūdī* (*The Mas'udic Canon*) a handbook of astronomy with tables that reflected his own observations as well as his extensive familiarity with the work of others. He also wrote works on trigonometry and on transits. His *India*, in which astronomy was only a single topic among many, was a masterpiece of ethnography.

By 900, Ptolemy's geometric and physical models to account for the observed positions of the planets had become dominant in Islamic civilization. One of Ptolemy's (fl. 125–150 C.E.) insights had been to determine, mathematically, the point about which a planet's mean motion was uniform. This point came to be known as the equant. Because the equant was not the center of an orb (or the center of the Earth), and because Ptolemy accounted for a planet's mean motion with an orb, the existence of the equant was

physically and philosophically inconceivable since orbs had to rotate uniformly about their centers. Aiming for a more accurate picture of the cosmos, Ibn al-Haytham's (d.c. 1040) *Doubts Against Ptolemy* (Ar. *al-Shukūk 'alā Baṭlamyūs*) catalogued this and other inconsistencies in Ptolemy's work (Saliba 2007, pp. 173–179).

Scientists associated with the Marāgha Observatory in Azerbaijan, such as Mu'ayyad al-Dīn al-'Urdī (d. 1266), Naṣīr al-Dīn al-Ṭūsī (d. 1274), and Quṭb al-Dīn al-Shīrāzī (d. 1311), developed innovative models, consisting entirely of orbs rotating uniformly about their own centers, that accounted for the available observations. In so doing, these astronomers removed the physical and philosophical inconsistencies of the equant point. Ibn al-Shāṭir (d. 1375) an astronomer and mosque timekeeper from Damascus continued the intellectual project of the Marāgha astronomers (Saliba 2007, pp. 131–170); Ibn al-Shāṭir's models resurfaced in Copernicus' *De Revolutionibus*, having been transformed into heliocentric models (Saliba 2007, pp. 193–232). Observations were an important part of the research associated with Marāgha, and as astrological forecasts were one motive for Hülegü's patronage, better observations would mean better forecasts (Sayılı 1960, p. 202). But astronomers associated with Marāgha also related observations to theoretical concerns. Al-Maghribī (d. 1283) carried out observations to find new parameters for the solar model, which was crucial for timekeeping. Maghribī also wrote on astrology. Ṭūsī's *Zīj-i İlkhānī* (*The Ilkhanid Astronomical Handbook*) contained a new value for the precession of the equinoxes, a parameter that would help astronomers calculate future celestial positions. Though the Ptolemaic solar model did not suffer from the difficulty of the equant, Ibn al-Shāṭir proposed a new solar model which better fit the available observations.

Theoretical and observational activity continued at the observatory in Samarqand in the fifteenth century under the leadership of Ulugh Bey (d. 1449). At Samarqand was a *madrasa* with science as part of the curriculum (Fazlıoğlu 2008, pp. 3–68). The instruments at Samarqand were on a large scale and were the

model for later observatories, such as the one at Jaipur. In the sixteenth century, Taqī al-Dīn ibn Ma'rūf used a comet to predict military success for the Ottomans (Sayılı 1960, pp. 289–305).

Astronomy became part of a tradition of religious scholarship not only because of the emerging division between astronomy and astrology but also because religious texts, from early on in Islamic civilization, paid attention to scientific developments. Early *Mu'tazilī kalām* texts, for instance, argued implicitly against the emerging *falsafa*. Al-Ghazālī (d. 1111) subjected science and natural philosophy to a sustained critique in *The Incoherence of the Philosophers* (Al-Ghazālī 1997/2000, pp. 166–177). *Mutakallimūn* (practitioners of *kalām*) did not aim to advance astronomy, but their arguments forced astronomers working in a religious milieu to couch more carefully the physical foundations of their own science. In the following centuries, *mutakallimūn* and *Qur'ān* commentators incorporated astronomical material into their own treatises (Morrison 2007, pp. 95–125; Sabra 1994, pp. 34–42). Once Ghazālī had pointed out the weaknesses of *falsafa*, the theoretical aspects of astrology, such as the idea that the heavens were a cause (though not an independent cause) of terrestrial events, found their way into some *Qur'ān* commentaries. Many of the astronomers associated with Marāgha (e.g., Ṭūsī, Shīrāzī, and Nizām al-Dīn al-Nisābūrī (d. c. 1330)) achieved recognition for their writings on religious subjects. Perhaps the culmination of scholars pursuing both scientific and religious subjects was 'Alī Qushjī's proposal for an astronomy founded on axioms derived wholly from observation and mathematics and not at all from natural philosophy as had been the case in the past (Ragep 2001, pp. 61–63).

Astronomy became part of a tradition of religious scholarship also because astronomy could enhance one's appreciation of God's creation of the cosmos (Ragep 2001, p. 63). Certain religious scholars introduced a skepticism about human perception to undercut the authority of astronomers (Morrison 2007, pp. 108–112). That skepticism, though, pitted itself against the ability of astronomy to enlighten Muslims as to the wonders of God's creation. One astronomer

working in a religious milieu, Nīsābūrī, used his relative confidence in knowledge derived from astronomy to convey a sense of wonder and mystery at all that he did not know. More important, Nīsābūrī drew a parallel between patterns of reasoning in Islamic law and patterns of reasoning in astronomy (Morrison 2007, pp. 70–72).

There was no astronomy unaffected by Islam to compete with *‘ilm al-hay’a*, but there was a competing astronomy based entirely on revealed sources (Heinen 1982). Astronomy affected Islam and vice versa. But astronomy in Islamic civilization and Islam still had, in the end, different sources of intellectual authority. Astronomy was classified apart from sciences such as Islamic law or *Qur’ān* commentary for the source of authority was the intellect not revelation. The intellect could be authoritative if the science contained nothing religiously objectionable. Matters of intellectual authority, the position of science in religious scholarship, and religious objectionability are the ways in which astronomy in Islamic civilization is relevant to a broader discussion about religion and science. Matters of intellectual authority are, then, bound up in how astronomers in Islamic civilization conceived of knowledge.

Cross-References

- [Astrology in Islam](#)
- [Mathematics in Islam General](#)
- [Philosophy in Islam](#)
- [Physics, Science in Islam](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)
- [Science in Islam, Classification](#)
- [Science in Islam, Transmission](#)
- [Theology in Islam](#)
- [Typologies in Science and Religion](#)

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Astronomy in Islamic Civilization

► [Astronomy in Islam](#)

Astrophysics

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Related Terms

[Astronomy](#)

Description

Astrophysics is the application of the known laws of physics and/or theoretical models to understand

the known contents of the Universe, such as planets, stars, and galaxies, whose discovery and quantitative physical properties have been previously established by astronomical observations. Astronomers determine the luminosity, distance, size, mass, density, chemical composition, motion, and magnetic fields of these cosmic objects, while astrophysicists interpret and explain the astronomical observations using diverse aspects of physics, including dynamics, mechanics, statistical mechanics, continuum and line radiation processes, atomic and molecular physics, quantum mechanics, nuclear and particle physics, thermodynamics, and special and general relativity. Good astrophysics includes the prediction of definitive, new observational consequences. An example was the interpretation of pulsars, discovered by radio astronomers, as radio beams emitted from rotating neutron stars, with the prediction that the observed pulsar periods would lengthen as time goes on and the rotational energy of the neutron star is expended. Bad astrophysics includes mathematical speculations with sufficient adjustable parameters to accommodate most future observational tests. Recent developments in astrophysics include the explanation of the pervasive 3° microwave background as the relic radiation of the Big Bang; galaxy formation in the earliest stages of the expanding Universe; the interpretation of cosmic X-ray sources in terms of a neutron star or black hole that is accreting material from a nearby stellar companion; and the implications of unexpectedly high-speed motions at the peripheries of galaxies or within galaxy clusters in terms of invisible dark matter required to hold the visible moving material together. More speculative astrophysical concepts, which may not be stringently constrained by observations, include theories of the origin of the Big Bang, cosmic inflation, dark matter and dark energy, and string theory.

Self-identification

Science

Astrophysics self-identifies as a science that explains the observed physical properties of the

known physical constituents of the Universe outside the Earth. It assumes that these celestial bodies obey identical physical laws to those on Earth, such as the laws of universal gravitation, dynamics, and thermal radiation. Astrophysicists use these laws to describe celestial bodies, with explanations that can be tested and verified by decisive observations.

Religion

Astrophysics is not a religion, but it incorporates a belief in ordered physical behavior described by laws that operate throughout the observable Universe.

Characteristics

Astrophysics is a nonexperimental science in that celestial bodies cannot be taken apart or manipulated by controlled experiments in terrestrial laboratories, and astrophysical explanations of cosmic phenomena can only be verified by passive observations. Astrophysicists study matter in the Universe under extreme conditions of temperature, pressure, or density that cannot be achieved on Earth.

Relevance to Science and Religion

Astrophysics operates under a faith that objective physical laws, which are verified by experimental and observational tests on Earth, can explain physical objects throughout the Universe. Like religion, astrophysics often seeks a deeper understanding of phenomena that can operate beyond the range of known perception.

Sources of Authority

The ultimate source of authority in astrophysics is peer review by application of known physical laws, mathematical calculations, and verifiable predictions of observational consequences. Any astrophysical explanation of celestial phenomena must be tested through decisive, new

observations that show that the explanation is true or false, right or wrong.

Ethical Principles

Astrophysicists are skeptical, taught to question any discovery and to test it by repeated calculations and predictions of significant observations, and they are trained to employ personal detachment and uncompromising honesty. They focus on the predictable, repeatable aspects of the observable Universe, and their results are either verified or falsified through an ongoing process of peer review.

Key Values

The key value of astrophysics is the physical explanation of celestial bodies throughout the observable Universe.

Conceptualization

Nature/World

Astrophysicists regard nature as equivalent to the physical world outside Earth, although the natural terrestrial world is used as a foundation for physical laws thought to be applicable throughout the Universe. Nature is supposed to include both known and unknown cosmic objects and phenomena, either perceptible with contemporary astronomical telescopes or currently unseen and potentially observable with future instruments.

Human Being

Astrophysics does not normally consider either human beings or the pains and pleasures of human life. Such topics are thought to be outside the domain of astrophysical inquiry.

Life and Death

Astronomers and astrophysicists have shown that our planet and everything on it are composed of elements synthesized either in the nuclear crucibles of stars that exploded into space before the

Earth and Sun formed or before that, during the first moments of the Big Bang that gave rise to the expanding Universe. Despite our ability to pry living things apart, identifying their atomic, chemical, and molecular constituents, which can often be found outside Earth, no one has discovered the spark of life, showing how inanimate matter could have been transformed into a living thing, either on our planet or elsewhere. Astrophysicists forecast that life on Earth will not last forever, and that the entire human race is scheduled for extinction in a few billion years when the brightening Sun will vaporize the Earth's oceans.

Reality

To an astrophysicist, the real Universe consists of the currently observable one, but they often believe in a yet undiscovered, invisible reality that lies beyond the visible one and includes all that exists. Known celestial bodies, with well-defined, observed physical characteristics, are thought to be real, but so are other ill-defined celestial phenomena such as dark matter, dark energy, and supposedly empty space.

Knowledge

Astrophysicists regard knowledge of the Universe as a cumulative, ongoing process of the discovery and explanation of its ingredients and behavior.

Truth

Astrophysicists believe in an objective, scientific truth verifiable by decisive observations and significant tests. To them, truth in the extraterrestrial world consists of celestial bodies or phenomena that may be repeatedly and consistently observed and explained by known physical laws.

Perception

Astrophysicists provide possible explanations for the observations of astronomers who use new technology and novel telescopes to extend the capacity of their physical senses, thereby perceiving, becoming aware of, and eventually understanding otherwise invisible physical objects that lie outside the Earth and are inaccessible to direct observation. These perceptions are repeatable, and can be obtained by anyone using the same

or similar instruments. Some astrophysicists regard mathematical extrapolations of existing physical laws as a method of perception.

Time

Because light travels at a finite speed, astronomers look back into time when observing distant objects. As long as light passes through empty space, encountering no atoms or electrons, it can persist forever, bringing its message forward from the beginning of time to the end of the Universe. Powerful telescopes are therefore used as time machines to see objects as they were in the past, when their light was first emitted. They are seen as they were then and not as they might be now. The expanding Universe has a history, which astrophysicists decipher, but this only applies to times after the Big Bang about 14 billion years ago. No astrophysicist knows for certain what happened before the Big Bang, and time might have even begun with this creative event.

Consciousness

To an astrophysicist, consciousness is the mental awareness of the surrounding Universe, involving the perception of any physical object that might be explained by known physical laws.

Rationality/Reason

An astrophysical concept is rational if it uses accepted physical laws and can be decisively tested by significant observations. The use of mathematical equations in applications of physical laws to astrophysical situations may also be considered rational.

Mystery

The entire Universe is regarded as a great hidden mystery awaiting discovery and understanding, and its known constituents may also have mysterious aspects that remain to be examined and understood.

Relevant Themes

There are many critical, unexplained aspects of the Universe that lie outside the domain of

astrophysics, and are concerns of religion. They include the origin and fate of the Universe and life within it. No astrophysicist knows for certain what happened before the Big Bang, or how the observable Universe came into being, and they do not know if life originated from inanimate matter, or exactly what might have provided the spark of life on Earth. And owing to the recent discoveries of dark matter and dark energy, which we know almost nothing about, the eventual fate of the observable Universe remains unknown, despite the fact that distant galaxies are now accelerating into invisibility.

Cross-References

- ▶ [Astronomy](#)
- ▶ [Cosmology](#)
- ▶ [Physics in Christianity](#)
- ▶ [Physics in Judaism](#)
- ▶ [Physics in Protestantism](#)
- ▶ [Science in Buddhism](#)
- ▶ [Space](#)
- ▶ [Space and Time](#)
- ▶ [Time](#)

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ATP

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Adenosine triphosphate. The energy exchange medium in the biological cell. It is a chemical

that has three phosphate groups lined up in a row, the outer one of which is susceptible to being detached in such a way as to free up energy for use by the cell. The ATP can be regenerated from ADP (adenosine diphosphate) and Pi (inorganic phosphate) by an enzyme, using energy obtained from food in animals and from sunlight in plants, to reattach the third phosphate.

Attachment: Theory and Patterns

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Related Terms

Caregiving; Mental representations;
Relationships; Religion as attachment; Spirituality

Normative Aspects of Attachment Theory

The term attachment refers to a strong disposition on the part of the offspring in many mammalian species to seek proximity to and contact with a specific figure and particularly to do so in certain situations such as when he or she is frightened, ill, or tired. John Bowlby, the founder of attachment theory (Bowlby 1969–1980), sought to understand this mammalian phenomenon by drawing mainly on principles from control systems theory and the theory of evolution by natural selection but also by incorporating selected principles from psychoanalysis (particularly the object relations theory and the independent school of British psychoanalysis), information processing theory, and the early literature on artificial intelligence. Bowlby argued that attachment behaviors have been naturally selected by mammalian species' ancestral environments (i.e., environments of evolutionary adaptedness, EEA) by keeping the offspring in physical proximity to their caregivers and thus protected from natural

dangers, such as predation. In other words, physical proximity is the predictable outcome (or set goal) of attachment behaviors, and increased chances of survival, in turn potentiating future reproductive success, is their evolutionary function. According to Bowlby, attachment behaviors are governed by an attachment behavioral system. This system is believed to be universal and to work similarly to mechanical systems, such as thermostats and goal-directed missiles, but to have been programmed by EAS rather than humans. Like other control systems, the attachment system is activated by certain conditions and deactivated by others. The attachment system is held to be activated by natural clues to danger, which can have both external (e.g., physical separation, predators approaching) and internal (e.g., fear, illness) sources. The system is held to be deactivated by natural clues to safety, most notably physical contact with the figure selected out as a source of security and safety (i.e., the Attachment Figure).

The attachment system is one among many evolved systems (e.g., exploration, reproduction, caregiving systems). Flexibility of functioning for the organism requires that these systems communicate rather than operate in isolation. For example, activation of the attachment system should be associated with deactivation of the exploratory system; when frightened by a sudden, loud sound, the offspring ceases to play (i.e., explore) and instead moves closer to the attachment figure (i.e., displays attachment behavior). The offspring's attachment system also operates in close synchrony with the caregiver's caregiving system, for example, when the former part is frightened and cries, (i.e., displays attachment behavior) the latter moves closer and picks him or her up (i.e., displays caregiving behaviors).

During the first year of life, the offspring typically develops one or a few attachment relationships, typically with their primary caregiver (s). Although the term "attachment" has broad connotations in everyday language, attachment relationships differ from other relationships (including close relationships in general) in important ways. Bowlby (1969–1980) and his

close collaborator Mary Ainsworth used the term “attachment relationship” to denote a strong affectional bond between two individuals, in which none is interchangeable with others. The attachment figure accomplishes two important functions for the attached person: (a) provides a safe haven in times of threat or stress and (b) serves as a secure base from which to explore the environment and develop new mental and physical skills. The attached person also resists separation from the attachment figure and experiences anxiety when involuntarily separated. Moreover, loss of the attachment figure leads to grief and mourning. Finally, the attachment figure is, at least implicitly, viewed as stronger and wiser by the attached person.

Bowlby (1969–1980) also argued that the offspring develops a set of partly unconscious mental representations, or internal working models (IWMs), of self and other, based on his or her interaction history with the attachment figure(s). These IWMs are held to reflect real experiences, to be continually updated based on new experiences, and to generalize to the individual’s representations of self and other in future relationships. Although IWMs are continually updated, principles of cognitive assimilation and behavioral automatization make a complete transformation of IWMs based on later experiences less likely. Therefore, Bowlby expected general continuity of IWMs across maturation and relationships while acknowledging that in the wake of radical and lingering shifts in experience, lawful discontinuity was to be expected. The partly unconscious nature of IWMs stems from the immaturity of the brain’s memory systems at early ages of development. In memory terms, early interactions with attachment figures are stored as implicit or procedural memories rather than as explicit or declarative memories.

Bowlby argued that psychological defenses are closely linked to peoples’ mental representations of self and other. In particular, he suggested that individuals who have consistently or often encountered insensitive caregiving will defensively come to exclude this information, for example, about parental rejection, from their

conscious experience and associated explicit/declarative memories. This, Bowlby believed, is especially likely if the caregiver provides inconsonant information to the child (e.g., “I love you so much”). In this example, the child is likely to develop an implicit/procedural representation of the self as unworthy of care and others as unlikely to provide care but an explicit/declarative representation of themselves as self-sufficient and others as loving. In other words, defensive exclusion was thought to lead to a structural incoherence (or multiplicity) of working models. Part of the strategy believed to underlie defensive exclusion is a defensive shift of attention, characterized by the individual attending to other aspects of the environment (e.g., toys) instead of, for example, a rejecting caregiver. Although Bowlby used information processing terminology, his usage of the term “defensive” (rather than merely “selective”) in reference of exclusion implied that a child who has received insensitive care uses a self-protective strategy to enable himself or herself to maintain behavioral organization vis-a-vis the caregiver and to ward off potentially overwhelming feelings of anxiety and anger. This account clearly connects Bowlby’s theory to the psychoanalytic idea of defense mechanisms. However, when the child’s needs for safety and security have been consistently met, according to Bowlby, the child will not need to resort to defensive strategies. In consequence, the IWMs of such individuals will display structural coherency (or singularity), where the child’s conscious/explicit feeling of worth will correspond with his or her actual (procedural/implicit) disposition to seek out care and advice when needed.

Individual Differences in Attachment Organization

Utilizing a semi-structured 20-min, 8-episode separation-reunion laboratory procedure for infants and toddlers, known as the strange situation procedure, Ainsworth and colleagues (1978) identified individual differences in child-caregiver attachment patterns (i.e., secure [B], insecure/avoidant [A], and insecure/resistant [C])

attachment). This procedure combines elements aiming at activation of both the child's attachment (i.e., novel environment, a participating stranger, separation from the attachment figure) and exploratory (i.e., novel attractive toys) systems. In this procedure, secure children strike a balance between attachment and exploration; they tend to use the attachment figure as a secure base for constructive exploration and protest separation, actively seek physical contact and/or interaction with the attachment figure on reunion, be comforted by the renewed contact with the attachment figure, and finally return to exploration. Avoidant children tend to engage in (defensive) exploration at the expense of attachment (i.e., a minimizing attachment strategy (Main 1991)); their exploration is marked by independence, they typically do not protest separation, and they do not seek physical contact or interaction with the attachment figure on reunion; indeed, they may even subtly avoid the attachment figure. Resistant children tend to engage in attachment at the expense of exploration (i.e., a maximizing attachment strategy (Main 1991)); they tend to cling to or be preoccupied with the attachment figure even prior to separation, protest separation strongly, and intermingle between passivity and angry resistance (e.g., temper tantrums) on reunion with the attachment figure, without returning to any constructive exploration. Mary Main and Judith Solomon (Main and Solomon 1990) subsequently identified a fourth category, known as insecure/disorganized/disoriented attachment, characterized by various behavioral breakdowns in attachment-related patterning in the presence of the attachment figure (e.g., prolonged freezing, marked anomalies or stereotypies, and sequential or simultaneous displays of opposing behaviors, such as moving away from parent while crying).

Empirical research has shown that aspects of caregiving tend to be the most robust and consistent predictors of attachment quality as assessed with the strange situation procedure, while the direct role (i.e., main effect) of genetic heritability has been found negligible in normal (twin) populations (Cassidy and Shaver 2008). More specifically, caregivers of children subsequently

classified as securely attached tend to be reliably sensitive to their child's signals (i.e., responding promptly and appropriately), caregivers of avoidant children tend to reject their child's attachment behaviors (e.g., show signs of discomfort with physical contact), caregivers of resistant children tend to be markedly inconsistently responsive (i.e., sometimes sensitive, oftentimes neglecting), and caregivers of disorganized children tend to be abusive and/or subtly frightening, dissociative, or frightened (Cassidy and Shaver 2008).

Individual differences in early attachment organization have been established as an important predictor of various aspects of socioemotional development in several long-term prospective longitudinal studies (Cassidy and Shaver 2008). For example, secure attachment has been found predictive of a high social competence and a low degree of behavioral problems throughout childhood and adolescence. In contrast, disorganized attachment has been established as an important attachment-related risk factor in development as it foreshadows later behavioral problems (e.g., aggression), dissociative inclinations, and psychopathology (Cassidy and Shaver 2008).

Attachment in Adulthood

Bowlby (1969–1980) emphasized that the attachment behavioral system is active “from the cradle to the grave,” and he suggested that long-term adult romantic or marital relationships are often the principal attachments in adulthood. Based on this notion, social and personality psychologists (Hazan and Shaver 1987; Mikulincer and Shaver 2007) began to study attachment-related aspects of adult relationships. Like Bowlby, these scholars suggested that the attachment, caregiving, and reproductive behavioral systems are integrated in long-term adult pair-bonds, for example, a given adult partner both gives and receives care within the pair-bond. In other words, unlike child-parent attachments, adult pair-bonds are symmetrical (i.e., none of the partners are consistently seen as stronger and wiser).

Based on the idea that adult pair-bonds involve attachment components, Cindy Hazan

and Phillip Shaver (1987) constructed a brief self-report questionnaire measure to assess adult attachment style, that is, an adult's typical perceptions, expectations, and behavioral inclinations in adult pair-bonds and other close adult relationships (see (Mikulincer and Shaver 2007) for methodological developments). Since then, attachment theory has established the position as one of the leading frameworks for understanding close relationships across the life span within many disciplines in psychology (most notably developmental, clinical, social, and personality psychology).

Religion as Attachment

Attachment theory has also made an important contribution to the psychology of religion (Kirkpatrick 2005; Granqvist and Kirkpatrick 2008; Granqvist et al. 2010). From the early 1990s onward, Lee Kirkpatrick has argued based on religious phenomenology and a review of 100 years of research and theorizing in the psychology of religion that believers' perceptions of God and their own relationship with God often tend to meet the established criteria for defining attachment relationships. In other words, God is viewed and used as an attachment figure, especially in theistic faith traditions characterized by the idea of a personal God with whom one may have a personal relationship. For example, regarding the proximity component of attachment, an important function of prayer is to establish a sense of connection or closeness to God. Also, people tend to turn to God as a safe haven when distressed. One example is that an overwhelming majority of sudden religious conversions occur during life situations of emotional turmoil. In addition, believers tend to describe God with words that are analogous to those used to describe other secure bases, for example, "loving," "guiding," "caring." Perceiving a personal relationship with a God thought to possess such secure base-related qualities has also been found, as expected, to confer certain psychological advantages (e.g., freedom from worry and guilt). Although religious teachings

maintain that God does not die or abandon people, the subjective feeling of losing a previously felt connection with God is associated with intense separation distress, a "wilderness experience," among believers. Indeed, according to much Christian theology, separation from God is the very essence of hell. Finally, God is thought to be omnipotent and omniscient, thus clearly stronger and wiser than believers themselves.

Novel empirical research on ► [religion as attachment](#) has corroborated Kirkpatrick's idea that people actually do use God as an attachment figure (Granqvist and Kirkpatrick 2008; Granqvist et al. 2010). For example, separation-related exposures (such as "God has abandoned me") have been found to increase theistic believers' motivation to experience closeness to God, even when delivered subliminally (i.e., unconsciously for the study participants). It should be noted, however, that unlike other attachment figures, God does not have a visible interaction history with believers. Partly therefore, it has been suggested that the believer-divine relationship should be considered an attachment-like relationship, or a symbolic attachment, rather than an attachment proper (Granqvist and Kirkpatrick 2008; Granqvist et al. 2010).

Kirkpatrick also proposed two hypotheses, the compensation and correspondence hypotheses, about how individual differences in attachment may relate to religiousness (see Kirkpatrick 2005). Since then, these hypotheses have been revised (Granqvist and Kirkpatrick 2008; Granqvist et al. 2010). In the current formulation of the compensation hypothesis, it is stated that religiosity in the case of insecure attachment develops from explicit/controlled distress regulation strategies, where God is used as a surrogate attachment-like figure. This hypothesis is founded in Bowlby's (1969–1980) and Ainsworth's discussions of the use of surrogate attachments among children whose principal attachment figures are or have been unavailable or unsatisfactory. In support of this hypothesis, empirical research has shown insecure attachment to be related to, for example, sudden religious conversions during life situations marked by emotional turmoil.

In the current formulation of the correspondence hypothesis, it is stated that religiosity in the case of

secure attachment develops from (a) generalized, positive representations of self and other (IWM aspect) and (b) partial adoption of a sensitive caregiver's religion (social aspect). This hypothesis is founded both in Bowlby's (1969–1980) idea of generalizing IWMs and the proposition that secure attachment facilitates successful socialization of parental values in general. Supporting this hypothesis, empirical research has found secure attachment to be related to, for example, a loving God image, the use of God as an available safe haven even at implicit/unconscious levels of operation (presumably due to a coherent/singular representation of God), and a high degree of parent-offspring similarity in religiousness.

Extant research on religion as attachment has used a wide variety of research methodologies. The published literature includes studies using different data collection methods (e.g., self-report questionnaires, semi-structured interviews, lexical decisions), research designs (cross-sectional, prospective, and experimental designs), religious populations (e.g., Swedish Lutherans, New Agers, Pentecostals, Americans from the "Bible Belt," Israeli Jews, Italian Catholics), and participants in different developmental periods (children, adolescents, young adults, elders).

Cross-References

- ▶ [Anthropomorphism](#)
- ▶ [Control Theory \(Cybernetics\)](#)
- ▶ [Conversion](#)
- ▶ [Developmental Psychology](#)
- ▶ [Evolutionary Psychology](#)
- ▶ [Love \(Alterity, Relationship\)](#)
- ▶ [New Age Religions](#)
- ▶ [Psychoanalysis/Depth Psychology](#)
- ▶ [Psychology of Religion](#)
- ▶ [Social Psychology](#)

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Attention

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Related Terms

[Concentration](#); [Focalization](#)

Description

“▶ [Attention](#)” is one of the major domains of psychological functions and, as such, it is central to our understanding of the mind. In the fields of

experimental psychology and cognitive science, attention typically refers to the set of functions that prioritize the processing of information relevant to immediate task goals. Occasionally, the term “attention” is also used to refer to nonselective functions relating to states of arousal, effort, concentration, or vigilance. Though these state-related functions may interact with selective attention functions, it is best to draw a clear conceptual distinction between them, and to reserve the technical term for selective attention functions.

The content of our conscious experience is highly selective: at any given moment, only a very small number of events will come to occupy our awareness, and consequently, drive voluntary behavior. These events are drawn from a boundless stream of continuous sensory stimulation by the mechanisms of selective attention, which enhance the processing of potentially relevant information while suppressing processing of irrelevant, and potentially distracting, sensory input. Selected information can then be used more efficiently to guide purposeful, or goal-directed, action. Selective attention has been most intensively investigated within perception. However, similar mechanisms for prioritizing behaviorally relevant information also operate within internalized representations of events maintained within short-term, or working memory. The selective retrieval of relevant long-term memories could also rely on mechanisms related to selective attention, but this is only beginning to be explored in the psychological literature.

Attention and conscious “awareness” are strongly interrelated concepts. One prevalent view is that awareness is the direct product of selective attention, insofar as only prioritized and selected events come to occupy awareness. Neurological case studies provide striking evidence that attention is a necessary precondition for perceptual awareness. “Hemispatial neglect” is a neurological syndrome characterized by a pathological failure to attend to sensory information from affected spatial locations, typically the side of space opposite to the site of damage. As a result of the spatial inattention, information at unattended spatial locations typically fails to reach conscious awareness. However, even

though few would dispute that attention is necessary for determining the contents of awareness, it may not be sufficient. In some cases, what drives our behavior may not conform fully to what occupies our awareness. It is possible, therefore, that some events may be prioritized and selected for guiding action without reaching conscious awareness. In the intriguing case of “► [blindsight](#),” individuals with damage to the primary visual cortex show some residual goal-directed action toward, and accurate “guessing” about, events that they do not experience phenomenologically. Moreover, selective attention can optimize behavioral responses toward events that are not consciously perceived by these patients. Therefore, although attention and awareness are tightly interrelated, they should not be considered to be synonymous.

The study of attention can trace its roots to the earliest days of experimental psychology and psychophysics. Herman von Helmholtz (1867) provided the first well-known empirical observations that it is possible to control the focus of spatial attention at will, independently of the location of the eye gaze. He built an apparatus in which it was possible to illuminate a display containing several letters for a fraction of a second. While holding his gaze at a fixed location, he noted that it was impossible to view simultaneously all the items in the briefly presented display. However, he found that he could reconstruct the display by mentally focusing on specific locations of the display, over multiple iterations, while continuing to hold his gaze fixed. After Helmholtz’s seminal empirical explorations into voluntary attentional control, William James (1890) lucidly described many of the principles and properties of selective attention. Using introspective methods, James wrote what was to become the most highly cited quotation defining selective attention:

Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state. . .

Attention in Early Cognitive Psychology: Capacity Limitations

After an extended hiatus during the behaviorist movement, when the study of internal mental processes, including attention, was discouraged, the study of attention once again took central stage within the emerging fields of cognitive psychology and neuropsychology. Psychological tasks, such as the dichotic-listening task, were developed to test the behavioral consequences of focusing attention on one out of multiple competing streams of information versus dividing attention among the multiple streams. The major aim of these early studies was to determine where the resource “capacity” for information processing became limited, that is, the stage at which simultaneous processing of multiple tasks becomes impossible. The empirical data gathered during these early days of cognitive psychology showed that it was possible to focus effectively on one stream of information based on basic physical characteristics of the signals (e.g., spatial location or pitch) so that little of the irrelevant, competing auditory stream reached awareness. However, occasionally, salient information from the irrelevant stream, such as the individual’s name, or information that was related to the attended message, was registered. Different scholars used such findings to support contrasting theories. “Early selection” theories, first proposed by Donald Broadbent (1958), placed the capacity limit, or “*bottleneck*,” at early stages of information processing. They held that information related to irrelevant sensory streams is filtered out, or attenuated, during the earliest stages of perceptual processing. “Late selection” theories, first proposed by J. Anthony Deutsch and Diana Deutsch (1963), placed the bottleneck much later during information processing. They contended that information processing was unimpeded until after semantic analysis of stimuli, after which only relevant information was selected to drive awareness or action.

Attention in Contemporary Cognitive Neuroscience: Selection and Integration

In more recent years, technological advances have paved the foundation of a new scientific perspective into attention. Cognitive

neuroscience exploits a range of powerful methods to measure and manipulate brain activity, thereby permitting systematic analysis of how activity in different neural structures and networks is modulated by task goals. To date, the majority of attention research has been carried out using visual spatial selective attention, where visual events at an instructed, or cued, location are made relevant to the task goals (e.g., covert orienting, Posner 1980). Nevertheless, studies have also shown that it is possible to orient attention to objects, features within objects, temporal intervals, and high-level associative attributes of stimuli. Moreover, similar mechanisms of selection also govern perceptual processing within other sensory modalities (e.g., audition, touch) as well as across modalities (e.g., between vision and audition).

Although our understanding of the neural mechanisms by which selective attention prioritizes and selects task-relevant events remains incomplete, important strides have been made. The evidence to date shows clearly that the biasing of information processing according to task goals is a widespread property across sensory, motor, and associative regions of the brain. The findings, therefore, argue against fixed points of limited capacity during information processing, but instead indicate that the mechanisms of selective attention operate at multiple stages. Emerging consensus is gathering around the theoretical view that the function of selective attention is to deliver the relevant data to guide perception and action within the current task goals and motivational state. This is achieved through two complementary mechanisms: “selecting” the attributes of the relevant events throughout multiple levels of the information processing stream, and integrating, or “binding,” the selected attributes into coherent objects.

Noninvasive recordings of brain activity from electrodes positioned on the scalp of human participants, using “*event-related potentials*” (ERPs), have indicated that the neural processing of a given event, such as a briefly presented visual stimulus, is strongly influenced by whether that event is potentially relevant to the current behavioral task. This type of recording based on the

electroencephalogram – event-related potential – has low spatial resolution, but it enables monitoring of stimulus-related brain activity on a millisecond-by-millisecond basis, providing sensitive measures of successive stages of information processing from perception to action. Multiple stages of attentional modulation can be observed, which become dissociable under different experimental conditions, from early stages of perceptual analysis to higher processing stages related to semantic analysis and decision-making processes. Corroborative and complementary evidence has come from the measurement of changes in blood flow that are coupled to neural activity with “positron-emission tomography” (PET) and “► [functional magnetic-resonance imaging](#)”. PET and fMRI measure local changes in blood flow that accompany brain activity. Unlike ERP, these neuroimaging methods have high spatial resolution, but the temporal resolution is relatively coarse. Such experiments generally demonstrate selective modulation of neural activity: stimuli that are the target of a behavioral response within the current task activate perceptual cortex more strongly than a physically identical, but behaviorally irrelevant stimulus. In the case of visual tasks, such attentional modulations have been observed across the hierarchy of visual areas, including in primary visual cortex, lateral geniculate nucleus of the thalamus, and superior colliculi. Direct recordings from individual neurons in nonhuman primates performing visual tasks have also confirmed modulation of neuronal activity across the visual hierarchy, including cortical and subcortical regions.

According to one of the prevailing contemporary theories of attention, selective attention “biases” neural competition in sensory areas via “bottom-up,” sensory-driven mechanisms favoring high-contrast events and by “► [top-down](#)” feedback signals, which carry information about the task goals (“biased competition” model: Desimone and Duncan 1995). During visual perception, for example, sensory input from the retina proceeds through a number of processing stages. This stimulus-driven input is integrated along the hierarchy of visual brain areas, so that neurons within higher-level processing regions

are sensitive to progressively more complex features, and/or feature combinations, presented within increasingly large proportions of the visual field (i.e., receptive field). As a result of this convergence, multiple features and objects within the receptive field compete for coding. Some features will compete more strongly than others, due to inherent differences in stimulus energy (e.g., brighter and bigger stimuli), and therefore, will be more likely to be selected for further perceptual processing. In addition to this “bottom-up” selection, top-down attentional control mechanisms also bias perceptual processing via feedback signals that convey information about the task goals. Top-down biasing is achieved through a combination of cellular mechanisms. When more than one stimulus comes to occupy the receptive field of a neuron in a visual cortical area, activity related to the attributes of irrelevant distracting stimuli is filtered away. The tonic baseline activity of neurons coding a potentially task-relevant location or an object shape is also elevated relative to activity in neurons coding irrelevant locations or shapes. The activity across neurons that code relevant spatial locations also becomes more tightly synchronized within high-frequency, gamma bands and less synchronized within low-frequency, alpha bands, which in turn increases the impact that the output of these neurons can exert further down the hierarchy. Critically, as selected attributes become more strongly represented, neural interactions will also bias competition in favor of other attributes of the same item aiding co-selection and integration.

The result of a biased competition during perceptual processing is sometimes referred to as a “saliency map,” which encodes the spatial location of a small number of potentially relevant targets. It is not yet completely understood how these cellular mechanisms come together to prioritize processing of relevant events, and additional aspects of the cellular mechanisms are likely to be unveiled. But, in broad terms, it is presumed that, by enhancing the signals from neurons coding the relevant locations or attributes, filtering out distracting activity from the output of these neurons, and by synchronizing the

high-impact activity of these relevant and filtered signals, it is possible to select only the attributes of the relevant objects, which then become integrated into cohesive objects to guide conscious perception and action. According to this view, attention plays a major role in solving the difficult “binding problem” posed by the way that perceptual systems are organized, by helping piece together the constituent features of putative target events. An early account proposing a role of attention in the integration of the features of task-relevant objects was proposed by Anne Treisman (Treisman and Gelade 1980, Feature Integration Theory), though in this case only spatial biases were considered to be necessary for correctly binding features of potential target objects.

The setting and monitoring of task goals is part of the psychological domain of “executive functions,” which are thought to involve activity in prefrontal regions of the brain. Once task goals are established, biasing of task-relevant information may be mediated through working memory or long-term memory representations. In the case of spatial attention, a large-scale frontal-parietal network of areas has been implicated in providing the top-down feedback signals to bias information processing along the perceptual hierarchy (Mesulam 1981). In particular, parietal, frontal, and subcortical areas that code the location of events to guide eye movements may also play a prominent role in guiding spatial attention, even in the absence of overt eye movements. The overlap between the control of spatial attention and of eye movements is supported by co-extensive patterns of activation for the two types of functions obtained using functional magnetic resonance imaging, by the sensitivity of neurons to both oculomotor and attention functions in the same brain regions; and by the measurable and spatially specific influence in visual cortical excitability upon stimulation of the frontal area implicated in eye-movement control (frontal eye fields). A strict interpretation of spatial attention as the consequence of planned eye movements, and later of planned actions more generally, is known as the “*premotor theory of attention*.”

Self-identification

Science

The study of attention as a psychological domain has consistently been approached from a scientific perspective. However, one inherent difficulty in investigating attention is that it is a process that operates upon internal mental states. As such, it cannot be observed directly, but can only be experienced by the subject of the mental state. This inherent subjectivity has, at times, been considered reason for excluding attention, and other internal mental phenomena, from scientific enquiry, especially during the *behaviorism* movement.

Although it is not possible to negate the ontological subjectivism of a mental process such as attention, it is possible to observe and quantify its effects upon overt behavior and upon neural activity. For example, the effects of attention on behavioral responses and neural activity can be measured by experimentally manipulating the predictability of task-relevant stimuli (Posner 1980). Using this approach, attention is typically operationalized behaviorally as the optimization of motor responses (e.g., faster reaction times or more accurate perceptual discrimination) to detect or discriminate a predicted, expected stimulus as compared to an unexpected stimulus. Alternatively, it is possible to manipulate the number and type of distracting stimuli in visual search tasks (Treisman and Gelade 1980). In this case, the time required for accurate behavioral performance is taken to indicate of the duration of the attentional mechanisms required to select and integrate the task-relevant target objects.

Characteristics

The process of attention – as the prioritization of task-relevant information – is relevant to most psychological functions. Though mainly investigated in the context of perception, the selection and integration of task-relevant information is also relevant for memory, emotional processing, language, and motor control. Whereas the specific mechanisms for biasing and optimizing

neural activity in different neural systems may differ in the details, attention can be viewed as a basic principle underlying the efficient functioning of neural and cognitive systems.

Since the early days of Experimental Psychology, attention has been recognized as a fundamental aspect of human perception and behavior, and its investigation has enjoyed a privileged position in the field. The study of attention spans various levels of organization. The mechanisms of attention have been investigated within single neurons in perceptual and associative brain areas, in retinotopic maps within brain areas, across neural circuits, and at the level of behavioral responses and conscious reports. In this way, attention might provide a crucial bridge to span multiple levels of analysis within the human cognitive and neurophysiological system.

Relevance to Science and Religion

The study of attention has not played a prominent role in issues at the interface of science and religion. As a fundamental organizing principle of human cognition, see above, attention is relevant for understanding many aspects of the human mind. As such, it will be of relevance to issues in religion that relate to the human mind, such as how the human mind creates and transmits religious discourse.

The basic concept of attention – prioritization of certain items over other to achieve goals – can also be extended to high-level concepts such as an individual's system of beliefs. In this regard, one may focus on religious beliefs or prioritize religious interpretations of events.

The ability to focus attention and to block out distraction is required by many religious and spiritual practices, such as meditation, whose goal is to heighten awareness, self-awareness, and self-knowledge.

Sources of Authority

The primary source of authority is the empirical data. Scientific models of attention are built

upon the interpretation of data that are recorded by experimentalists, and disseminated to the academy via peer-reviewed publications in specialist journals. In practice, authority also comes from academic institutions (Universities and research institutes), funding bodies, and specialist organizations or societies to which academics may belong, via membership fees (Cognitive Neuroscience Society) and/or peer election (Society for Neuroscience; Royal Society). Together, these organizations strongly influence the direction of research in attention and the acceptance of particular interpretations of data. Nevertheless, in the end, as an empirical science, the absolute source of authority must remain with the data. In the absence of scientific fraud, data cannot be challenged, only the subsequent interpretations.

Ethical Principles

The study of attention poses no particular ethical challenges. Research follows established ethical guidelines for experimentation on humans and animals.

Society can benefit in two different ways. The enquiry into attention enhances our understanding about the human mind and brain. Traditionally, beneficiaries have been largely limited to academics and university students; however, there is an increasing focus to educate the broader community via the public media. Findings from basic research can also fuel translational or clinical research, whose aim is to develop and evaluate treatments for disorders involving attention (e.g., attention-deficit hyperactivity disorder, neglect).

Key Values

Research into attention, as a major psychological domain, is part of the academic quest for knowledge about the biological mechanisms of cognitive systems, undertaken with scientific integrity and rigor.

Conceptualization

Nature/World

The study of attention does not conceptualize nature/world any differently from other empirical sciences.

Human Being

The majority of scientists engaged in the scientific study of human cognitive mechanisms, including attention, consider the human being as a species of primate that, although highly advanced, shares a continuity of cognitive complexity with other living creatures. In practice, researchers often emphasize the similarities, rather than differences, between humans and other primates, to the extent that there is little consensus as to whether humans possess any entirely unique cognitive faculties that cannot be observed in some form within other species.

Life and Death

The study of attention does not conceptualize life and death any differently from other biological sciences.

Reality

Cognitive psychology and neuroscience recognize that external reality is not fully and directly apprehensible through perception. Our senses transduce only a small fraction of the external energy impinging on the individual. Furthermore, our perception is guided by a complex interaction between the transduced external information (through vision, touch, audition, etc.) and internal signals (based on past experience, motivation, current goals, etc.). Our apprehension of reality is therefore highly subjective, and greatly determined by the process of selective attention.

Knowledge

The study of attention has little bearing on general concepts of knowledge. However, selective attention may play an important role in shaping an individual's corpus of knowledge, accumulated through his or her accumulated experiences (also referred to as semantic memory). The selective biasing of task-relevant or salient

information is thought not only to guide awareness and action, but also to guide the formation of memories, including memories for meanings and facts.

Truth

The study of attention does not imply any specific conceptualization of truth.

Perception

The study of attention is central to the understanding of perception, as already described in the main definition of this entry. In short, perceptual awareness may be considered as the result of attentional processes operating upon the competitive processing of signals triggered by the transduced sensory stimulation. Our perception is highly selective, limited to only a few items, and highly determined by subjective factors, such as our task goals and expectations.

Time

The study of attention has little to say about the nature of time. In contrast, it has revealed interesting insights about how our cognition unfolds over time, and about how we perceive temporal durations and intervals.

Our perceptual abilities have significant temporal limits. Studies in which participants are required to perform concurrently two or more tasks that require planning and production of separate responses reveal dramatic interference and performance costs, a phenomenon known as the "*psychological refractory period*." Even in the absence of speeded motor requirements, upon detecting a task-relevant event, people become unable to perceive another relevant event for hundreds of milliseconds, a phenomenon known as the "*attentional blink*."

The perception of temporal attributes – such as onset times, durations, and intervals – is also influenced by attention. Attended items are perceived to occur earlier than nonattended items ("*prior entry*"), and to last longer. Paying attention to the passage of time itself expands the duration of perceived time relative to paying attention to other aspects of an event.

Consciousness

Attention is strongly related to conscious awareness, as already explained in the main definition of this entry.

Rationality/Reason

The study of attention does not have any specific implication for the concepts of rationality or reason.

Mystery

The study of attention does not have any specific implication for the concept of mystery.

Cross-References

- [Cognitive Neuroscience](#)
- [Cognitive Psychology](#)
- [Consciousness, The Problem of](#)
- [Neglect](#)
- [Neuroimaging](#)
- [Neurophysiology](#)
- [Neuropsychology](#)

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Attraction

- [Love \(Affective, Sexual\)](#)

Attribution/Attribution Theory

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Related Terms

[Agency](#); [Causal inference](#); [Causality](#); [Explanation](#); [Intentional action](#); [Intentionality](#); [Moral judgment](#); [Person perception](#); [Social cognition](#); [Social inference](#); [Social perception](#)

In social psychology, the term *attribution* has at least two meanings: the first refers to explanations of behavior (i.e., answers to why-questions) and the second refers to inferences or ascriptions (e.g., inferring traits from behavior, ascribing blame to a person). What the two meanings have in common, in science as in dictionary definitions, is a process of *assigning*: in attribution as explanation, a behavior is assigned to its cause; in attribution as inference, some attribute (e.g., a personality trait or blame) is assigned to the agent on the basis of the behavior. Despite the connection between these processes, they have distinct psychological characteristics and have evolved in two distinct historic lines of research. Both originate in work by Austrian philosopher and psychologist Fritz Heider (1958), who recognized attribution as a central process of forming subjective interpretations of the world, but the two lines emphasize different aspects of this fundamental insight.

Attribution as Explanation

Heider examined how people make sense of human behavior, and he argued that they search for causes of behavior. But people have two distinct conceptions of causality. They subsume purposeful human behaviors under a model of “personal causality” – according to which behavior is based on the agent’s intention, which is in

turn based on reasons. Quite different, the model of “impersonal causality” applies to any unintentional behavior and all other physical events; these events are brought about by causal forces that do not involve subjective reasons or intentions. Heider’s dichotomy is, in somewhat awkward terminology, the fundamental distinction between intentional and unintentional events – a distinction that arises early in infancy, is understood by other primates, and reaches a sophisticated conceptual structure in adulthood (Malle et al. 2001). Few concepts have as much influence on human social cognition as the folk concept of ► **intentionality**.

Surprisingly, however, attribution research soon moved away from Heider’s emphasis on intentionality. Whether it was an exegetic misunderstanding or perhaps a theoretically motivated simplification, attribution researchers after Heider claimed that people explain behavior by referring to one of two kinds of causes: either “person causes” (internal to the agent) or “situation causes” (external to the agent). This dichotomy is not the same as Heider’s personal/impersonal distinction, because, in the standard reading, “person causes” can be either beliefs, desires, and intentions that guide intentional action (e.g., She quit her job because *she felt the pay was too low*), or causal states that bring about unintentional behavior (e.g., He cried because *he was sad*). Likewise, “situation causes” can also guide intentional action (e.g., He chose Spain for vacation *because it is warm*) or bring about unintentional behavior (e.g., He fell because *the floor was slippery*). The person-situation dichotomy cuts across and, therefore leaves out the intentionality concept, implying that people care most about whether a behavior’s (main) cause is inside or outside the skin, not whether it was performed intentionally.

The most explicit theory of attribution that relied on this dichotomy (but relabeled it internal-external) was Harold Kelley’s covariation model (Kelley 1967). According to this model, people look for covariations between causes and effects, and they search for such information in service of finding out whether the behavior was internally caused (i.e., by the person) or

externally caused (i.e., by the situation). If Miriam experiences repeated headaches, she may look for triggering events that co-occur with the headaches until she finds whether something inside or outside of her appears to cause the headaches (e.g., a sinus infection vs. MSG in the food she eats at work).

The covariation model has limited applicability, however. First, it succeeds only when repeated co-occurrences can be observed. Second, the model delivers only whether the cause is “internal” or “external,” which by itself would be uninformative for most everyday explanations. Third, the model treats explanations of all events alike, ignoring the important distinction between intentional and unintentional behavior.

Empirical tests of the covariation model tended to support it, but only in experimental situations in which covariation information was explicitly presented. The few studies that have examined whether people actually seek out covariation information when answering a why question in everyday life have disconfirmed the model.

Doubts and criticisms of the standard attribution model had existed since the late 1970s, and even Heider himself, in an interview in 1976, argued that the literature had not adequately analyzed attributions of intentional actions to motives. It became clear that, when explaining intentional action, people don’t look for abstract things like internal vs. external causes or for covariation, but they try to construct the agent’s own *reasons* for acting (Malle 1999). Reasons are unlike any other causes. They are subjective states involved in a reasoning process that integrates what the actor desires and how she believes she can achieve it. Because social perceivers perform such belief-desire reasoning when they prepare to act themselves, finding another person’s reasons is not just pure observation; it is also perspective taking, reconstruction, and simulation of what one’s own reasons would be in the actor’s situation. The process of understanding why another person acted is, therefore aided by an act of imagination, but it is also constrained by the limits of such imagination – to most people, the serial killer’s

actions will remain a complete mystery, and even the actions of people from different cultures may feel not only unfamiliar but at times incomprehensible.

When people cannot imagine the agent's specific reasons or when they find those reasons unsatisfactory (e.g., "he wanted to kill people"), they often take a step back and look into the "causal history" of those reasons, citing factors such as personality, culture, and context that seemed to have contributed to those reasons (Malle 1999). The choice between reason explanations and causal history of reason explanations is guided by both cognitive processes (e.g., knowing or not knowing the reasons) and motivational processes (e.g., trying to portray the agent as rational and deliberate, which favors reasons) (Malle 2004). We see here the two major functions of explanations of intentional action: their cognitive function, which is to interpret behavior and provide meaning; and their social function, which is to manage ongoing interaction. These two functions hold for explanations of unintentional behavior as well, but those explanations are less central in social life, and they do not match the conceptual and linguistic richness contained in explanations of intentional behavior.

This more recent approach to attribution takes into account the folk-conceptual structure underlying behavior explanations – in particular, the intentionality concept and the notion of reasons – and by doing so, it resolves a number of inconsistencies in past research. For example, the famous hypothesis of an actor-observer asymmetry in attribution (suggesting that actors refer to more external causes than observers do) has been falsified by a recent meta-analysis of over 100 published research studies. But the hypothesis is falsified only when explanations are analyzed as internal vs. external; variants of an actor-observer hypothesis are strongly supported when explanations are analyzed in terms of their folk-conceptual structure. For example, due to both cognitive and motivational processes, actors offer more reason explanations for intentional behaviors than observers do (Malle et al. 2007).

Attribution as Inference

Beginning with Jones and Davis in 1965 (Jones and Davis 1965), researchers became interested in an inference people sometimes make when they observe another person's behavior: inferring the person's stable dispositions such as personality traits, attitudes, and values. For example, James sees Audrey putting coins in somebody else's parking meter and concludes she is kind. Jones and Davis's model identified two main conditions under which such dispositional attributions are likely: if the chosen action deviates from a norm and if it has unique effects when compared with alternative courses of action.

However, even when those conditions do not hold and situational demands instigate the behavior, people sometimes make dispositional attributions and are then said to display the "fundamental attribution error" (Ross 1977). This charge has become a core element of mainstream attribution work and generated several theoretical models to account both for the normal and the erroneous cases. In these two-stage models, an automatic trait inference in response to a behavior is followed by (often insufficient) correction for situational demands that are impinging on the behavior. The evidence supporting these models has been compelling, but, once more, no evidence outside of tight lab paradigms has been offered. There surely are cases in which a person is too quick to infer a disposition from another's behavior. But how frequent are such erroneous inferences in everyday life?

Traditional attribution work has portrayed social perceivers as always aiming at a dispositional inference – because, the argument goes, dispositions are predictive of future behavior. However, recent research suggests that social perceivers who interact and converse with each other in naturalistic settings are concerned less with prediction than with making sense of behavior in the here and now and with trying to grasp the meaning of other people's actions in terms of their beliefs, desires, intentions, and emotions. As a result, among the events people attend to in social interaction, dispositions make up less than 10%, whereas behaviors and ongoing mental

states make up 90%. And among explanations of behavior, no more than 5% refer to traits, whereas two thirds refer to mental states (Malle 2004). We must conclude that people are not dispositionists, as social psychology traditionally assumed, but mentalists. This observation converges well with developmental, evolutionary, and social neuroscience research, which considers the capacity to represent other people's mental states as the core of social cognition (Malle and Hodges 2005). It also converges well with recent research on the role of attributions in communication, which documents people's subtle responsiveness to the demands of an ongoing conversation and their focus on present actions and mental states.

Attribution and Moral Judgment

When a negative outcome occurs (e.g., a window was shattered), people try to find out who is responsible for the outcome and who is to blame. Such blame judgments often rely directly on causal attributions (e.g., whoever shattered the window is likely responsible) (Weiner 1995), but sometimes, they are more complex. When a window was shattered by the neighbor's dog trying to chase a cat, the dog owner may be responsible; if the window was damaged by a light wind, the builder who improperly installed the windows may be responsible. Responsibility and blame attributions are thus based both on assessments of causality (who brought about what) and on obligations (who ought to do or prevent what). In addition, attributions of responsibility and blame are critically dependent on the intentionality of the behavior in question. Obviously, a behavior is more blameworthy when it is judged to be intentional than when it is judged to be unintentional. But even among unintentional negative behaviors, those that are preventable are highly blameworthy because the agent *could have* formed an intention to prevent it. Such negligence is not as bad as intentional wrongdoing, but it is nonetheless blamable because humans expect each other to intentionally follow the norm of preventing harm.

The Search for Meaning in Human Behavior

Attribution research has played an important role in social psychology over the past 50 years. It has seen a theoretical evolution from simpler dichotomies to more complex, detailed models of how people conceptualize, cognitively process, and speak about human behavior. From the start, attribution work has highlighted the importance of studying social behavior by examining people's *perceptions* of behavior, as those often form the basis for social behavior itself. Likewise, it has illustrated people's persistent search for meaning in social interactions. The linking of behavior to its causes, especially the actor's reasons, makes meaningful what would otherwise be inexplicable bare movement.

People's search for meaning goes of course beyond social interaction and includes the attempt to understand the entire physical world. In these attempts, too, we can see traces of the folk-conceptual structures that are so prominent in explanations of behavior. When elementary particles have "charm," thermostats "notice" a temperature discrepancy, and evolution "selects" the fittest, we see the ease with which the human mind employs the familiar conceptual framework of mind and action. Likewise, most religious traditions ascribe to supreme beings the qualities of human agents, from desires to punish to plans and emotions, from perception and knowing to deliberate action. Gods, just as humans, are objects of attribution.

Cross-References

- ▶ [Developmental Psychology](#)
- ▶ [Empathy](#)
- ▶ [Evolution](#)
- ▶ [Social Neuroscience](#)
- ▶ [Social Psychology](#)
- ▶ [Theory of Mind](#)

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- ways and reasons in which religious postulates, explanations, and schemas become plausible.

Autism

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Related Terms

Autistic thinking

Autism is a *spectrum* condition, meaning that it is manifested to varying degrees of severity. At one extreme, a person may have no social skills, no language, and major learning difficulties. At the other extreme, the individual may have average or even above average IQ, precocious vocabulary (though a lack of interest in small-talk or chatting), and odd social skills (being one-sided or extremely self-centered). The former would receive a diagnosis of *classic autism*. The latter would receive a diagnosis of *Asperger Syndrome* (AS). Both of these are subgroups on the autistic spectrum. Both also share a strong preference for routines and repetition, and “obsessional” interest in highly specific topics.

The empathizing-systemizing (E-S) theory proposes that there are empathizing deficits in autism, while systemizing is either intact or superior. Empathy involves imagining another person’s thoughts and feelings, and having an appropriate emotional reaction to those feelings. Children and adults with AS show their empathizing deficits on age-appropriate tests of emotion recognition, theory of mind, and spontaneous empathy. Systemizing is the drive to analyze a system in terms of underlying rules in order to understand and predict its behavior. People with autism spectrum conditions show precocious understanding of systems, relative to their mental

Attributional Theory of Religion

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Derives from the general attributional theory in psychology and social psychology. It assumes human universal capacity of making sense of the world and creating plausible explanations of things, events, and persons. Attributional theory of religion focuses on situations and contexts,

age, on tests of intuitive physics or questionnaires assessing how interested a person is in different types of systems (maps, train timetables, machines, syntax, etc.). The unusually strong repetitive behavior, the strong desire for routines, and the “need for sameness,” can be seen as the result of a strong drive to systemize. Systemizing also requires excellent attention to detail, and people with autism and AS are faster on visual search tasks.

Anatomical abnormalities have been identified in different brain regions in autism. The brain regions that have been reported to be atypical include the cerebellum, corpus callosum hippocampus and the amygdala. Epilepsy also occurs in a proportion of individuals with autism spectrum conditions, though the exact rate is no longer clear. The number of Purkinje cells in the cerebellar cortex is abnormally low. Abnormalities have also been reported in the density of packing of neurons in the hippocampus, amygdala, and other parts of the limbic system. Abnormalities have also been found in the functioning of the amygdala, the orbito- and medial-frontal cortex. These atypical patterns of neural activity arise in relation to the empathizing deficits.

Today, we recognize that 1% of children have an autism spectrum condition. The sibling recurrence rate is 5–10%. Regarding twin studies, 60% of monozygotic (MZ) pairs are concordant for autism versus no dizygotic (DZ) pairs. When a broader phenotype is considered, 92% of MZ pairs are concordant as compared to 10% of DZ pairs. Molecular linkage genetic studies have led to a number of chromosomal regions being implicated, such as 2q, 7q, and 15q (Baron-Cohen 2008).

Cross-References

- [Cognitive Science Psychology](#)
- [Empathy](#)
- [Medical Psychology](#)
- [Neuroimaging](#)
- [Neuropathology](#)
- [Neuroscience](#)

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Autistic Thinking

- [Autism](#)

Automation

- [Control Theory \(Cybernetics\)](#)

Automation, Electronic

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Related Terms

[Computer science](#); [Computerization](#); [Computing machinery](#); [Control](#); [Mechanization](#)

Description

Permanently searching for automation is an interdisciplinary area of study searching for applications of mechanics, control theory, and electronics to improve the quality of human life or enhance human tasks under different religious, social, economic, and political conditions. The word automation is a contraction for automatic operation, and the inspiring ideas can be traced back to 2,000 years ago (Bennett 1996). Automation is based on control theory and the concept of feedback (the output is compared permanently with the input to produce an error, and the goal

is to minimize the error between desired and actual). The area of automation first developed during the industrial revolution to control process variables such as temperature (boiler control for steam generation), pressure (pneumatic systems), liquid levels, and the speed of rotating machinery (steam engine governor). Later, electricity and electronics were incorporated for measurement, transmission, and manipulation of signals and for actuation (Bennett 1996). During the Second World War, automation brought together mechanical, electrical, and electronic engineers to solve complex problems, i.e., aiming of anti-aircraft guns, electric motor speed control, and ship and aircraft steering. By the end of the war, the classical control techniques have been established, and books published during the 1940s and early 1950s helped to disseminate results. Automation is pervasive in industries where there is a constant need for faster, efficient, and green manufacturing (Difrank 2008; Hitomi 1994).

In recent years, control theory and automation have incorporated mathematical models and techniques inspired by living systems, for example, artificial neural networks are simplified models of the nervous system; the genetic algorithm is an optimization technique that follows the principles of natural selection; artificial immune systems are basic models of the actual immune system; and electronic controllers such as the electronic gene and the emulated DNA chip model the working principles of gene expression and gene networks.

Self-Identification

Science

Automation is an interdisciplinary area of study and takes concepts from physics, chemistry, biology, and mathematics. Plant and process models are based on first principles; control strategies are formulated in mathematical language with rigorous proofs; recent control techniques known as computational intelligence or machine learning are inspired by natural systems.

Distinction Among Other Disciplines/Religions

Automation integrates mathematics, chemistry, biology, and physics around practical applications. Mathematical models are used to understand real-world problems and to design control strategies; computer simulations are used to reduce costs or to test the limits of the proposed physical systems.

Relevance to Science and Religion

There is no deep connection between automation and religion. While some religions may see work as punishment, automation improves labor conditions by freeing workers from tedious or dangerous activities.

A recent use of automation argues for a limit on physical labor by orthodox Jews during the Sabbath, a time for peace and relaxation during which any work or act of creation is prohibited. Jewish law prohibits manually turning on and off electrical devices, as this act is a demonstration of mastery. Automation might be described as an enhancer of religious experience since technology performs human activities and supports spiritual experience (Woodruff et al. 2007).

Sources of Authority

The source of authority for this discipline comes from first principles, mathematical theories, experiments, computer simulations, and successful technological implementations. Control theory provides the mathematical framework for automation.

Ethical Principles

The ethical principles are the same as in any human endeavor. There are moral questions about automation taking jobs from people or replacing humans with machines.

Key Values

The key values are to respect, value, and protect human life; improve the quality of human life by minimizing dirty, dull, and dangerous activities; respect nature; and follow environmental regulations.

Conceptualization

Nature/World

The natural world is to be mastered and controlled in a responsible, sustainable way to enhance human happiness.

Human Being

The main purpose of automation is to free humans from dull, dangerous, and dirty tasks by using mechanics, control theory, and electronics.

Reality

Automation is applied to reality to improve human living conditions.

Knowledge

Control theory is knowledge developed to support automation. New knowledge is created by modeling and simulating real-world situations.

Truth

Mathematical theories need to be proved and be true.

Perception

Measurements of variables to perform control loops.

Time

Time is fundamental for faster and more efficient processes. Automation happens in a real context.

Mystery

Reality is modeled, and experiments are designed to learn and reduce mysteries. Current models of reality are used to understand the world (Muller et al. 2001).

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Autonomic Nervous System

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Related Terms

[Autonomous](#); [Nervous system](#)

The autonomic (or vegetative) nervous system (ANS) is that part of the nervous system that is not under our direct volitional control, but assures permanent and instantaneous adjustment of body and organ functions to changing needs and conditions, e.g., at rest or during stress, when supine or standing, in warm or cold environment, during sleep, digestion, effort, intercourse, while walking or sitting, meditating or working mentally, etc. Thus, the ANS serves our bodily, emotional and behavioral functions by adapting the multitude of, e.g., cardiovascular, respiratory, thermoregulatory, metabolic, endocrine, gastrointestinal, urinary, reproductive, and other functions and responses to changes in the surrounding, external as well as in the internal milieu. These complex tasks involve central and peripheral parts of the ANS and integrate

behavioral and physiologic status and responses (Hamill and Shapiro 2004).

The term “autonomic nervous system” was first introduced in 1898 by the Cambridge physiologist John Newport Langley (November 2, 1852–November 5, 1925) who divided the ANS into the sympathetic, parasympathetic, and enteric (intestinal) systems (Langley 1921). Yet, there is also a complex central autonomic network involving areas in the spinal cord, brainstem, and brain that interact with each other, receive peripheral visceral and humoral afferences and modulate the peripheral ANS and visceral organs (Bennarroch 1997, 2004; Blessing 1997; Hilz 1999; Saper 2002).

The central ANS participates in the control of endocrine and somatosensory systems. Among the multiple and interconnected areas of central autonomic modulation are the insular cortex with influence on blood pressure, heart rate, respiration, gastrointestinal motility, secretion, saliva production, piloerection, pupillary dilatation (Bennarroch 2004; Hilz 1999; Saper 2002; Verberne and Owens 1998); the ventromedial prefrontal cortex, anterior cingulate gyrus; the amygdala modulating emotional and fear responses; the basal forebrain and limbic striatum, the hypothalamus, and the periaqueductal gray modulating motor, pain perception, and autonomic stress responses (Bennarroch 1997, 2004; Blessing 1997; Hilz 1999; Saper 2002).

The parabrachial nucleus participates in cardiovascular, respiratory, osmo- and thermoregulatory, and gastrointestinal activity including taste and saliva production (Bennarroch 2004).

The dorsal pons includes a “pontine micturition center” and innervates sexual organs, bladder and bowel, and pelvic floor muscles (Bennarroch 2004; Blessing 1997; Saper 2002). The nucleus tractus solitarii in the dorsomedial medulla oblongata is a most important relay area for visceral and taste afferents, and viscerosensory input to all areas of central autonomic control. It has areas for taste, gastrointestinal, respiratory, and cardiovascular afferents, and is involved in cardiopulmonary, gastrointestinal, baroreceptor- and chemoreceptor-reflexes (Bennarroch 2004; Blessing 1997; Saper 2002).

The ventrolateral medulla participates in vasomotor, cardiac, and respiratory control (Hilz 1999). The various areas of central autonomic modulation are interconnected at different levels (Hilz 1999).

The peripheral ANS can be divided into the sympathetic and parasympathetic systems (Hilz 1999).

Among the many responses mediated by the sympathetic system are increased melatonin synthesis, heat production in Brown adipose tissue, sweat secretion, pupillary dilatation, skin piloerection, light serous saliva production, increase in heart rate, excitability and contractility, bronchial relaxation, abdominal vasoconstriction, gastrointestinal motility decrease and sphincter contraction, increased bladder capacity and continence, male ejaculation and – depending on the type of receptors activated – variable changes in hormone secretion including insulin and glucagon from the pancreas, constriction or dilatation of small muscle arteries (arterioles), uterus relaxation or contraction, and catecholamine secretion in the adrenal medulla (Hamill and Shapiro 2004).

Preganglionic sympathetic nerve cells receive input from multiple supraspinal pathways, and arise from the intermediolateral and intermediomedial cell columns, at the spinal cord levels T1 to L2-3 (Hilz 1999). Using acetylcholine as main transmitter, preganglionic nerve fibers communicate via nicotinic synapses with the secondary or postganglionic nerve cells in paravertebral sympathetic chain ganglia, prevertebral, previsceral, or terminal ganglia. Among co-transmitters are substance P, neurotensin, somatostatin, enkephalins, GABA, serotonin, etc. The adrenal medulla is innervated by preganglionic fibers only, and produces mainly epinephrine (>80%), particularly during stress, and some norepinephrine (<20%) (Hamill and Shapiro 2004; Hilz 1999).

Postganglionic neurons innervate, e.g., blood vessels, pilomotor muscles, sweat glands, and internal organs via so-called varicosities that are packed with neurotransmitter vesicles mainly secreting norepinephrine (at muscarinic sweat glands acetylcholine); some neurons also use

dopamine, epinephrine, or serotonin transmission. Among co-transmitters are ATP, neuropeptide Y. Target organs have different adrenergic receptors such as α_1 -, α_2 -, β_1 -, β_2 -receptors (Hamill and Shapiro 2004; Hilz 1999).

The parasympathetic system mediates functions such as pupillary constriction, tear flow, serous saliva secretion, decrease in heart rate, cardiac excitability and contractility, increase in mucous bronchial secretion and bronchial contraction, gallbladder contraction, increase of gastrointestinal muscle tone, motility and secretion, gastrointestinal sphincter relaxation, pancreatic hormone secretion, voiding of the bladder, or penile erection.

Parasympathetic preganglionic neurons are located in the brainstem or sacral spinal cord, mainly at segments S2–S4. Long preganglionic nerve fibers synapse with short *postganglionic nerve fibers* in the “ganglia” (e.g., ciliary, submandibular, pterygopalatine, or otic ganglion), close to the target organs (Harati and Machkhas 1997).

Seventy-five percent of all parasympathetic activity is mediated by the *Vagus nerve* that travels from the brainstem to chest and abdominal organs, and the gastrointestinal tract to the level of the left colonic flexure.

Sacral preganglionic parasympathetic neurons from S2 to S4 receive spinal and supraspinal autonomic input, and mediate parasympathetic impulses via nicotinic cholinergic synapses to postganglionic neurons with short fibers and muscarinic, cholinergic neurotransmission to lower bowel and pelvic target organs. Apart from the neurotransmitter acetylcholine, there are various “co-transmitters” such as vasoactive intestinal polypeptide (VIP), nitric oxide (NO), calcitonin gene-related peptide (CGRP), galanin, peptide histidine methionine (PHM), and many others (Harati and Machkhas 1997).

The enteric nervous system contains 50–100 million motor, sensory, and interneurons and regulates bowel motility, secretion, and absorption. Largely independent from central control, three layers of interconnected ganglion cells, the plexus myentericus Auerbachii, the plexus submucosus externus Schabadaschii, and the

plexus submucosus internus Meissneri, coordinate peristalsis, and ion- and water-transportation across intestinal cells. Yet, there is also sympathetic and parasympathetic modulation of the enteric system. Among the abundant neurotransmitters and co-transmitters mediating motility activating or inhibiting signals are acetylcholine, substance P or norepinephrine, nitric oxide, and vasointestinal peptide (Hamill and Shapiro 2004; Hilz 1999).

Cross-References

- [Anatomy of the Brain](#)
- [Neurophysiology](#)
- [Neuroscience](#)

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Autonomous

- [Autonomic Nervous System](#)

Autonomy

- [Free Will](#)

Averaged Evoked Potentials

- [Evoked and Event-Related Potentials](#)

Awakening

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Related Terms

[Bodhi \(Sanskrit & Pāli\); Enlightenment](#)

Description

Awakening stands at the core of the Buddhist scheme of deliverance; hence, an understanding of its implications is of central relevance for a proper positioning of Buddhism in relation to the dialogue between science and religions.

The expression “awakening” renders the Sanskrit and Pāli term *bodhi*, sometimes also translated as “enlightenment.” This latter translation is less apt, however, given that the term *bodhi* derives from the verbal root *budh*, which means quite literally “to wake up” or “awaken.” An example for this usage can be found in a description of a person who sees various beautiful sights in a dream, all of which disappear as soon as he wakes up (Trenckner and Chalmers

1888–1896, I 365). The expression used to describe such waking up employs a derivative of the same root *budh*.

The term “enlightenment,” besides carrying unwarranted connotations as a referent to a European intellectual movement, runs the risk of giving the misleading impression that *bodhi* involves some form of a luminous experience. According to Buddhist meditation theory, however, visions of an inner light or luminosity rather pertain to the development of mental tranquility, which on its own is held to fall short of issuing in any of the levels of awakening recognized in Buddhism. Far from being an inner vision of light, awakening is better compared to the extinction of a light (Alsdorf and Norman 1966, Stanza 906). That is, what awakening refers to, in terms of actual experience, appears to be a cessation of the whole world as previously cognized and therewith inevitably also a cessation of any light or other visual object. In other words, what the Buddhist practitioner awakens to is the realization of Nirvāṇa.

The early Buddhist discourses, representing the earliest textual strata at our disposition for the study of Buddhist thought, indicate that with the realization of Nirvāṇa one awakens to a sphere of experience that goes beyond matter – represented in terms of the four main elements of earth, water, fire and wind – as well as beyond various forms of immaterial experiences (Steinthal 1885, 80). Nirvāṇa, as the unconditioned, stands apart from the conditioned nature of all other aspects of the world (► [Dependent Arising](#)).

The realization of Nirvāṇa is the goal of Buddhist soteriology, which stipulates as preconditions for such a realization a threefold training in morality, concentration, and wisdom. Morality in the sense of adherence to ethical conduct by abstaining from killing, stealing, sexual misconduct, falsehood, etc., is considered to provide the indispensable foundation for progress to awakening. Building on this foundation, an aspirant to awakening develops concentration as a basis for the growth of liberating wisdom, in line with the maxim that only a concentrated mind will be able to see and understand in such a way that genuine

wisdom arises. The arising of wisdom, from a Buddhist perspective, requires in particular insight into the three characteristics of conditioned existence. These three characteristics describe the nature of existence as being impermanent, as lacking any lasting satisfaction and as being devoid of an unchanging essence or self.

Central qualities required for the arising of liberating wisdom are the seven so-called factors of awakening: mindfulness, investigation of phenomena, energy, joy, tranquility, concentration, and equanimity. According to early Buddhist meditation theory, the bringing into being and maturation of these seven mental factors will enable the breakthrough to the actual experience of awakening.

Early Buddhist thought describes a breakthrough to awakening as taking place at four distinct levels:

- Stream-entry
- Once-return
- Non-return
- Arahantship

These four levels of awakening reflect the degree to which the mind has been liberated from ten types of fetters, mental forms of bondage that according to Buddhist thought are responsible for keeping the unawakened person bound to continued existence in the cycle of rebirths, *saṃsāra*.

On reaching the first of these four levels, the attainment of stream-entry, three of these fetters are eradicated. These are the fetter of personality view, which stands for belief in the existence of a permanent self (► [Anattā](#)); the fetter of doubt, in particular uncertainty regarding the nature of what is wholesome and unwholesome; and the fetter of clinging to rules and vows as in themselves sufficient for reaching awakening.

The actual experience of stream-entry involves the arising of the so-called eye of Dharma, a metaphorical description of the first “vision” – if it can be called such – of Nirvāṇa. Such direct realization of Nirvāṇa corresponds to insight into the four noble truths, in particular into the third of these four (► [Truths, Four Noble](#)).

The “stream” that has been fully “entered” at this point is the noble eightfold path

(Feer 1884–1898, V 347), which covers the central requirements for progress to full awakening (► [Truths, Four Noble](#)). The time required for this “stream” to lead the one who has entered it to the highest level of awakening, the full liberation of an arahant, is reckoned to be seven lives at most, none of which will take place in a lower sphere of rebirth.

The next two fetters to be overcome during progress to full awakening are sensual lust and ill will. A once-returner has made substantial progress in this respect, since with the second level of awakening these two fetters have been considerably weakened. Their complete overcoming is accomplished with the third level of awakening, the attainment of non-return.

An arahant has eliminated the remaining five fetters, which are desire for fine-material experiences, desire for immaterial experiences, pride, restlessness, and ignorance. With all fetters destroyed, it is held impossible for an arahant to be acting under the influence of desire, hatred, delusion, or fear (Carpenter and Rhys Davids 1890–1911, III 133). By dint of having fully awakened, an arahant is also said to be incapable of undertaking such deeds as deliberately depriving another living being of life, appropriating what belongs to others by way of theft, or consciously speaking falsehood (Trenckner and Chalmers 1888–1896, I 523). The inner aloofness reached with full awakening is also reckoned to make it impossible for an arahant to engage in sexual activity in any form, or else to hoard up things for the sake of sensual enjoyment.

With subsequent developments in later Buddhist traditions and the evolution of the bodhisattva ideal – the aspiration to become a Buddha in the distant future (► [Bodhisattva Ideal](#)) – the awakening of an arahant was seen as inferior to the awakening of a Pratyekabuddha (Pāli Paccekabuddha) – a Buddha who does not teach – and the awakening of a full-fledged Buddha.

The arahant, the Pratyekabuddha, and the Buddha already feature as distinct types of fully awakened beings in the early texts. While an arahant gains full awakening after having received the liberating teachings of a Buddha, a Pratyekabuddha and a Buddha reach the same without the guidance of a teacher. The two types

of Buddhas differ in as much as the Pratyekabuddha does not deliver teachings, whereas a Buddha is one who, having gained full awakening himself, teaches others the way to awakening. Thus, what in the early texts marks the difference between these three is mainly the way they reach awakening, whereas the notion that their actual awakening is substantially different appears to be a later development.

In sum, the Buddhist notion of awakening can be understood to refer to a distinct type of experience which, being based on the development of moral conduct and mental cultivation, in turn has clear ethical consequences. A fully awakened one is free from rebirth and any mental defilement, being incapable of breaches of morality. In other words, the experience of the unconditioned – Nirvāṇa – leads according to early Buddhist thought to an irreversible liberation of the mind, which has become totally awakened. According to a poetical comparison, the freedom of the fully awakened one is like a bird in the sky, which leaves no track behind (von Hinüber and Norman 1994, Stanza 93).

Cross-References

- [Anatta](#)
- [Dukkha](#)

- [Freedom](#)
- [Impermanence \(Buddhist\)](#)
- [Liberation, Theology of](#)
- [Wisdom \(Philosophically\)](#)

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B

Baptism in the Spirit

► [Pentecostalism](#)

Basal Ganglia

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In the brains of tetrapod vertebrates, the basal ganglia refer to a group of interconnected subcortical nuclei: striatum, substantia nigra, globus pallidus (nucleus entopedunculus in anurans), and subthalamic nucleus. Neurotransmitters include dopamine, glutamate, and gamma-amino-butyric-acid. Participating in motor control, attention, and reinforcement learning, the basal ganglionic nuclei belong to the fundamental processing units of the tetrapod brain. Comparative studies of the anatomic connections, the chemoarchitecture and the development of the basal forebrain suggest that tetrapod vertebrates share a common pattern of basal ganglia organization.

Basic Programming Concepts

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Every computer program can be written using only three kinds of control structures: an assignment statement, a conditional, and a looping construct.

The basic assignment statement using the notation of the programming language Pascal is `<variable> := <value>` (e.g., `x := 7`); whereas in the programming language C or one of its derivatives, the assignment symbol is `=` (e.g., `x = 7`). The variable, which is a name for a location in memory, must appear on the left, whereas the value that will be stored at that memory location appears on the right. A purely functional programming language such as Haskell does not contain assignment statements; rather, the programmer uses functional composition (see terms in Mathematics), and the final value returned is the answer to the problem, which is specified as a conditional.

In many programming languages, the conditional is expressed as *if/else*, where the *else* part may be empty. This basic construct corresponds to the way that a programmer might express his

algorithm in natural language. In the declarative paradigm, which consists of functional (e.g., Haskell) and logical languages (e.g., Prolog), the programmer also specifies the problem as a conditional although the syntax differs. For example, in Haskell, the programmer may describe the problem with an empty list followed by a non-empty list; whereas, in Prolog, the programmer will specify the problem with a list of clauses that are executed until a clause becomes true. In each case, the *if/else* or *if/else if / else if . . . else* construct is inferred from the syntax.

Most imperative and object-oriented languages use a *while* to represent a loop. When a loop appears in the code, the computer checks a logical (Boolean) condition, and if true, the statements within the loop block execute in sequence, followed by a recheck of the Boolean condition at the top of the loop; otherwise, the loop terminates, and the next statement after the while executes. However, in a functional language, recursion (see below) replaces the looping construct.

Behavior Settings

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Extra-individual, dynamic ecological structures that are generated through the collective actions of individuals. These naturally occurring, emergent ecological structures are composed of both individuals' actions and the material features (affordances) that support them. Behavior settings are quasi-stable systems whose participants act to preserve setting integrity if circumstances threaten its stable functioning. By virtue of their participation in behavior settings, individuals' actions are constrained through their expression of the normative practices that characterize that setting. For this reason, behavior settings serve as reliable predictors of individuals' actions. The core concept in Roger Barker's ecological psychology.

Behavioral Adaptiveness

► [Evolutionary Psychology](#)

Behavioral Medicine and Health Psychology

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Related Terms

[Clinical health psychology](#); [Medical psychology](#);
[Occupational health psychology](#)

Description

Behavioral medicine and health psychology are closely related fields of inquiry that were first recognized in the late 1970s. Behavioral Medicine, as defined by the Society of Behavioral Medicine (adapted from Schwartz and Weiss (1978)), is "the interdisciplinary field concerned with the development and integration of behavioral, psychosocial, and biomedical science knowledge and techniques relevant to the understanding of health and illness, and the application of this knowledge and these techniques to prevention, diagnosis, treatment and rehabilitation" (Society of Behavioral Medicine 2008). The standard definition of health psychology, provided by Matarazzo and adopted by Division 38 (Health Psychology) of the American Psychological Association, states that health psychology is, "the aggregate of the special educational, scientific, and professional contributions of the discipline of psychology to the promotion and maintenance of health, the prevention and treatment of illness, the identification of etiologic and diagnostic correlates of health, illness, and related dysfunction, and to the analysis and improvement of the health care system and health

policy formation” (Matarazzo 1982). Both are concerned with the relationships and reciprocal causal connections regarding how health/illness affects and is affected by biological, psychological, and behavioral factors. Consequently, both fields are oriented around the biopsychosocial model of health and illness. The classic definition of this model was provided by Engel (1977). “To provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he (sic) lives and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physician role and the health care system. This requires a biopsychosocial model.”

The biopsychosocial model represents a ► [systems approach](#) to understanding health and illness. In this approach, the person is contextualized within an environment that consists of several levels (or analytic systems) including the physical, social, and cultural. The person must make continual adaptations to this environment. These adaptations involve the interplay of biological (at many levels, e.g., cellular, tissue, organ), psychological, and social factors. Important to this conceptualization are the following: (1) clear boundaries between levels/systems do not exist; (2) the dynamic interplay between systems is important for health/illness; (3) no level is logically superior to another but all are important and must be considered, in their interaction, to arrive at a comprehensive understanding of health/illness.

The primary distinction between behavioral medicine and health psychology is that health psychology is discipline specific whereas behavioral medicine is multidisciplinary. Therefore, only a psychologist could be rightly termed a health psychologist but any professional working in the areas described above could be a behavioral medicine specialist. Older conceptualizations of behavioral medicine as only involving behavior as applied to medical practice, namely treating illness, are now viewed as overly restrictive and no longer accepted. In what follows these two fields will be considered

simultaneously unless otherwise indicated. For simplicity the term “behavioral medicine” will be used.

Self-Identification

Science

Behavioral medicine has always identified itself as a science, albeit one that straddles the boundaries between the natural and social sciences and one that has strong basic and applied dimensions. It relies upon the findings from studies conducted using scientific methods to establish knowledge in the field, and basic as well as clinical research are carried out accordingly. Examples of these methods include case studies, single subject experimental designs, correlation studies, cross-sectional and longitudinal studies, and experimental and quasi-experimental studies that incorporate various controls. For treatment intervention studies the ► [randomized controlled trial](#) is considered the gold standard. Because of the types of interventions used in behavioral medicine, it is often not possible to conduct blinded studies. Specifically, double blind studies of treatment outcomes are nearly impossible to conduct and single blind treatment outcome studies are difficult, though sometimes possible. It is common to compare two active treatments and the use of attention-placebo controls, though present in some studies, is also sometimes deemed unethical or impractical. Similarly, it is not always possible, due to ethical or expense constraints, to use randomization and consequently non-randomized studies are also used.

Applied practitioners in behavioral medicine and health psychology typically practice out of a “► [scientist-practitioner](#)” model. In this model practitioners are trained in the methods of science so that they are at least minimally capable of reviewing, critiquing, and applying the scientific literature to their particular areas of practice. Nevertheless, it became clear that only a small minority of treatments actually had solid scientific support, a situation that led to calls for scientific examination of all treatments to determine their efficacy and effectiveness. In 2000 the

Office of Behavioral and Social Sciences at the US National Institutes of Health funded the first Evidence-Based Behavioral Medicine (EBBM) Committee and there is currently a strong movement in the field toward EBBM practice. The goal of this movement is to “enable practitioners to access effective techniques that can be used when their clinical expertise suggests that these will match the needs and preferences of individual clients” (Spring et al. 2005).

Characteristics

Behavioral medicine is distinctive in that it purposely and deliberately focuses examination on the relationships between physical aspects of health/illness and psychological/behavioral aspects of functioning. Consequently its domain is broad and extends beyond the boundaries of traditional disciplines to include areas of study relevant to fields such as medicine, public health, psychology, biology, chemistry, sociology, and economics. It is common, likely the norm, for research teams to be interdisciplinary in composition. As a result of these collaborations new fields have been identified. For example, a prototype of these new fields is psycho-neuro-immunology, an area of study investigating how and in what ways psychological responses to environmental input may influence immune system functioning and, ultimately, health outcomes. Health psychology shares with behavioral medicine the same topical areas for study and practice, thus establishing its distinctive quality among other areas of psychology. Strictly speaking, however, health psychology is not ipso facto an interdisciplinary field.

Relevance to Science and Religion

Behavioral medicine is interested in the scholarly discussion related to “Science and Religion” to the extent that this discussion has importance for understanding how religion or aspects of religious belief, practice, or experience influence and are influenced by health and illness as well

as behaviors, cognitions, and emotions related to health/illness. Thus religion (or aspects of it) may be viewed as either the independent or dependent variable in research studies. However, to this point religion is essentially considered as another psychological or behavioral variable among the many to be studied; one with no special status of its own. Further, from a theological perspective, the studies in behavioral medicine that do include religious variables tend to be unsophisticated in terms of their underlying theoretical foundation. Nevertheless, interest in the area of religion and health is increasing as evidenced by the formation of the Spirituality and Health Special Interest Group of the Society of Behavioral Medicine, increasing number of published peer-reviewed primary research articles, and the significant number of professional journals that have featured special issues on this topic. As noted by the title of the special interest group above, much of the attention to this area in behavioral medicine has recently become focused more on spirituality than religion per se. Discussions of a more fundamental nature concerning behavioral medicine and religion as related to epistemology, ontology, and methodology have largely not begun.

Sources of Authority

At the most basic level, the sources of authority in behavioral medicine are peer-reviewed primary empirical research publications found in scholarly journals in the field. These form the basis for secondary analyses such as meta-analytic examinations of particular questions or consideration by panels of experts who are convened by government and private agencies to issue statements regarding aspects of behavioral medicine (e.g., Is the Type A Behavior Pattern a risk factor for coronary heart disease?). Generally, recent journal publications carry more weight of authority than ones from the more distant past. Though it is technically the case that each reported study is judged on its merits, not the journal it is published in, it is nonetheless true that articles in journals with higher visibility tend to receive more citations both in print and at conference presentations

and are, therefore, more influential. It is also true that individual authors who have published many well-known studies tend to be viewed as authorities though, in keeping with the scientific spirit of the field, their authority is specific to their particular area of scientific expertise and their statements are always open to empirical challenge. There are many topical subareas, and their related journals, subsumed under the umbrella of behavioral medicine. Each subarea has its most visible journals and these constitute principal authorities for that subarea. Journals with broad coverage that often include influential articles on behavioral medicine include *Annals of Behavioral Medicine*, *Journal of Behavioral Medicine*, *Health Psychology*, *Psychology and Health*, *Journal of the American Medical Association*, *American Journal of Public Health*, *Journal of Psychosomatic Medicine*, and *the Lancet*, among many others. Professional presentations at the annual conventions of the Society of Behavioral Medicine, American Psychological Association, American Psychosomatic Society, and European Health Psychology Society are also potential sources of influence. In all cases, though, ultimate authority rests on the quality of the scientific findings pertaining to any question.

Ethical Principles

Behavioral medicine is guided by the ethical principles of the many disciplines that make up the field. Health psychology is governed by the Ethical Principles of Psychologists and Code of Conduct of the American Psychological Association (2002). Other influential writings include the AMA Code of Medical Ethics (American Medical Association 2008), the Declaration of Helsinki (World Medical Association 2008), and the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979). The most basic ethical obligation is to do no harm to patients and participants in research. Other core principles include fidelity and responsibility, integrity, justice, and respect for people's rights and dignity.

Key Values

The primary value of behavioral medicine is to prevent or ameliorate human suffering by the judicious application of knowledge regarding psychological and behavioral functioning in ways that are efficacious. A second value is the acquisition and distribution of knowledge regarding how human psychological and behavioral functioning influences and is influenced by health and illness.

Conceptualization

Nature/World

Nature is composed of the observable, or potentially observable, physical entities of earth and includes their dynamic interaction and attendant processes. Strictly speaking, world would be everything included on earth but in practice both nature and world could be expanded to include all observable entities and their interactions and processes in the universe.

Human Being

Human beings are biological creatures capable of self-reflection, advanced cognitive functioning, speech, abstract thinking, and creativity. Humans are typically social and capable of engaging in scientific and artistic pursuits. Humans appear to be unique in their universal proclivity to make moral and ethical judgments. Additionally, humans often report experiencing a spiritual dimension to their existence and the effects of this spiritual dimension are potentially the object of scientific study.

Life and Death

Humans are alive, or have life, when they are capable of carrying out physical and biological functions typical of their species. Behavioral medicine has not generally examined life apart from human existence, though the same definition used with humans would likely apply to other species. Behavioral medicine has not formally agreed upon statements on the origins of life (either for the individual or for the species). Death is viewed as the cessation of physical functioning.

Reality

There is a general common-sense notion in behavioral medicine that reality is the physical world surrounding humans. However, behavioral medicine is also interested in the “personal reality” of the individual, i.e., how the individual perceives his/her world and experience. It is thus recognized that reality, in the second sense, for any two people residing in the same environment may be quite different. Reality may be known, at least in part, through the methods of science.

Knowledge

Knowledge is that which is understood to be congruent with reality. Consequently, there is an objective knowledge that exists, i.e., proper understanding of the physical world and its functioning that is publicly verifiable, and a subjective knowledge, i.e., that which is understood by the individual and is in accord with his/her reality but may, at times, conflict with the subjective knowledge understood by others.

Truth

To the extent that truth is defined in behavioral medicine it is done so implicitly. Thus, in the search for knowledge behavioral medicine practitioners are engaged in an attempt to understand the true nature of things, i.e., the truth. However, behavioral medicine has not explicitly defined truth, likely because this construct is viewed as the purview of religion or philosophy.

Perception

Perception is a person's understanding of the meaning of a sensation. A sensation occurs when a sensory stimulus elicits a response from the sensory system that reaches the level of consciousness. In behavioral medicine perception is differentiated from sensation in that perception is a higher order mental process involving interpretive activity. This is most often salient in areas of behavioral medicine involved in studying pain.

Time

Time has to do with the ongoing relationships of objects to each other. Time is measured

objectively based on observations of changes in the relationships of objects in the surrounding environment. The subjective experience of time is freed from objective measures of relationships and thus time may be experienced as either speeded up or slowed down. This subjective experience is influenced by psychological states and physical occurrences.

Consciousness

Consciousness is the quality of being aware. Thus, one is conscious (and therefore experiencing consciousness) to the degree that one is aware of feelings, thoughts, perceptions, ideas, sensations, and reasoning. States of consciousness have to do with the degree that one is awake and alert and range from completely unconscious to being fully alert.

Rationality/Reason

Rationality has to do with the ability to think in ways that are in accord with the functioning of the physical world, the known facts, and the rules of logic. The more one's thought processes are congruent with these, the more rational one is thinking.

Mystery

Mystery, to the extent behavioral medicine has a position on it, would simply be that which is unknown. Behavioral medicine has not, however, specifically defined this term.

Relevant Themes

One other issue of some importance from the perspective of behavioral medicine regarding the Science and Religion interface deals with basic presuppositions regarding the nature of humans. For example, behavioral medicine is often concerned with issues of motivation and behavior change. Fundamental to these considerations are hypotheses regarding what motivates people to behave in certain ways and these hypotheses are, in turn, derived from underlying, bedrock, theories regarding the essential nature of humans. At this level there is, what has been to

this point, implicit or even unrecognized overlap between the “science” of behavioral medicine and religious doctrines. A more thorough and explicit discussion at this level of conceptualization about how behavioral medicine theories of motivation and behavior change relate to religiously based conceptions of human nature would serve to engage these disciplines in a significant manner.

Cross-References

- [Aging, Psychology of](#)
- [Biological Psychology](#)
- [Medical Sociology](#)
- [Neuropsychology](#)
- [Pain \(Suffering\)](#)
- [Psychobiology](#)

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Behavioral Neurobiology

- [Neuroethology](#)

Behavioral Neuroscience

- [Biological Psychology](#)

Behavioral Selection

- [Evolutionary Psychology](#)

Belief

- [Faith and Belief](#)

Belligerence

- [Aggression](#)

Ben Yehudah, Eliezer

- [Language and Literature, Hebrew](#)

Biases and Heuristics

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Biases are tendencies toward certain types of behaviors; the *confirmation bias* is the tendency to selectively notice information that confirms

what one already believes. *Heuristics* are simplified algorithms (i.e., “quick rules of thumb”) that people may use in the place of more complicated algorithmic rules in order to make a decision more quickly; the *availability heuristic* is the tendency to base judgments of likelihood on how easily an example can be retrieved from memory.

Bible

► Ecclesiology

Bible as Literature

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Description

“The Bible as Literature” denotes an academic subject taught in high schools, colleges, and universities and the academic specialty of a worldwide network of scholars. As a Library of Congress subject category in *World Cat* it elicits entries for 1,252 books. In recent years, practitioners have preferred the term, “Literary Study of the Bible,” which produces listings as the subject of 653 books. There is no professional organization or journal specifically devoted to the topic.

The Bible as Literature/Literary Study of the Bible is a subdiscipline of both Biblical Studies and Literary Criticism. Its activity is “exegesis,” i.e., commentary on and interpretation of the Bible.

The word “Bible” has several meanings. It refers to a collection of separate books and to that collection defined as a single book. The Jewish Bible consists only of the Hebrew Scriptures or Tanakh. The Christian Bible includes the books of the New Testament plus the Hebrew

Scriptures, which it refers to as the Old Testament. The Catholic Bible contains, in addition, the Apocrypha, a set of books not included in the Protestant Bible.

Literature is defined as “...artistic writings worthy of being remembered. ...that are characterized by beauty of expression and form and by universality of intellectual and emotional appeal” (Dictionary.com). Literary Study is defined as “the humanistic study of literature” ([WordNet®](http://WordNet.com)). “The purpose of a literary inquiry is a better understanding of the text – its construction, its forms of expression, its meaning and significance, and/or its relation to non-textual elements or to other texts” (Berlin 2008). Although the text that Literary Study examines is usually concrete and specific, no understanding it produces is exhaustive or conclusive.

The Bible as Literature/Literary Study of the Bible is governed by a set of ► [hermeneutic](#) methods – i.e., certain principles of commentary and interpretation. It takes a secular approach, treating biblical texts as works produced by human beings within human history rather than a theological approach, which treats them as Holy Scripture, Divine Revelation, or The Word of God. It applies techniques of literary criticism to the Bible in the same ways they have been applied to other literary works since the time of Aristotle. These include:

- Analysis of plot and structure
- Discussion of character, including the characters of narrator and author
- Exploration of theme
- Consideration of historical and geographic setting
- Delineation of linguistic and stylistic devices, including figures of speech and verse and prose conventions
- Categorization of genres
- Correlation of intertextual references to other works

Some readers within faith communities that adhere to a theological approach to biblical interpretation regard The Literary Study of the Bible as subversive; others see it as complementary.

The Bible as Literature/Literary Study of the Bible is also defined by contrast to a different

secular approach to the Bible known as the “Higher Criticism,” Textual Criticism, “Literarkritik,” or, confusingly, “Literary Criticism of the Bible.” This academic discipline studies the Bible as a documentary artifact, employing scientific methods to understand the historical or “diachronic” process that produced the texts accreted and deleted during the period in antiquity encompassing the Bible’s composition and canonization. While Higher Criticism attempts to reverse engineer the received text into earlier constituent layers and fragments, The Bible as Literature/Literary Study of the Bible interprets the received text as a completed “synchronic” whole at the end of its evolutionary history. It discusses characters and plot events in the present tense.

The Bible as Literature/Literary Study of the Bible emerged as a self-conscious academic specialty in the 1970s, but recorded interpretations are as old as the text itself. Examples of internal exegesis include Moses’ explanations of the purpose of the Sabbath day by reference to the seventh day of the creation, or Jesus’ interpretation of the laws of the Decalogue in his Sermon on the Mount, or St. Paul’s disquisitions on the spiritual rather than the literal meaning of circumcision portrayed in Genesis.

Early exegetes like Philo of Alexandria supplied allegorical interpretations of anthropomorphic features of the Hebrew God to make the Biblical deity palatable to rationalistic Hellenistic readers. During the Rabbinical period collections of oral interpretive commentary on passages of the Hebrew Bible were collected in the Midrash. Some Jewish and Christian commentaries, for instance, by Longinus and St. Augustine, acknowledged the richness of poetic and rhetorical language in Biblical passages of poetry or parable.

Medieval Jewish scholars described principles of parallelism in Hebrew poetry and patterns of metaphor, hyperbole, wordplay, and rhyme as well as different authorships of different sections of Isaiah. The Venerable Bede (672–735) wrote a treatise entitled *On Figures and Tropes of Holy Writ*. During in the Middle Ages the Bible also served as a model for original literary

writings like Dante’s *Divine Comedy* and English miracle and mystery plays.

The revival of classics and the rise of humanism and science during the Renaissance and Reformation generated more interest in the Bible as Literature. Petrarch, one of the modern originators of the idea of literature as an independent subject, stated that “the bible not only contains poetry, it is poetry at its core” (Wall 1995). In his “Defense of Poesie” from Puritan attacks against secular literature, Sir Philip Sidney celebrated the literary accomplishments of “David in his Psalms; Solomon in his Song of Songs, in his Ecclesiastes, and Proverbs, Moses and Deborah in their hymns; and the writer of Job” (Duncan-Jones and van Dorsten 1973). George Herbert admired the structural configurations of the text: “Seeing not only how each verse doth shine,/But all the constellations of the storie./This verse marks that, and both do make a motion/Unto a third, that ten leaves off doth lie. . .”(Herbert 1857) and John Donne expostulated upon the arcane beauty of its rhetoric: “thou art a figurative, a metaphorical God too; a God in whose words there is such a height of figures, such voyages, such peregrinations to fetch remote and precious metaphors. . .such things in thy words, as all profane authors seem of the seed of the serpent that creeps, thou art the Dove that flies” (Donne 1975). Works like Milton’s *Paradise Lost* and *Samson Agonistes* amplified such appreciation by using Biblical texts as sources for original literary production.

This development of literary appreciation of the Bible was accompanied by the beginnings of a scientific-historical approach. Lorenzo Valla applied meticulous scholarship dependent upon knowledge of ancient languages to finding, comparing, emending multiple manuscripts, leading the way to Erasmus’ critical editions of the Greek New Testament and Tyndale’s translation of the Old. Such scholarly efforts continued during the late seventeenth and eighteenth century Enlightenment. Spurred by the strategy of systematic doubt and reliance on reason and empirical observation developed by Bacon and Descartes, Spinoza declared that the Bible needed to be understood only on the basis of evidence present

within it and available to any reader. Reading unencumbered by theological presuppositions led to the first formulation of multiple authorship of the five books of Moses by Richard Simon in 1678.

This secular historicizing scientific approach was paralleled by further exploration of the aesthetic literary values of the Bible. Robert Lowth discovered that the principle of Hebrew poetics lay not in meter or rhyme but in the balance of ideas and phrases, which he discerned in the Psalms, the Prophets, and elsewhere. Lowth's literary-critical work inspired the poetry of Ossian and of William Blake, who based his idiosyncratic poetic and artistic output directly on Biblical models of style. Blake claimed that the Old and the New Testament were "the great Code of Art," that all great art is as visionary as the Bible, that poets are by definition prophets, and that all gods reside in the human breast.

These dual tendencies in secular Biblical exegesis continued throughout the nineteenth century. Scientific-historical analysis became known as "higher criticism," elaborated in the Documentary Hypothesis proposed by Julius Wellhausen. Based on linguistic and stylistic analysis of the Hebrew Bible texts, he postulated four strains – J, E, P, and D – written at different times in different political and cultural contexts, eventually knitted together by ancient editors known as redactors. This hypothesis continues to guide "Biblical Literature" studies today, where refinements and revisions still proliferate based on new discoveries and interpretations of material artifacts. Scientific/historical research proceeded in New Testament studies with efforts to separate myth and legend from fact in Gospel accounts of the life of Jesus, e.g., in David Friedrich Strauss's 1846 *Life of Jesus Critically Examined*, and in Adolph Harnack's, *What is Christianity?*, which placed New Testament stories and teachings in the context of Near Eastern religious traditions.

The Higher Criticism combined with the geological discoveries of Charles Lyell and the biological theories of Darwin to present direct challenges to religious worldviews based on

theological readings of the Bible and led to widespread Victorian soul-searching about the conflict between science and religion. An alternate approach, sidestepping that conflict was provided by the Bible as Literature movement, which, though secular, repudiated the Higher Criticism's atomism, reductionism, technicality, and insensitivity to the Bible's aesthetic values. One of its founders, Matthew Arnold, had abandoned belief in a personal God, but argued that the arts provided a worthy successor to religious faith, and as a superlative example of literature the Bible should remain as a central object of study and appreciation. Arnold maintained that the Bible's literary language was of a different order than the language of objective description subjected to scientific confirmation or rebuttal.

Following Arnold, "The Bible as Literature" became a popular phrase denoting the subject of academic research and college and high school English courses. By the middle of the twentieth century, T. S. Eliot and C. S. Lewis, prominent British author/critics who remained religious believers, objected to its secular subversion of the Bible's unique theological authority. The technique of intense close readings of biblical texts fostered by the "New Criticism" generated widely cited critical accomplishments beginning with the translation of Eric Auerbach's essay "Odysseus' Scar." It contrasted the Bible's spare characterizations and descriptions with those of the classics, finding them richer with suggestive depth and hidden complexity – "fraught with background" (Auerbach 1953).

Northrop Frye and Robert Alter, two literary critics and professors of English, made major contributions to the field during the latter half of the twentieth century. Though often in stark disagreement, both applied systematic theories of literary analysis which rewarded intensive attention with the discovery of subtle details and rich patterns of coherence. Frye's *Anatomy of Criticism* postulated an overall unity of language, plot, imagery, theme, and character, an analytical framework that he completed elaborating in his last three books, all of them about the Protestant Bible (Frye 1957, 1982, 1990). Robert Alter's *The Art of Biblical Narrative* developed

a technique for linking small and large units of composition in the Hebrew Bible through internal reference or allusion (Alter 1981, 1985, 1987, 1992). Their approaches have been classified as variations of “structuralism” or “narratology,” each claiming some scientific authority derived from methodological sources in linguistics and anthropology. These approaches also have more traditional roots: Alter’s in the rabbinical techniques of midrash (the collection of early Rabbinic commentaries on the Hebrew Bible, in general, a commentary on a text that is free and sometimes fanciful), and Frye’s in patristic typology and in the poetics of visionary experience he found in William Blake. Though secular rather than theological interpreters, Alter and Frye assume that the received texts are coherent and complete.

By the middle 1970s the abundant fruits of such formalist literary study of the Bible were attracting historical scholars and led to the launch of a new journal by their professional association, The Society of Biblical Literature. Titled *Semeia*, it combined historical with literary approaches to interpretation. At the same time some literary scholars adapted the historians’ idea of separate strains of biblical authorship to arrive at new literary readings. In the J strain, Harold Bloom found a complete literary masterpiece he ascribed to a woman at King Solomon’s court (Bloom and Rosenberg 1990). Leslie Brisman construed a dramatic dialogue in Genesis between the normative voice of Isaac, associated with the P strain, and the quirky voice of Jacob, associated with J (Brisman 1990).

The contrast between Literary Study of the Bible and other interpretive approaches has been further blurred by literary critics’ adoption of the “hermeneutics of suspicion” associated with the movement called post-structuralism, postmodernism, or Critical Theory. Rather than discovering formal coherence, aesthetic value, and truth of representation in the Bible, the new analytic methods have brought forth Feminist gender analysis, Marxist class analysis, New Historicist power analysis, Cultural Studies anthropological analysis, and Psychoanalytic depth psychology analysis. This expansion of

the category “Bible as Literature” has further stimulated research, publication, the organization of conferences, and the creation of courses. Some interpretations generated by these methodologies are offered as more scientific than traditional literary exegesis, some simply as “a reading,” one among many that are possible.

Such relativism regarding knowledge of the Biblical text has issued in two related avenues of inquiry in Literary Study of the Bible: (1) the history of interpretation, which determines Biblical meaning as the changing outcome of the way it is understood by readers in specified historical and ideological contexts and (2) intertextual studies, or “The Bible *and* Literature,” which explores how literary texts by later writers like Milton, Blake, Shakespeare, or Toni Morrison, interpret and are influenced by the Bible.

Recently developed “ecoliterary” and “ecocritical” approaches incorporate the biological sciences into the Literary Study of the Bible. They focus on Biblical representations of nature and of human and divine relationships with nature, particularly in light of present day environmental issues. Lynn White’s 1967 essay, “The Historical Roots of Our Ecological Crisis” (White 1967), asserted that a significant cause of that crisis is the influence of the Bible’s language commanding humans to “fill the earth and subdue it and have dominion over. . .every living thing. . .” (Genesis 1.27) This language has been reinterpreted to enlist the Bible in the cause of environmental stewardship, both by secular critics and by theological writers concerned with Creation Care or Creation Theology. In one of several hortatory introductory essays to *The Green Bible*, an edition that replaces red lettering for the words of Jesus with green lettering for words dealing with nature, Ellen Bernstein writes: “The ecological language of the creation accounts helps us discern the ecological vision alive throughout the Hebrew Bible. So we begin with a literary reading of these texts to see what we can learn about God and Gods relation to the world, and about nature and human nature” (Maudlin and Baer 2008). Such ecocritical biblical exegesis is practiced by fundamentalist, anti-Darwinian “creationist”

theologians (<http://www.icr.org>), by literary critics who find in Genesis evidence for an emerging ethos of anti-anthropocentrism (Walker-Jones 2008), by cultural geographers (Hiebert 1996, 2008), and by environmental scientists who study human history within the framework of natural history (Hillel 2006).

Another ecocritical approach is pursued in Agrarian Studies, which finds throughout the Bible an underlying theme of respect for the land, concern for soil, and appreciation for sustainable agriculture. Blending theology with science and literary analysis, Agrarian Studies supports efforts to reform the present industrial food system, to critique some applications of science in modern technology, and to revive local agriculture and the culture of farming (Davis 2009). The interplay between the Bible and such agrarian issues is prominent in recent ecoliterary works, including the writings of Wendell Berry, Barbara Kingsolver's novel, *Prodigal Summer*, and Ruth Ozeki's novel *All Over Creation*.

Yet another new ecocritical approach labeled "Darwinian Literary Studies" applies findings and methods of sociobiology, evolutionary psychology, and Darwinian anthropology to the study of literature. Assuming that natural selection "shaped the human mind, and thus human behavior, and thus human culture," it uses the mechanisms of evolution to make sense of literary activity and of the content of texts, claiming to find in them elements of a biologically determined and scientifically defined universal human nature. Such findings are "tied into a web of mutually reinforcing, falsifiable hypotheses in the biological and social sciences" and form part of the larger "tree of knowledge" uniting all of the sciences. According to Jonathan Gottschall, "Darwinian literary criticism . . . focuses on the fascinating multiplicity of ways characters . . . accomplish the prime directive of all life: to live long enough to reproduce and, in species where parental care is necessary (like ours), rear young to reproduce again" (Gottschall 2003). Such a directive echoes the command reported in the Book of Genesis to have been issued by God to all living creatures including humans: "Be fruitful

and multiply and fill the earth. . ." (1:26). The structuralist literary critic, J. P. Fokkelman observed in 1987 that "the overriding concern of the book [is]: life-survival-offspring-fertility-continuity" (Alter and Kermode 1987), and Steven Marx elaborated that idea in his discussion of generation, genealogy, and genetics in Genesis in 2000 (Marx 2000), but as of 2009 the application of self-conscious Darwinian studies to the Literary Study of the Bible remains only a promise.

Self-Identification

Science

As reflected in the preceding chronological account, The Bible as Literature/Literary Study of the Bible has traditionally defined itself by exclusion of science: first by distinguishing its subject matter from theology, which treated the Bible as God's revealed truth, and second from the "Higher Criticism," which treated the Bible as a historical artifact representing actual historical events. Some proponents of the Bible as Literature (Sidney, Donne, Blake, Frye) have claimed that the language of the Bible refers to visionary or imaginative reality distinct from the material, temporal reality referenced by the language of science. Ancient midrashic and contemporary postmodern exegetes reject the scientific principle of falsifiability and the logical law of contradiction and accept multiple mutually contradictory interpretations. Nevertheless, the Bible as Literature/Literary Study of the Bible has also incorporated methods that can be classified as scientific because of their appeals to supportive textual and archaeological evidence, inner consistency, principles of design and symmetry, as well as to the psychology of rhetoric and the classification of genres. Recent developments in ecocriticism applied to the Bible as Literature/Literary Study of the Bible abandon the exclusionary definition of the field and seek to make it compatible with disciplines conventionally regarded as scientific such as ecology, cultural geography, and evolutionary biology.

Religion

The Bible as Literature/Literary Study of the Bible does not identify as a religion, but can be considered as either a religious or nonreligious endeavor. Early literary biblical exegesis was usually done within the framework of theology to enhance the status and appreciation of the sacred text by illuminating its literary virtues. Until the sixteenth century such study was limited to a few people who could read, and in both Jewish rabbinic and Christian patristic traditions, interpretation was seen to be inspired by God or the Holy Spirit. Since the Renaissance, one strain of literary criticism considers poets to be prophets and the Bible as prophetic utterance stemming from a quasi-divine source within humans. Some historical criticism and postmodern literary criticism aims to highlight arbitrary, accidental, or erroneous features of the Bible to undermine claims of its religious significance.

Characteristics

As mentioned, the Bible as Literature/Literary Study of the Bible is defined by its distinction from both theological and from historical or scientific biblical studies. It is a blend of literary criticism and Biblical studies. However since Biblical studies are sometimes theological and literary criticism sometimes incorporates methods of historical or scientific disciplines, another distinction lies in its unstable and elastic definition.

Relevance to Science and Religion

The category and academic pursuit of The Bible as Literature/Literary Study of the Bible arose out of the Science and Religion Controversy of the nineteenth century. Scientific discoveries about the historical evolution of the received biblical texts and about the circumstances of their composition along with discoveries about geology and biology contradicted many traditional beliefs about the Bible's truthfulness and authority. The Literary Study of the Bible avoided this

controversy by creating new possibilities for finding meaning and value in the Bible as a work of art available to nonreligious people. Religion has inspired and in turn been strengthened by art, and in this sense the Literary Study of the Bible can enhance religious experience and support religious belief. Conversely, study of the Bible as Literature can widen scientific access to the richness and complexity of religious experience and can reveal ways that texts and their interpretations have motivated the behavior of readers. For example, in a general education course entitled "God and Nature," proposed for Cal Poly University San Luis Obispo for Spring 2010, a biologist will present current scientific research that explains the variety of life on earth with Darwinian principles, a religious studies scholar will compare the Genesis account with creation myths from other cultures, and a literary critic will examine the aesthetic design and the emotional appeals of the language of *The Origin of Species*, of the Bible and of the other creation myths.

Sources of Authority

As a blend of Biblical studies and literary criticism, The Literary Study of the Bible accords authority to researchers in both fields. Prestige of historical Biblical scholars usually depends on mastery of ancient languages, historical, geographic, and archaeological erudition and technical skills like paleography and epigraphy, as well as on standing within professional hierarchies. Prestige of literary critics depends more on breadth of learning, rhetorical eloquence, self-fashioned identity, and originality of positions argued. Publication in prestigious journals and employment at select universities counts for both. Authority also stems from textual sources, primary and secondary. Biblical authority is no higher than the authority of other literary texts. Generally in Biblical scholarship, the more ancient the material referenced the greater its authority. Literary criticism tends to value references to new trends and information from unexpected quarters.

Ethical Principles

Since the subdiscipline has neither a journal nor a professional organization and since its definition is somewhat elastic, it is hard to answer this question. One principle generally observed by participants is respect for readers who do not share the same view of biblical authority or similar interpretations of the meaning and significance of biblical texts.

Key Values

One is aesthetic: participants pursue discovery and elucidation of imaginative and intellectual beauty encoded in the Biblical text and its interpretations. Another is philosophical: the apprehension of truth and wisdom through various ways of understanding the Biblical text and through the revelation of errors or distortions. The values of nonviolence, gender, racial and ethnic equality, social justice, and environmental stewardship inform some literary readings of the Bible.

Conceptualization

Nature/World

Literature represents nature/world, i.e., creation, with words. The study of literature inquires not about the world of nature, but rather the world of words and images. The Hebrew Bible shows God creating nature with words. The New Testament includes the statement that “In the Beginning was the Word. . . and the word was God.” So both the Literary Study of the Bible and the Bible itself privilege verbal utterance over physical creation. However, insofar as the Literary Study of the Bible regards it as a historical artifact it treats the Bible as a product and representation of the natural and social world of its historical and geographic settings.

Human Being

Literary criticism examines the Bible’s alternate representations of the human being: it is created

male and female at the same time as the other animals by the words of God and it is molded male first out of earthen clay and then born female out of the male’s body. Literary Study of the Bible relates these stories of origin to other discourses in the Bible about the relationships between men and women and between humans and animals. It tends to regard these stories of the creation of humans by God as products of the human imagination.

Life and Death

Literary Study construes the Bible’s stories of the origin of life either as contradictory to the scientific narrative of evolution or as analogous to it. It devises figurative meanings of the story of the origin of death as punishment for transgression and as a consequence of gaining the knowledge of good and evil and observes the symmetries created by New Testament images of death overcome by the resurrection of Jesus and the community of the saved.

Reality

Concepts of reality are classified as (1) “realist,” meaning that reality consists of formal abstract universals encoded in words and symbols (2) “nominalist,” meaning that reality consists of material particulars arbitrarily categorized and labeled by formal abstractions, words, and symbols, and (3) “conceptualist,” meaning that reality consists of a combination of formal abstractions and material particulars. All three have adherents within the Literary Study of the Bible. The realist view manifests in formalist, typological and archetypal criticism, which regards the text as absolute. The nominalist view informs historical and post-structuralist readings. The conceptualist mix is adopted by most critics in actual practice.

Knowledge

Knowledge in this field is largely textual, knowing what is in the Bible, understanding its languages – ancient and modern, explicit and occult – and being attuned to subtle detail and hidden pattern. Some knowledge is intuitive: the ability to read between the lines, discover

significance in the unstated, discern correspondences, and find meaning in unusual psychological states. Knowledge is accumulated by study of the text and its interpretations, by understanding literary theories, analytical vocabulary, and lexicons of symbol and archetype. The Literary Study of the Bible also values non-textual scientific knowledge about the provenance of the text, the history and geography of its settings, and the findings of comparative religion.

Truth

Literary Study of the Bible elaborates the notion that the truth of the text's assertions is found not only in their literal sense but in figurative, allegorical, or "spiritual" senses arrived at through knowledgeable interpretation. Theological notions of the Bible's "inerrant truth" assert that as God's Word, the Scriptures contain truth that no human inquiry, scientific or otherwise, can fully comprehend. Both the Book of Proverbs and the Gospel of John claim that the Word of the text precedes the creation of the world. The Literary Study of the Bible reflects on what is meant by such paradoxical utterances. Adherents of New Criticism assume that the Bible in whole and in parts, like other literary works, has a fullness of meanings that can be approached but never fully grasped by interpretation. Historical and scientific forms of Literary Study of the Bible find truth by placing the Bible in its material and cultural context – referred to by some scholars as its *Sitz im Leben*.

Perception

Perception is closely related to "knowledge." Realist-leaning literary critics associate perception with "vision" of a nonmaterial higher-order reality apprehensible through dreams and other altered psychological states. The Bible itself is full of representations of such visions and auditory perceptions, which realist interpreters identify with and sometimes share. Nominalist-leaning critics regard perception as accurate only if backed by scientific methods requiring falsifiable, repeatable, intersubjectively confirmable evidence. They seek to explain Biblical visions as hallucination. Conceptualist-inclined

interpreters regard perception as a synthetic creation of subject and object and find the range of vision recorded in the Bible worthy of further investigation.

Time

The Hebrew Bible/Old Testament begins with the creation of Time – "the first day" – by God, who presumably exists outside of time. The Christian Bible concludes its temporal narrative of the history of the world with an account of the end of time and its replacement by a new heaven and new earth, also presumably eternal. With utterances like God's I AM WHO AM in Exodus 3:14 and Jesus' "Before Abraham was, I AM," in John 8:58, the text suggests a supertemporal realm of existence pondered by Biblical interpreters like Augustine and Aquinas and rendered artistically by Dante and Bosch. "Synchronic" literary criticism of the Bible treats the whole text as contemporaneous and present simultaneously to the reader, especially in its employment of typology. "Diachronic" criticism treats the text as an artifact that evolved in the past over a long temporal interval.

Consciousness

Some Literary Study of the Bible treats its sequence of portrayals of God from beginning to end as a study in an evolving consciousness, one that learns by experience and by interaction with its human offspring in history – for instance, Jack Miles' *God: A Biography* and *Christ: A Crisis in the Life of God* (New York: Alfred A. Knopf 1995).

Reason/Rationality

As a secular academic discipline, Literary Study of the Bible values rationality and reason, which it applies to understanding even those Biblical texts that appear irrational or are claimed to be superrational.

Mystery

The Bible is filled with incident and language that is perplexing, enigmatic, and uncanny. Protagonists like Abraham, Job, and the disciples of Jesus and antagonists like the Pharaoh or the Roman

authorities are mystified by God's words and actions. Such mystification promotes wonder and awe, which can contribute to the authority of the divine or the divinely inspired speaker and can increase reverence for the text. Literary analysis can either intensify or undermine such responses on the part of the reader.

Relevant Themes

None

Cross-References

- [Biblical Studies](#)
- [Classics](#)
- [Critical and Cultural Theory](#)
- [Evolutionary Theology](#)
- [Faith and Belief](#)
- [Hermeneutics, Theological](#)
- [Historiography \(Classical\)](#)
- [History of Ideas \(Intellectual History\)](#)
- [Humanities](#)
- [Poetry](#)

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Biblical Hebrew

► [Language and Literature, Hebrew](#)

Biblical Studies

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Related Terms

[Hermeneutics](#)

Description

Biblical studies constitutes a subdiscipline of the academic study of religion. Integral to that more encompassing discipline is the examination of religious texts and how they have been and are used within particular religious traditions. Specifically, biblical studies focuses on those religious texts deemed sacred and authoritative (i.e., “scriptural”) by Jews and Christians. Jewish scriptures are frequently referred to by the Hebrew acronym, “*Tanakh*,” used to designate the three parts of the canon: *Torah* (the Pentateuch), *Nevi'im* (prophets), and *Ketuvim* (the writings). The Christian Bible comprises both the Jewish scriptures and Christian writings called the “New Testament.” Ultimately, the goal of biblical studies is to explore fully what S. Schneiders has felicitously described as three “worlds” of meaning: (1) *the world behind the text*, that is, the historical context in which the biblical writings arose; (2) *the world of the text*, that is, the linguistic reality presented in the biblical texts as they now stand, regardless of how they came to be; and (3) *the world before the text*, that is, the engagement with these religious texts by past and present readers/interpreters (Schneiders 1991).

Noteworthy, recent developments in biblical studies may be highlighted in terms of Schneiders’ taxonomy. To illuminate the “world behind the text,” biblical studies has paid increasing attention to noncanonical religious texts that were produced contemporaneously with the works deemed scriptural. Scrutiny of Jewish and Christian Apocrypha and Pseudepigrapha, the Dead Sea Scrolls, and Gnostic writings reveals the religious diversity within Judaism and Christianity as they developed during the biblical era. Archaeology and the study of material culture continue to be important complements to biblical studies. The 2001–2006 collaboration that resulted in the restoration, translation, and publication of the so-called Gospel of Judas is a parade example. In coming to terms with the “world of the text,” biblical studies has acknowledged the importance of the postmodern, “linguistic turn.” Narrative criticism, reader-response criticism, and deconstructive criticism are widely employed in biblical studies at the beginning of the twenty-first century. In elucidating the “world before the text,” biblical studies now benefits from the insights of postcolonial readers, who not only sensitize Western critics to the role the Bible played in imperialistic, colonial expansion but also offer hermeneutical approaches that build upon and challenge the hegemony of the historical-critical method.

In light of these developments, one senses a transformation underway in the practice of biblical studies as a subdiscipline. No longer a mostly historical or “historicist” enterprise that seeks to drive a wedge between exegesis (narrowly understood as recovering what a text *meant*) and hermeneutics (discovering what a text might *mean*), biblical studies has become more conscious (and accepting) of the fact that its work may be carried out as both an *etic* and an *emic* endeavor. When biblical studies is pursued impartially with an outsider’s (etic) perspective, the task is primarily descriptive and analytical, the goal of which is to understand how religious communities have appropriated biblical texts as scripture, as “guides for life” (Sanders 1976: 531–560). However, biblical scholars can and often do work from

the perspective of an insider (emic), that is, interpreting scripture while standing within a religious tradition (Judaism or Christianity) and perhaps holding to a particular construal of that tradition (i.e., belonging to a specific branch, denomination, confessional stance of Judaism or Christianity), or an ideology (feminist, womanist, queer, etc.). The etic approach is not necessarily inimical to belief, practice, or ideology; indeed, it can and does provide insights and correctives that insiders welcome. Similarly, careful attention to the ways in which the Jewish and Christian scriptures have been and continue to be “adaptable for life” (Sanders, *ibid.*) among practitioners or impact the broader culture in both positive and negative ways provides the biblical scholar with a more profound understanding of the function of sacred texts.

Self-identification

Science

As a subdiscipline of the study of religion, biblical studies does not identify itself as a science, in the narrow sense of the word. If science is defined as a way of knowing whose goal is to understand a universe made up of material and energy, a way of knowing that seeks to understand the natural world by building theories with broad and lasting explanatory value, logically constructed of facts built upon a foundation of direct and indirect experimentation, generalized laws, and confirmed hypotheses, then biblical studies cannot be considered a way of knowing of that sort. It clearly finds its moorings in Renaissance humanism.

Nevertheless, some do talk about the “science” of biblical studies. Since the nineteenth century, the historical-critical method has dominated biblical studies. The Jewish rationalist and philosopher Baruch Spinoza (1632–1677) was an important harbinger of that approach. Insisting that scriptures be read objectively, like any other text, Spinoza was one of the first to study the Bible “scientifically.” He was keen on investigating the historical background of the Bible’s constituent texts, classifying and comparing their

literary genres, and posing questions of authorship. Following Spinoza’s lead, nineteenth- and twentieth-century historical critics, chary of any hermeneutic shaped by dogmatic or confessional commitments, attempted to determine what the biblical texts’ meaning would have been in their original, ancient contexts. For that reason, during the past 100 years or so, biblical studies has been primarily concerned with establishing the origins of texts, with ferreting out “authorial intention,” with characterizing the original audience(s). It has also been concerned with how biblical texts were preserved and transmitted and how to describe the historical processes by which they achieved their present canonical status.

By the final quarter of the twentieth century, the limits of the historical-critical method were abundantly apparent. Biblical studies has displayed a dogged rigor in reinventing itself. The subdiscipline has been increasingly willing to acknowledge the provisional nature of its accomplishments. Methodological conversations have never been so animated. New alliances have been forged with the social sciences. In the eyes of some, the latter move has lent biblical studies a certain scientific cachet, despite its firm grounding in the humanities.

Religion

“Historical” fundamentalism is a distinctly Protestant, Christian phenomenon that arose in America in the late nineteenth and early twentieth centuries as a response to the “modernist” challenges of higher biblical criticism, Darwinian evolutionary theory, and Spencerian “social” Darwinism. It has as a cornerstone of its construal of the Christian religion a belief in biblical inerrancy. Fundamentalists are committed to the notion that the Bible (in its original autographs) is divinely inspired and, by virtue of that inspiration, guaranteed to be without historical, scientific, or theological error. As it developed, Christian fundamentalism has given rise to a branch of biblical studies whose primary aim is to bolster biblical inerrancy as the primary tenet of religious belief. James Barr terms this “Biblicism,” a form of Christianity in which the Bible is the supreme religious symbol, comparable to

Christ, the “accessible and articulate reality, available empirically for checking and verification, that provides for the lines that run through the religion and determine its shape and character” (1978: 36). Insofar as fundamentalist biblical studies functions to protect the Bible against all other modes of interpretation, it constitutes a cultus for a quite separate religious form.

Characteristics

Biblical studies is distinguished by its methodological pluralism and interdisciplinarity. Expert training in ancient languages is almost always the starting point. Scholars of the Hebrew Bible (Old Testament) are expected to achieve a high level of proficiency in ancient Hebrew and Aramaic. Comparative study of other ancient Near Eastern Languages (e.g., Ugaritic, Akkadian) is usually undertaken as well. Scholars of the Christian scriptures master Greek and frequently Coptic, Latin, and Syriac. Language study is complemented by work in humanities-based disciplines such as history, literary theory, gender, and cross-cultural studies. Increasingly, biblical studies draws upon the methods of disciplines housed in the social sciences, especially anthropology, sociology, and linguistics.

Relevance to Science and Religion

Science and religion are potent forces in contemporary life. Questions about the relationship between science and religion – whether construed as conflict, independence, dialogue, or integration (Barbour 1997: 77–105) – have come to the fore, especially in the USA. The recurrent, passionate debates and court trials about what ought to be the theoretical basis for teaching biology in the science classes of American public schools (evolution, intelligent design, or both) have pitted not only religion against science but the scientific method against biblical interpretation. Americans continue to replay the Scopes trial – over and over again. Biblical studies is poised to *and should* offer an important corrective.

Drawing upon its traditional strengths and methods, biblical studies is able to contextualize the biblical worldview. While writing in a prescientific age, the authors of the biblical texts were neither unconcerned with nor ignorant about the natural world. But the biblical authors were not engaged in “doing science.” Their empirical observations and comments are epiphenomenal to a far bolder religious enterprise, one that biblical studies can clarify. More importantly, biblical studies can make an even greater contribution by addressing the role of the Bible in the history of science (see section “[Relevant Themes](#),” below), a perspective that has been almost entirely lacking in recent debates.

Sources of Authority

As a subdiscipline of the academic study of religion, biblical studies is usually carried out in the context of accredited institutions of higher education: colleges, universities, theological seminaries, and schools. Scholars of biblical studies normally hold advanced degrees, usually the Ph.D. or its equivalent. One of the oldest learned societies in America, The Society of Biblical Literature (SBL), is also one of the largest and boasts a large and growing international membership. Many members of the SBL also hold membership in the American Academy of Religion (AAR). Both the SBL and the AAR are constituent members of the American Council of Learned Societies. Both publish highly respected, refereed journals: *The Journal of the Society of Biblical Literature* and *The Journal of the American Academy of Religion*. Both have sponsored dissertation and monograph series. These are but two among a host of professional, academic organizations and journals (American and international ones) to which scholars of biblical studies contribute. Biblical scholars may also seek formal approval or certification (e.g., in the Roman Catholic Church, an “imprimatur”) of their work that attests conformity to the doctrine and discipline of a religious body, or the work may be published under the auspices of a religious institution.

Ethical Principles

The ethical principles that guide biblical studies are chiefly those of the academy, those that pertain to intellectual integrity. Additionally, biblical scholars share the ethical principles of the discipline of religious studies. Thus, they strive to maintain an objective respect for religious practitioners whose sacred texts they study. Humility in approaching the complex phenomenon of human religiosity is enjoined. All definitions of religion are recognized as provisional and necessarily incomplete. Broad-sweeping generalizations are eschewed; comparative taxonomies are offered with great caution. Because early Christians appropriated Jewish scriptures as their own, and in light of a tragic history of Christian anti-Judaism, biblical scholars are especially sensitive to latent prejudices embedded in the subdiscipline.

Key Values

As mentioned previously, the subdiscipline of biblical studies embraces methodological pluralism and interdisciplinarity. Beyond that, the key values of biblical studies are reflected by the thoroughgoing way in which the subdiscipline has confronted the challenges of modernity in thinking about religion and religious texts. For example, it has certainly not shied away from the notion that sacred texts are human constructs. The rigor with which it has pursued form-critical, source-critical, redaction-critical, text-critical, and archeological avenues to their limits bears witness to that courage. Moreover, biblical studies seriously entertains the profound implications of the “linguistic turn,” the recognition that reality is mediated by language. Biblical scholars recognize that religious texts create cultural worlds. People who embrace biblical religion think about and experience the world in ways that are fundamentally shaped by language and texts. That being the case, the study of biblical texts requires the study of human activity not just written words. Biblical studies seeks to illuminate not only the content of biblical texts, but also their context and

use, attending the larger field of cultural activities, including the ways religious texts have been, *and are*, read, spoken, and performed. Comparatively speaking, this level of sophistication in approaching religious texts is scarcely equaled in the study of the world’s other great religious traditions and can serve as a model for other subdisciplines of religious studies.

Conceptualization

In discussing the following concepts, a prefatory note is necessary. Topics of this sort are usually taken up under the aegis of “biblical theology.” As Dennis Olson of Princeton Theological Seminary explains, biblical theology reflects a *constructive* engagement with the Bible that “seeks to provide greater conceptual articulation, coherence, or development of the Bible’s texts, ideas, metaphors, stories, and poetry involving God, humans, and the world in dialogue with various methods, contexts, and historic theological traditions” (*New Interpreter’s® Dictionary of the Bible* I.461–465). In others words, biblical theology cannot help but be concerned with the *world before the text*. Since the 1960s, the arena of biblical theology has been a highly contested domain. Because biblical texts are themselves diverse (produced over a millennium and reflecting the religious aspirations of varying communities) and because interpreters bring a host of methods and perspectives (etic and emic) to the effort, biblical theology is fraught with difficulty. There are some who are convinced that biblical theology either runs the risk of reductionism or invariably imports dogmatic, systematizing assumptions. What follows reflects, admittedly, an attempt to be cautiously descriptive, privileging the *world behind the text* and the *world of the text*. In doing so, it attempts to suggest how the work of biblical studies, when directed toward these selected *topoi*, can uncover hermeneutical “talking points,” which might serve as the basis for an enhanced, more nuanced conversation between the scientific community and those for whom these religious texts hold particular significance.

Nature/World

Biblical studies is quick to note that the English word “nature” derives from the Latin *natura*, which is most often used to translate the Greek word *phusis*. There is no corresponding word in Hebrew. In the Hebrew Bible (and echoed in the Christian New Testament), the entire cosmos, that is, “nature,” is designated by the phrase “heavens and earth.” According to the creation ► [myths](#) of Genesis, the heavens and the earth (all the entities that are not the product of human invention) are result of God’s creative activity, God’s “work.” In the Hebrew Bible, God “creates” by ordering chaos and forming the cosmos out of primordial waters. The Bible – in both its Jewish and Christian portions – presents the creation as a unified whole. The stories that narrate the creation of the physical/material realm are neither separate from nor secondary to those that account for the appearance of human beings. In the Christian New Testament, the concept that God created the cosmos *ex nihilo* (out of nothing) emerges more fully (Romans 4:17; Hebrews 11:3), though the idea is latent in noncanonical Jewish texts from the Hellenistic era. As the product of God’s creative and sustaining activity, nature is also revelatory; it points beyond itself to its source, that is, God (See *New Interpreter’s Dictionary of the Bible*, “Nature, Natural Phenomena,” IV.238–239).

Human Being

As noted above, biblical studies deals with religious narratives that assume human being, the human person, is the result of God’s creative activity. Taken as a whole, the biblical tradition is singularly uninterested in speculation about human essences. It does not belabor the physiology of being (as bipartite: body/soul or tripartite: body/mind/soul). It affirms a simple – though hardly *simplicistic* – theological anthropology: Human being comprises a psychosomatic unity of life force/vitality (Hebrew: *nephesh*) and material physicality. The human person does not possess a soul; the human person *is* soul (Genesis 2:7).

The two creation ► [myths](#) of Genesis 1–2 are chiefly concerned to describe the *rôle* of human

being in the created order rather than detailing the processes by which human being came into existence:

Genesis 1 – While scholars continue to debate about the precise implications of what is meant by the account of Genesis 1 (assigned by historical criticism of the Pentateuch to the Priestly strand of the postexilic period) that says that humans were created in the “image and likeness of God” (Genesis 1:26–28), most agree that the focus there is on the intended *rôle* envisioned for humanity, viz., that of being God’s representative in the world, holding primary power of governance over it.

Genesis 2 – In the second creation story of Genesis 2:4bff, which historical criticism attributes to the so-called Yahwist tradition, humanity is formed from already existent, arable soil (Genesis 2:7). Employing a Hebrew pun on a verbal root that can mean both “serve” and “till” (Genesis 2:15), the Yahwist describes humanity’s place as that of “farmer from farmland,” as “slave of soil,” an account whose focus, then, is on humanity’s relationship to, solidarity with, the created order, the physical universe.

Both of these narrative strands shape the understanding of the human person throughout the Christian New Testament (See *New Interpreter’s Dictionary of the Bible*, “Humanity, NT” and “Humanity, OT,” II.907–912).

Life and Death

In the biblical worldview limned by this subdiscipline, the cosmos apart from the animating activity of God is void and lifeless. God is the source of vitality; the world cannot produce life on its own. Since all that lives depends upon God for its existence, to *live* is to find one’s place in appropriate relationship with God. Thus, biblical thought betrays relatively little interest in cosmology, biology, or philosophy, favoring instead the moral dimension of existence (see “[Knowledge](#)” below, and *New Interpreter’s Dictionary of the Bible*, “Life,” III.655–661).

In the Yahwist’s account of creation in Genesis 2, the prospect for humanity is long life lived in fellowship with God (the more abstract notion

of *immortality* is not introduced in this context). Mortality – death – is a consequence of human disobedience. Moreover, as a result of sin, life expectancy for humans decreases. The genealogy of Genesis 5:27 reports that Methuselah lived 969 years. By comparison, Abraham, the progenitor of the Jewish people, lived only 175 years (Genesis 25:7). For the psalmist, the normal span of a human life is reckoned as 70 years, 80 at the outside (Psalm 90:10).

Reality

Generally speaking, the biblical tradition is not given to discrete, philosophical meditation/speculation about the nature of reality as such. That God is the source of existence as human beings experience it is the fundamental, operative presupposition in both Jewish and Christian scriptures. Nevertheless, apprehension of that reality is elusive: Moses was granted only to see God's "backside" (Exodus 33:18–23); Paul admits that "we see by means of a mirror, in an enigma" (*di' esoptrou en ainigmati* – 1 Corinthians 13:12). To glimpse the richness and subtlety of the Bible's conception of reality, biblical studies pays careful attention to metaphors found in biblical poetry, to the ways in which the verb "to be" is manipulated in narratives, to words that can be translated as "life," and to expressions such as "there is" or "there is not."

Knowledge

Biblical texts bear witness to the fact that humans can and do rely upon the senses to deliver mostly reliable information about the nature of things – animate and inanimate – and for negotiating existence in world. Sensory information requires the complements of intuition and rational processes. Taken together, these can lead to "true" (see below) knowledge.

Knowledge goes beyond information. It is the basis for moral agency, right action. The Bible's concern is not with articulating an epistemology. Rather, knowledge is assayed in terms of moral understanding, embedded in an unfolding narrative about covenantal relationality (See *New Interpreter's Dictionary of the Bible*, "Knowledge," III.539–546).

Why "moral understanding," not "ethics"? One must take seriously the nature of biblical texts. They are not philosophical treatises. Wayne A. Meeks, Woolsey Professor Emeritus of Religious Studies at Yale University, makes an important distinction between biblical morality and philosophical ethics: "I take 'ethics' in the sense of a reflective, second-order activity: it is morality rendered self-conscious; it asks about the logic of moral discourse and action, about the grounds for judgment, about the anatomy of duty or the roots and structure of virtue. It is thus, as the *Oxford English Dictionary* has it, 'the science of morality'" (1993: 4–5). By contrast, biblical stories, Psalms, prophetic pronouncements, Gospels, and letters do not seek to engage readers in ethical reflection. Rather, their aim is to *shape religious communities* concretely by articulating a set of practices and by fostering their inculcation with *paranaesis*, that is, moral exhortation.

The *sine qua non* of true knowledge is *wisdom* (See *New Interpreter's Dictionary of the Bible*, "Wisdom in the NT" and "Wisdom in the OT," V.865–875). Wisdom denotes a depth dimension of knowledge. Wisdom leads to proper relationships, to harmony with God, with one's fellow humans, and with the world. In some portions of the biblical tradition, wisdom is *personified* (often as a female) and is exalted as the creative agent by which the world was brought into existence and is governed (see Proverbs 1, 8, 9).

In the biblical world, revelation is also a source of knowledge, of wisdom. Ultimately, one of the animating features of the biblical narratives is the fact that human perplexity about the elusive nature of reality (see above) and the need for guidance is met by God's self-revelation. Deuteronomy 29:29 captures this perfectly: "The secret things belong to the Lord our God, but the revealed things belong to us and to our children forever: to observe all the words of this law." In the Christian Gospel of John, Jesus is portrayed as the human embodiment of God's *Logos*, God's "word," God's "reason/logic," and God's "wisdom" (John 1:14). Those who believe that Jesus is God's self-manifestation, who follow him and obey his commandments, find "the way, the truth and the life" (John 14:1–6).

Truth

Biblical words for truth (Hebrew = *‘emeth*; Greek = *alētheia*) are used to express a number of concepts. Two may be singled out. Truth is first and foremost a characteristic of *action*; one *enacts* “truth” by keeping promises, acting justly, fulfilling an obligation, showing piety, etc. Thus, both the Hebrew and the Greek words frequently render “truth” in terms of “reliability,” “faithfulness,” and “trustworthiness.” Secondly, writers in both the Hebrew Bible and the New Testament value “truth” in the sense of correspondence between words and reality. When used to convey that meaning, “truth” in the biblical sense implies “accuracy” and “honesty” in the use of words to make some reality evident (See *New Interpreter’s Dictionary of the Bible*, “Truth,” V.681–686).

Perception

While biblical texts take for granted the fact that humans can and do rely upon the senses to deliver mostly reliable information about the nature of things – animate and inanimate – and for negotiating existence in world, they also betray an awareness that reality is not conterminous with sense perception. The senses can deceive. In the New Testament, Paul (a Jewish Pharisee and Christian indebted to intertestamental Jewish interpreters) states that the entire creation participated in the fall of humanity and that it, too, is alienated from God. Subsequent Christian interpreters, especially during the Protestant Reformation, argued that Paul’s notion of a fallen creation implied that the self-revelatory nature of the cosmos became diminished and opaque and human ability to perceive nature aright skewed. This interpretive trajectory has had important implications for how some Christians evaluate the claims of science; there are Christians who hold that, apart from grace that comes from belief in Christ, humans are incapable of understanding the natural world.

Time

Since James Barr, then Professor of Old Testament Literature and Theology at the University of Edinburgh, wrote his groundbreaking *Semantics of Biblical Language* in 1961 and his subsequent

monograph, *Biblical Words for Time* in 1962, biblical studies has been tendentially reiterating that the thought world of the authors of the Hebrew Bible and the Christian New Testament ought not be shoe-horned into anachronistic, abstract, inappropriately comparative categories. Rather than offering meditations on the nature of “time,” biblical texts provide a lexicon for describing the movements of celestial objects. Day, night, week, month, and year are the basic units of observation. Sunrise and sunset and the waxing and waning of the moon are coordinated with agricultural cycles. Seedtime and harvest are intimately tied to cultic festivals, days set apart as “holy.” Time, then, is not so much a dimension to be contemplated but a set of relationships to be negotiated. When that is recognized, the enumeration of the first 3 “days” in Genesis 1:3–13 prior to the creation of the sun and the moon on the fourth is not incongruous. The creative “week” is not so much about 24-hour days as it is about a rhythm established by a plan that brings into existence a firmament first, then lights to “occupy” the firmament, then seas and dry land, followed by the life-forms that populate both, all of this related, ultimately, to the observance of Sabbath.

While it is granted that “a 1,000 years in [God’s] sight are like a day” (Psalm 90:4; c.f., 2 Peter 3:8), the God of the Hebrew and Christian religions, who is beyond “time” as humans experience it, is nevertheless self-revelatory and intervenes in human affairs. Epiphanies are made to particular persons, in concrete places, at specific times. Decisions are made as a result. Actions follow. Modes of reckoning and recording time and concomitant elements of calendrical calculation and history writing are ancillary to religious purposes. Events are arranged in a constellation of significances.

Temporal references in the Bible are underlined in ways that indicate their *momentous* character. The most common Hebrew word typically translated as “time” (*‘eth*) is usually accompanied by prepositions, adjectives, demonstrative pronouns, and modifying phrases (“*in* the time,” “*near* the time,” “*at that* time,” “*at the* time of your deliverance,” etc.). In the Christian New

Testament, following the lead of the Septuagint (the Greek translation of the Hebrew Bible), concern to describe events as having moment is indicated by a decided preference for *kairos* (“appropriate” or “decisive” time) as opposed to *chronos* (“workaday” time). This is nowhere more evident than in the Christian Gospel of John, where the culminating event, Jesus’ Passion, is encapsulated as his “hour” (*hōra* – see 17:1). Finally, several writings in the Jewish scriptures and all of those in the Christian corpus are colored by eschatological/apocalyptic expectations. Time is religiously meaningful and teleological (See *New Interpreter’s Dictionary of the Bible*, “Time,” V.595–600).

Consciousness

The Bible details no Cartesian breakthrough (“*Cognito ergo sum*”). There is no Hebrew word that is even roughly translatable as “consciousness” (See *New Interpreter’s Dictionary of the Bible*, “Conscience,” I.719–726). The stories of Genesis 2–3, which biblical studies regards as ► **myths**, drop tantalizing hints, sweetly perfumed handkerchiefs that beckon interpretive suitors to retrieve. When the *adam* is animated by God’s breath in Genesis 2:7 and becomes a *nephesh* (see above, “**human being**”), is a coming to consciousness implied? The text is not explicit. When the human male is given the task of naming the animals (a role tantamount to being cocreator in comparative, ancient Near Eastern thought) and recognizes that among them is no suitable mate, does he acquire for himself reflexive self-awareness (Genesis 2:18–20)? Again, interpreters are left at sixes and sevens. Maybe the awakening comes when the woman, created by the Lord out of the *adam*’s (“clod man’s”) rib, is presented to him and he declares, “At last, this is bone of my bone, flesh of my flesh” (Genesis 2:21–23). Doesn’t the aftertaste for having eaten the forbidden fruit of the tree of the knowledge of good and evil count for something (“their eyes were opened, and they knew that they were naked” – Genesis 3:7)? For the most part, historical critics hold back. The interpretative tradition, both Jewish and Christian, has been and is more solicitous.

Biblical scholars turn in elsewhere. They attend to the laconic pronouncements of the “Preacher” in the Hebrew Bible’s *Qoheleth* (Ecclesiastes). Writing in the first person singular, the text reflects an astute albeit resigned, world-weary consciousness (Ecclesiastes 3:7) that is altogether unique. Its place among the sacred writings of the Jews was still being debated in the 2nd century of the Common Era. The Book of Job reflects a sober, hard-won consciousness about himself and his place in the world as he attempts to come to terms with apparently unjust suffering. The Psalms, for example, are rife with explicitly introspective, self-reflective passages.

The Greek word for consciousness that would have been available to early Christian authors, *suneidēsis*, is not used by the authors of the Synoptic Gospels (Matthew, Mark, Luke) or the Johannine literature (Gospel of John, 1, 2, 3 John). Of the 27 occurrences in the New Testament, more than two-thirds are found in Paul’s letters. In most instances, English translations render *suneidēsis* as “moral consciousness” or simply “conscience,” implying the existence of an internal capacity [of the soul?] that guides conduct, that provides laws, that judges or sanctions behavior, and that renders verdicts of guilt or innocence. Biblical studies’ scholars are quick to point out that this later, shifted sense, with its penchant for legal metaphors, is an imposition on the Christian texts and skews readings (see especially Krister Stendahl’s watershed essay, “Paul and the Introspective Conscience of the West” cited below). With Timothy 4:2 and Titus 1:15 being the two notable exceptions, *all* of the New Testament occurrences of *suneidēsis* point to a more general conception of a human consciousness in touch with surroundings and self, which is, secondarily, capable of acknowledging shortcomings, producing bad feelings, and altering behaviors (Stendahl 1976).

Rationality/Reason

See sections “**Human Being**” and “**Knowledge**” above. As noted there, the ultimate goal of reason is to attain wisdom, the sure knowledge of God as

the source of all that is, the one who orders chaos. In biblical thought, the primary endowment that distinguishes human beings from animals is rationality, the ability of reason. Human governance in the world as God's representative is inextricably linked to thought and the ability to communicate thought, to translate it into action by means of speech acts. Thus, the proximate ends of ratiocination are regulatory. As the "governor" of life, reason controls the passions; it rules the emotions; it steels courage and banishes fear. Self-control is the benchmark, the rational life. Reason, however, may be misdirected. Or it may overstep its bounds. It can lead to pride, to self-assertion, to self-idolatry, and thus, ironically, to profound ignorance. In the Jewish scriptures, the book of Daniel recounts one of the most vivid examples of how hubris can lead to the loss of rationality and of one's humanity. The Babylonian king, Nebuchadnezzar, was struck by madness, *insania zoanthropia*, which drove him away from human society to dwell with animals, where for an extended period he ate "grass like oxen, his body bathed with the dew of heaven until his hair grew as long as eagles' feathers and his nails became like birds' claws" (Daniel 4:28–37). When he was restored to his rightful place as king, Nebuchadnezzar says that his "reason" (Hebrew = *manda'*) returned to him.

Mystery

See section "Time" above. In the Hebrew Bible, "mystery" (Hebrew = *razah*) first appears in Daniel (Daniel 2:18, 19, 27, 30, 47; 4:9). The word recurs in the apocalypses of the Pseudepigrapha and in the scrolls discovered at the Dead Sea. Mystery is revealed by divine agency to a seer. In Daniel and the intertestamental Jewish texts, the content of mystery is cosmological: Secrets about the function of universe are unveiled, secrets that simultaneously reveal the plan for how God's purpose will achieve its predetermined end.

The writings of the Christian New Testament presuppose this background. The Greek word for mystery (*mustērion*) occurs 27 times in those writings, 20 of which are in the letters of Paul. The content of the eschatological mystery,

according to Paul, may seem more narrowly defined, but to Paul's way of thinking, it is ultimately more astonishing and startling: The revelation (*apokalupsis* – Galatians 1:12) of the crucified and vindicated Messiah (Jesus) adumbrates God's previously hidden intent to include Gentiles with Jews as God's people (see Romans 11:15). In every other instance in the New Testament, mystery is a portmanteau for conveying two ideas at once: (1) it refers to hidden knowledge that will be unveiled by God (apocalyptic secrecy) and (2) it pertains to the *telos*, the divine purpose, in history (See *New Interpreter's Dictionary of the Bible*, "Mystery," IV.185–187).

Relevant Themes

Ian G. Barbour has outlined four ways for construing the relationship between science and religion: conflict, independence, dialogue, and integration (1997: 77–105). At present, sustained, substantive interchange between the subdiscipline of biblical studies and the scientific community is, unfortunately, minimal. For example, when, in 2006, Richard Dawkins, esteemed biologist and the Charles Simonyi Professor of the Public Understanding of Science in Oxford University, leveled his broadside against religion, including an outright assault on the God of the Hebrew Bible, whom he describes as "arguably the most unpleasant character in all fiction: jealous and proud of it; a petty, unjust, unforgiving control-freak; a vindictive, bloodthirsty ethnic cleanser; a misogynistic, homophobic, racist, infanticidal, genocidal, filicidal, pestilential, megalomaniacal, sadomasochistic, capriciously malevolent bully" (2006: 31), he hardly got a rise from specialists in the biblical studies. The guild paid little attention to his equally vituperative characterization of the New Testament theology as "vicious, sadomasochistic and repellent...barking mad" (2006: 253). That frosty silence does not connote the field's entrenchment in a position of either conflict or independence. Rather, representatives have adopted a mostly aloof disdain for the way in which Dawkins and his ilk (Sam Harris,

Christopher Hitchens, Daniel Dennett, etc.) superficially cast biblical religion, indeed all of religion, in fundamentalist terms (see section “Religion” above).

Barbour’s hope, shared by many in biblical studies, is to identify points of contact that would allow for meaningful dialogue. Barbour urges scientists and religionists to interrogate the presuppositions that motivate their respective pursuits, their mutual concern with “limit questions,” to examine the methodological parallels that exist between the disciplines, and to acknowledge their common interests in nature. Such an investigation, he believes, may provide an avenue to authentic engagement.

Answering Barbour’s call, John Haught, director of the Georgetown Center for the Study of Science and Religion, has pointed the way. He documents an emergent awareness among scientists of the “fundamentally narrative character of nature” (2003: 67). Scientists who understand the cosmos as *story* have come to “read” physical laws not as final explanation but as the grammatical framework – the essential, recurrent, predictable constraints – for emergent novelty and for bringing the “story” to expression. “Analogously,” Haught concludes, “the strict Darwinian ‘rules’ of adaptation and selection, along with the laws of physics and chemistry are ‘grammatical’ requirements of any conceivable life-story” (2003), a story that science seeks to “read” and “interpret.”

Working quite independently of Haught, Kenneth Miller, professor of biology at Brown University, frames science’s “story” in this way: “By any standard we live in a universe that is simply brimming with evolutionary possibilities. Our planet is one place where those possibilities have come to fruition. Not only did life emerge on this planet, but life mastered it. It adapted to conditions on the earth and then it changed them. It altered the gases in the atmosphere, reshaped the chemistry of the oceans, and remade the land forever. Life explored the possibilities of existence on Planet Earth, and evolution drove that exploration. Evolution’s winners were the organisms that most successfully found a pathway to change and as a result have come to dominate

existence on our planet. We are among those organisms, but we possess something special, something that no other organism to our knowledge has ever had—the ability to see and to understand how we came to be” (2009: 134).

Miller goes on to interpret this narrative in terms of an “evolutionary cosmology.” While evolutionary cosmology reckons with a view of the universe in which human existence in the living world is an inherent part of nature itself, it is also a view of human being that brings with it awesome responsibility. “Evolutionary cosmology not only promotes a powerful ethic of environmental stewardship, but it places an extraordinary premium on scientific learning and understanding. . . . Science is indeed a human activity, with all of the faults and failings that attend any human creation, but it is also a human creation that continues to promise to add greater insight, greater understanding, and greater depth to our lives” (2009: 156).

As the survey of concepts in “Conceptualization” above reveals, these sentiments are ones with which biblical studies resonates. The subdiscipline of biblical studies focuses on religious texts. In communities for whom they are sacred scripture, these texts reveal the nature of reality beneath the surface of things, including human existence itself. For both insiders and outsiders, these texts do not yield their secrets readily; they require interpretation. Science explores the universe, itself a “text.” Science seeks to discern the reality of nature, of what is going on beneath the surface, often transcending empirical observation. Hard-nosed materialism does not settle for easy explanations; theories are hard won. The quest for depth motivates both enterprises.

Perhaps, it is not too much of a stretch to say that both science and biblical studies wrestle, fundamentally, with how to read “texts” appropriately, that is, with hermeneutics. Viewing them as ways of reading, albeit *distinct* ways of reading, promises to bring science and biblical studies profitably into dialogue. Moreover, historical examples of how the Bible’s readers have both sparked and questioned scientific interpretations – and vice versa – can

be illuminative. It is worth remembering that almost as groundbreaking as the publication in 1859 of Darwin's *Origin of Species* was, with its challenges to the assumptions of natural theology and biblical literalism of his day, so, too, was the appearance in 1860 of a controversial volume entitled, harmlessly enough, *Essays and Reviews*. Containing contributions by seven English clergymen, the collection is likewise a monument to the serious engagement between religion and science in the Victorian Era. Not only did the essayists respond to Darwin's theory critically (and appreciatively), they introduced Great Britain to methods of interpretation, of *reading* that made biblical studies an equal partner in the advancement of science in the nineteenth century.

Cross-References

- [Bible as Literature](#)
- [Hermeneutics, Theological](#)
- [Imago Dei](#)
- [Myth](#)
- [Religious Studies](#)
- [Revelation](#)
- [Semantics](#)
- [Time](#)
- [Wisdom \(Philosophically\)](#)

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Big Bang Cosmology

- [Christian Cosmology](#)

Bioethics and the Jewish Culture

- [Bioethics in Judaism](#)

Bioethics in Christianity

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Description

The term “bioethics” was coined in 1927 by Fritz Jahr, who referred to the ethical use of animals and plants in scientific research as a “bioethical imperative.” In 1970, the American biochemist Van Rensselaer Potter broadened the perspective of the term to include solidarity toward the biosphere, with the intention to establish an academic discipline linking biology, ecology, medicine, and human values for the purpose of helping the survival of both human beings and other animal species. Today, bioethics also includes the study of the more commonplace questions of values which arise in different branches of medicine. The difference between “bioethics” and “medical ethics” is vague and

there are plenty of overlaps between the two fields as witnessed by new terms such as “biomedical ethics.”

When “bioethics” first emerged in the 1960s and 1970s in North America, one key issue was human experimentation that exploited vulnerable populations. These experiments were first conducted by German Nazi and Japanese army physicians in Germany and China, respectively, during WWII. The postwar trial of German army doctors led to the famous Nuremberg Code (1947) that has laid the moral cornerstone for ethical human experimentation. Unfortunately, the Nuremberg Code did not prevent the American public from having to face the Tuskegee Syphilis Study, cited as “arguably the most infamous biomedical research study in U.S. history.” The study was conducted between 1932 and 1972 in Tuskegee, Alabama by the US Public Health Service to study the natural progression of untreated syphilis in poor, rural black men. The latter were either not given or prevented from accessing penicillin, even though the effectiveness of the drug for syphilis was established in the 1940s. Other medical and ethical issues that emerged in the 1960s included the use of oral contraceptives, abortion, withdrawing of futile treatments, organ transplants and donations, the definition of death, and allocation of limited medical resources. Given the life-and-death and suffering nature of bioethical discourses, it is not surprising that the persons who first addressed these issues were theologians. As Daniel Callahan, one of the early pioneers of bioethics, remarked: “When I first became interested in bioethics in the mid-1960s, the only resources were theological or those drawn from within the traditions of medicine, themselves heavily shaped by religion” (1990: 2). Hence, although the term “theological bioethics” did not come into usage until later in the development of bioethics, it is no exaggeration to say that “theological” was the distinctive birthmark of “bioethics.” Initially, in the 1960s and 1970s and onward, the theological voices came primarily from Protestant, Catholic, and Jewish scholars; later in the 1990s, Muslim, Buddhist, and Hindu scholars have joined in as well.

One of the earliest and most prominent Christian theological voices in bioethics came from Paul Ramsey (1913–1988). Ramsey was a Methodist and earned his PhD at Yale under H. Richard Niebuhr. He subsequently taught Christian Ethics at Princeton and published his influential book on medical ethics in 1970 entitled *The Patient as Person* in which he exploited several key Christian theological themes, particularly the God-man covenant, creation, human brokenness, and dependence to guide in resolving medical quandaries regarding issues such as resource allocation, abortion, and genetic engineering. Another Christian ethicist of equal importance with Ramsey in his contribution to theological bioethics is James M. Gustafson (1925–), a Reformed theologian who earned his PhD at Yale under H. Richard Niebuhr and held teaching posts at Yale, Chicago, and Emory for a total of 43 years as a theological ethicist. In his seminal work *Can Ethics Be Christian?* (1975a) Gustafson provides an affirmative answer to the question and provides the reason that ethics, including medical ethics, can be Christian because “religion *qualifies* morality” (1975a: 173). This occurs when one’s action and reaction to the other persons is not only influenced by the persons, but also by the sense of an ultimate power that rules and sustains the world. This affirmation enables Gustafson to draw deeply on the Reformed theological tradition to claim that God is related to the world as Creator, Sustainer, Judge, and Redeemer and the implications of these theologies for medical ethics. In *The Contributions of Theology to Medical Ethics* (1975), he specifically makes three theological affirmations: “God intends the well-being of the creation” (1975b: 18); “God is both the ordering power that preserves and sustains the well-being of the creation and the power that creates new possibilities for well-being in events of nature and history” (1975b: 19); and “humans are finite and ‘sinful’ agents whose actions have a large measure of power to determine whether the well-being of the creation is sustained or fulfilled” (1975b: 22).

These pioneering efforts have been followed in the 1980s by other theologians and ethicists,

particularly several Roman Catholics including Richard McCormick, Germain Grisez, and Bernard Haring, and Jewish scholars including Immanuel Jakobovitz and Elliott Dorff. Other younger female theologians have also joined in to provide a voice in feminist bioethics, and they include Lisa Sowle Cahill, Margaret Farley, and Karen Lebacqz. Depending on the different theological traditions they come from, these theological bioethicists use religious languages and symbols as well as scriptural imageries and stories not only when they address audiences within their own faith traditions, but also when they speak in the public square. For example, Cahill insists that justice in access to health care resources, guided by “the priority of the preferential option for the poor,” should be the main focus for Christian theological bioethics, and this includes justice in global access to the goods essential to health. According to this author, justice for the poor and the oppressed is not a mere matter of reflecting a progressive or liberal policy; rather it is fulfilling a goal demanded by the New Testament gospel that should be shared by both left and right wings of the Christian churches. Cahill forcefully argues that theological bioethics must go beyond mere talking to link theology to Christian practices that include involvement in social and political processes and public discourses. Theological bioethics should take the form of “participatory discourse, offering a vision, a voice, and action that can carry into the sphere of democratic activism, both locally and globally” (2005: 6). Since theology reveals the nature of the God Christians believe in: historical, personal, relational, loving and just, theological bioethics must inform a normative bioethical theory that can lead to health care reform that reflects these attributes.

Theological bioethicists have also exerted their influence by participating in the formation of several centers that shape the field of bioethics in the USA, and these include The Institute of Religion at the Texas Medical Center, Houston (1954), the Hastings Center in New York (1961), the Kennedy Institute of Bioethics at Georgetown University (1971), and the Park Ridge Center in Chicago (1985). In addition, they also exert their

influence by serving on important policy bodies such as the US National Commission on the Protection of Human Subjects (1974), President’s Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research (1979), the National Bioethics Advisory Commission (1996–2001), and the President’s Council on Bioethics (2001). As a result, theological viewpoints related to bioethical issues are mediated to the public in a variety of ways as these scholars take up different roles in teaching, speaking, writing, and advising.

However, the influence of theological bioethicists has significantly lessened since the 1980s. Instead of speaking in the center stage of the bioethical world, they have become marginalized. There are several reasons for this development. As the discipline of bioethics become more mature in the 1980s, many university philosophy departments set up doctoral programs in bioethics. As a result, a new generation of secular philosophers entered this field of scholarship and many feel that the public debate of bioethical issues should be conducted on more objective, value-neutral, and rational grounds, purged of religious biases and dogmas in order to have more public credibility and viability. Confronted by this objection, and fearful of losing their influence in the public arena, many ethicists with religious commitments decided to change their identity from theological bioethicists to moral philosophers in bioethics. They remain silent about their theological convictions that have hitherto provided rich and substantive discourses on a variety of bioethical issues, opting for a secular and minimalistic approach on these issues in order to win public support. As Leon Kass has observed: “Perhaps for the sake of getting a broader hearing, perhaps not to profane sacred teachings or to preserve a separation between the things of God and the things of Caesar, most religious ethicists enter the public practice of ethics leave their special insights at the door and talk about “deontological vs. consequentialist,” “autonomy vs. paternalism,” justice vs. utility,” just like everybody else” (1990: 6–7). As a result, theology has lost much of its earlier influence by identifying and exposing substantive

social problems due to misuses of medicine and technology, such as profit-driven “managed care,” commercialization of human reproduction, commodification, and trivialization of embryonic life, reproductive surrogacy, genetic screening, and enhancement as a new form of eugenics and so on.

Cross-References

- [Bioethics in Islam](#)
- [Bioethics in Judaism](#)
- [Christianity](#)
- [Christian Ethics](#)
- [Ethics](#)

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Bioethics in Islam

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Related Terms

[Islamic bioethics](#)

Description

In contemporary Islam, bioethics is largely perceived as a subfield of Islamic legal reasoning (*fiqh*). As a field, it developed since the 1970s and 1980s following the introduction of groundbreaking medical technologies in reproductive medicine and end-of-life care. Therefore, bioethics developed primarily as medical ethics. Only during the 1990s and especially after 2000, the discussions switched to more general topics with less direct links to practical medical care, particularly due to the remarkable breakthroughs in the field of genetics.

Since bioethical questions are usually approached within the framework of *fiqh*, Islamic bioethical reasoning is qua definition perceived as a religious act. So far, no distinct subdiscipline “Islamic bioethics” has developed on a general level. There are several notable religious scholars who have specialized in bioethical questions since the 1980s, but the implementation of teaching programs is making only slow progress since 2000 in a handful of Muslim majority countries such as Iran, Pakistan, and Saudi Arabia.

Islamic bioethicists aim to show that the ethical-legal system of *fiqh*, which has its main roots in the time span of the seventh until the eleventh centuries C.E. and developed further until nowadays, is able to contribute answers to the rapid developments of modern medicine and biotechnology. For this reason, their interest in the relation between science and religion is largely guided by theology, i.e., they assume and often aim at proving that contemporary scientific discoveries only uncover the rules of God’s creation and can easily be brought into accordance with verses from the Qur’an or the collected deeds and sayings of the Prophet Muhammad and his companions (*Sunna*). This would proof scientifically the heavenly origin of the Qur’anic message and the godly authorization of Muhammad’s prophethood, because both Qur’an and *Sunna* from the seventh century would already contain knowledge uncovered by modern science only in the twentieth and twenty-first centuries.

Besides, Qur’an and *Sunna* texts from a great variety of authors from the four legal schools of

Sunni Islam and the *fiqh* tradition of the Shiites command authority in Islamic bioethical discussions due to a consensus about these sources' authoritativeness which developed over the centuries. Muslim scholars from the history of science or medicine are quoted much more rarely and usually in passing.

During the history of *fiqh*, the concept was developed that Islamic law serves five fundamental values: the protection of religion, human life, offspring, property, and intellect, respectively. In Islamic bioethical debates, the protection of life and offspring receive most attention. The main principles in achieving the protection of these values are several forms of balancing legally protected interests (sg. *maslaha*). In addition, legal maxims such as "necessity makes the forbidden allowed" (*al-darura tubih al-mahzûrât*) provide the possibility of exceptional rulings. Generally speaking, biotechnological and medical innovations are considered unproblematic, because it is argued that they cannot infringe on God's creational will otherwise the created mankind would not have been capable of such innovations. They are only viewed as forbidden or reprehensible if they collide with a religious rule directly or indirectly. However, exceptional rulings are allowed within the framework of balancing legally protected interests.

Nature and everything created apart from humans are explicitly said to serve the purpose of attending mankind, which is thus entitled to make use of it to enhance its life quality. Humans are conceptionalized as the only being with a mixture of earthly and heavenly components (the body and the soul). Therefore, they constitute a linkage between this world and the next, which elevates them over the rest of God's creation. Life is considered to begin with the mixing of egg and sperm, although there is considerable and yet undecided debate about the ontological status of nidation. The majority of Muslim bioethicists follow the model of increasing protection rights in the course of embryological development, granting full protection rights only after the 120th day of pregnancy, commonly perceived to be the date of ensoulment. Consciousness and reason are situated in the soul. Since the 1970s,

the traditional concept of heart-lung death has been substituted by the brain death criterion. A supranatural reality is assumed to exist, meaning not only God but also angels and especially a sort of demons (*djinn*s). Therefore, mysteries are a break with the usual order of things due to God's will. Mankind's ability of knowledge is generally seen as limited and depending on God's will. Truth can only be found through the interpretation of the foundational texts of Islam, but differing perceptions because differences in time and space are accepted as an intrinsic element of *fiqh*.

Cross-References

- [Anthropology in Islam](#)
- [Bioethics in Christianity](#)
- [Ethics](#)
- [Humanism in Islam](#)
- [Medicine in Islam](#)

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Bioethics in Judaism

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Related Terms

[Bioethics and the Jewish culture](#); [Jewish bioethics](#)

Jewish bioethics deals with major moral, religious, and legal issues for communal forms

of Judaism in modern medicine. Each issue is described biologically and medically, related to issues in traditional rabbinic law, and then discussed by reference to leading contemporary rabbis in different contemporary Jewish religious movements, notably Orthodox, Reform, and Conservative (noting differences between the seven main groups of communal Jewish life – the Ashkenazi, Roman, North African, Kurdish, Near Eastern, Yemenite, and Ethiopian – as well as some numerically significant minorities – the Lemba of North Africa, the B'nai Menashe of India, and the Crypto Jews of South America).

The discussion of bioethics is guided at the most universal level by four general principles of western ethics and eight general principles of Jewish ethics. The western principles are (1) Maximize freedom of patient choice (Autonomy), (2) Cause no injury to the patient (Nonmaleficence), (3) Promote patient welfare (Beneficence), and (4) Distribute benefits in a just manner (Justice). The rabbinic principles are (1) Be fruitful and multiply (with reference to Gen 1:2), (2) Be concerned for the suffering of animals, (3) Repair the world (tikkun olam), (4) Do not destroy (with reference to Dt 20:19), (5) Preserve life, (6) Heal (with reference to Ex 21:19), (7) Act according to the natural way, and (8) There is nothing new under the sun (with reference to Eccl 1:9).

What emerges are positions on the issues that will be familiar to any student of bioethics (from the application of the four general principles) but will be seen in distinctively new perspectives (from the application of the eight rabbinic principles). Issues commonly discussed include (1) methods to correct infertility, male and female, (2) responsibility toward all stages of preembryos, from stem cells to 40 days after fertilization, (3) cloning, (4) designer genes and children, (5) the special case of human engineering in order to avoid the eight deadly genetic diseases especially prevalent among Jews of eastern European descent – Canavan disease, Huntington disease, cystic fibrosis, Niemann-Pick disease, Gaucher disease, fanconi anemia, Bloom Syndrome, and familial dysautonomia,

(6) in order to select sex, (7) in order to test for specifically marked Jewish genes, and (8) in order to study both the genealogy of individuals and the collective history of the Jewish people, (9) morally judging genes in general, and finally (10) using genetics to make naturally non-kosher food kosher.

Multiple moral recommendations emerge, not all of which are complementary with each other. It is not surprising to see that many of the differences between liberal and conservative rabbis on questions of medical and biological ethics correlate, especially in North America, with differences between different kinds of Christians, liberal and conservative. However, some of the answers are surprising and do not correlate to general social class and political identities in American and European society. Moral judgments about cloning are a dramatic example of differences between Jewish and Christian moral political stances in western society. In general, traditional rabbinic authorities tend to allow cloning while more liberal authorities oppose it. Similarly, the logic of Jewish law is such that traditional Jews tend to prefer non-Jewish sperm donors while liberal Jews tend to prefer Jewish donors. The principle underlying the first anomaly is the extraordinary pressure following the Holocaust to parent Jews (viz., be fruitful and multiply), and the principle underlying the second anomaly is the extreme negative value placed on any form of incest (viz., act naturally).

Cross-References

- [Creation in Judaism](#)
- [Feminism in Judaism](#)
- [Judaism: An Overview](#)
- [Natural Sciences in Judaism](#)
- [Philosophy in Judaism](#)
- [Psychology in Judaism](#)
- [Redemption in Judaism](#)
- [Revelation in Judaism](#)
- [Secularism in Judaism](#)
- [Theology in Judaism](#)

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Bioinformatics, Computational

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Related Terms

[Computational biology](#)

Description

The field of Bioinformatics is an area of study that involves several fields, including computer science, molecular biology, genetics, and statistics. Bioinformatics is devoted to the development of theoretical and computational models and technologies for the solution of problems based on molecular data. In general, it involves the use of information technologies for the management of biological and genetic information, namely, to collect, store, analyze, and integrate data.

The main goals of Bioinformatics are (1) to manage data in such a way that it allows easy access to the existing information and to submit new entries as they are produced; (2) to develop technological tools that help analyze biological data; and (3) to use these tools to

analyze the data and interpret the results from a biological perspective.

The development of Bioinformatics goes back as far as 1948, to the Ph.D. thesis by Dr. Margaret Oakley Dayhoff on the use of computers in chemistry and biology. She used her knowledge of chemistry, mathematics, biology, and computer science to develop an entirely new field. However, the release of the first draft of the Human Genome Project in 2001 was one of the main events that generated a good deal of attention from scientists from different fields. Therefore, in the last two decades, we have witnessed a significant increase of available online tools and services, such as databases, applications to analyze biological and genetic data, gene ontologies, and paper repositories. Several technologies to support research at the laboratories have also been developed. Among the main data repositories are GenBank repository of nucleic acid sequences (<http://www.ncbi.nlm.nih.gov/Genbank/>), the SWISS-PROT database of protein sequences, and DNA Data Bank of Japan, DDBJ (<http://www.ddbj.nig.ac.jp/>).

Self-identification

Science

Bioinformatics is not a science itself. It may be considered as a scientific and technological interdisciplinary endeavor, since it involves theoretical and applied aspects of several sciences and technologies. It integrates work from biology, computer science, mathematics, statistics, genetics, medicine, and chemistry.

Characteristics

One aspect that makes this discipline distinctive is the fact that it integrates several sciences and disciplines. Bioinformatics is mainly concerned with understanding living beings and their internal processes during their lifetime and how genetic information is transferred throughout generations, and their interactions with the environment. It involves

the development and use of technological resources that contribute to the solution of health problems and to some extent understanding genetically related problems.

Relevance to Science and Religion

Bioinformatics studies biological systems, models biological elements, and processes from a scientific point of view. It also deals with the development of technological tools using information and telecommunication resources to support research processes in biology, genetics, and chemistry. A significant amount of research in Bioinformatics involves genetic information and assumes concepts supported on evolutionary theory; it attempts to give scientific explanations to some of the same main issues that Religion deals with such as the origin of life and the evolution of living beings.

Sources of Authority

Although there are several institutions that may be considered as the main authorities that are concerned with particular subareas of Bioinformatics, the following organizations can be considered as the well-recognized worldwide authorities in Bioinformatics:

- The European Molecular Biology Laboratory, EMBL (<http://www.embl.org/>)
- The National Institute of Health, NIH, from the United States Department of Health and Human Services (<http://www.nih.gov/>)
- National Institute of Genetics of Japan, NIG (<http://www.nig.ac.jp/index-e.html>)
- The National center for Biotechnology Information, NCBI (<http://www.ncbi.nlm.nih.gov/>)

Ethical Principles

This discipline deals with the study of living beings, and in many cases with testing new medical developments on animals and even on human beings. Therefore, its ethical principles are the general principles from biological and medical sciences.

Key Values

The key value of Bioinformatics is the study of living beings to provide explanations to diverse biological phenomena and solutions to health problems that can improve the quality of life in humankind.

Conceptualization

Nature/World

Nature is conceptualized as the constituent physical and biological elements that form the universe. *World* is the set of all physical elements in the universe.

Human Being

A human being is considered as a complex biological being endowed with special features that make him/her very efficient at problem solving and for understanding and changing his/her environment for his/her benefit and those of their own species.

Life and Death

Life is conceptualized as the presence of special functions in biological systems that allow them to remain in its environment performing its primary functions. Death is the event that happens when a living organism is not capable of continuing to perform its basic functions.

Reality

Reality is considered as the set of all elements in the universe that exist and can affect and interact with each other.

Knowledge

Knowledge is a set of data, rules, and facts known about a particular system or process.

Truth

Truth is some factual knowledge about the world that can be verified.

Perception

Perception is some partial knowledge that any life form or artificial being acquires from its

environment through some special components provided for such a task.

Time

Time is a reference measure that is used to keep track of the changes that occur in the world.

Consciousness

Consciousness is a life form or organism's ability to know about itself and its role in the world and of being aware of the consequences of its actions.

Rationality/Reason

Rationality is an ability of human beings to analyze situations and make what they believe are the right decisions under those circumstances.

Mystery

A mystery is something for which there is no formal or scientific explanation.

Cross-References

- [Algorithms, Computer](#)
- [Biology, Theoretical](#)
- [Complex Systems](#)
- [Graph Theory](#)
- [Natural Language Processing](#)

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Biological

- [Biology of Religion](#)

Biological Anthropology

- [Physical Anthropology \(Paleoanthropology\)](#)

Biological Anthropology and Human Ethology

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Related Terms

[Anthropological behavioral ecology](#); [Anthropological genetics](#); [Anthropology and biology](#); [Anthropology and Darwin](#); [Anthropology and evolution](#); [Biosocial anthropology](#); [Darwinian Theory and anthropology](#); [Ethology of humans and biological anthropology](#)

Description

Anthropology means the study of human beings. In the early years of anthropology in the

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nineteenth century and first half of the twentieth century, the discipline was divided into cultural anthropology and physical anthropology. Cultural anthropologists studied features that were transmitted across generations by social learning and which constituted what anthropologists considered culture. These features could be material objects, such as tools, or they could be the structural design features in describable patterns of behavior that were observable in living societies. In addition, cultural anthropologists often interpreted that which had been transmitted across generations culturally within religion, as by Clifford Geertz or structural anthropologists, such as Levy Strauss. In contrast, during this same time period, physical anthropologists were primarily interested in the comparative study of bones. They compared the bones of hominoid and hominid ancestors to modern human bones in attempts to reconstruct the evolutionary history of the human species.

In the latter half of the twentieth century, a small number of anthropologists began to study human behavior as well as human culture using Darwinian evolutionary theory. This new approach broke down the previous dichotomy of anthropology into cultural and physical and created a new more encompassing category called biological anthropology (Standford et al. 2008). Within biological anthropology, there are many more subdivisions, such as biosocial anthropology, anthropological genetics, and anthropological behavioral ecology. What these new approaches have in common was that they all use Darwinian principles of evolution by natural selection to study what used to be separate domains of cultural and physical anthropology. The most surprising application of Darwinian theory has been to cultural anthropology (Boyd and Richerson 1985).

Parallel to the introduction of Darwinian evolutionary theory into anthropology in the second half of twentieth century was the extension of Darwinian evolutionary theory from the biological study of the behavior of nonhuman animals to the study of the behavior of human beings. The branch of biology that was studying behavior of animals in their natural habitats was called

ethology. Human ethology is a subdiscipline of ethology. Ethologists, whether they study nonhuman species or humans, usually ask one or more of the four questions about behavior originally proposed by one of ethology's founders, Nobel Laureate Niko Tinbergen: What is the behavior's evolutionary history (phylogeny)? What is the behavior's development in the lifespan of the individual (ontogeny)? What are the behavior's proximate, mechanistic causes? Does the behavior increase one's survival or have adaptiveness? Many ethologists use Niko Tinbergen's definition of behavior, which is "the total of movements made by the intact animal" (Tinbergen 1951). However, other definitions of behavior used by ethologists and human ethologists are broader than movements. Synonyms for ethology are the biology of behavior and the comparative study of behavior. Even though human ethology emerged from biology rather than from anthropology, they both share an interest in understanding human behavior from a biological and evolutionary perspective.

Ethology can also be divided into behavioral ethology, cognitive ethology, and neuroethology. Behavioral ethology's emphasis is on the movements themselves, often in conjunction with trying to determine the intra- as well as extra-individual proximate causes of the movements. Cognitive ethology's emphases are the proximate cognitive functions as well as the evolution of the neural structures whose proximate functions they are. Cognitive proximate functions include such things as thinking, desiring, planning, goals, etc. Neuroethology's emphasis is on neurophysiological, proximate, and causal mechanisms of naturally occurring behaviors.

Ethology emerged out of zoology and the naturalistic study of animal behavior at the end of the nineteenth century (Burkhardt 2005). By the early to mid-twentieth century, ethology began developing a terminology, methods, and eventually theoretical formulations with which to scientifically study and understand the behaviors of animals in their natural environments (Immelmann and Beer 1989). Today, ethological methods (more so than ethological theory) are commonly used when the behavior of animals is

studied in their natural or seminatural environments. Ethological methods have been adopted by individuals who now call themselves animal behaviorists, sociobiologists, biosocial anthropologists, comparative and evolutionary psychologists, primatologists, behavioral ecologists, and human ethologists.

In the latter half of the twentieth century a few ethologists began applying the methods and theory of animal ethology to the study of human beings (Eibl-Eibesfeldt 1989). One of the most recent developments in human ethology has been its application to the understanding of human religious behavior (Feierman 2009). When religious behavior is the focus of ethological study, other aspects of religion – moods, feelings, beliefs, and values, the essence of religious experience – become contributing causes of the behavior. In addition, questions about religious behavior's evolutionary history, development in the lifespan of the individual, its proximate, mechanistic causes, and does the behavior have adaptiveness, can all be asked. Ethological studies of religion are very narrow in scope. They are not going to answer the big questions about religion. They have to be considered adjuncts and complements to other ways in which the fullness of religion is studied and understood. However, within this narrow confine, there are aspects of religion which ethology may be uniquely qualified to address.

Self-identification

Scientific disciplines usually start out, if possible, with an observation and description phase, followed by a categorization of that which has been observed and described into smaller units that become the units of specific study. To guide the study, theoretical propositions, which deductively predict outcomes of either spontaneous acts of nature (including specific naturally occurring behaviors) or of specific experiments done in the field or the laboratory, are formulated. Ethology was developed out of the observations of animals in their natural settings by late nineteenth-century naturalists. As a result, ethology already had

a good observational foundation of the behavior of animals by the time more formally trained zoologists started to systematize their observational methods in the early twentieth century.

In the first half of the twentieth century, ethology – primarily under the guidance of Konrad Lorenz, Niko Tinbergen, and Karl von Frisch – developed an inductive approach by careful observation of individual organisms alone, in pairs, or in groups of a relatively few species, predominantly birds, fish, and insects (bees). Only after a number of years of observation and inductive research did the founders of ethology generate theoretical propositions by which instinctive behaviors of animals could be understood and which outcomes could be predicted. In a move away from the early twentieth-century “instinct theories” of Harvard Psychology Professor William McDougal, the early ethologists conceptualized instincts as coordinated motor pattern behaviors. These theoretical propositions then addressed the proximate, causal mechanisms for certain types of these stereotyped instinctive behaviors, which are seen in all vertebrates, including humans. Prior to this time and based on the ways of conceptualizing behaviors of McDougal, so-called instinctive behaviors were thought to be outside the realm of scientific understanding. In 1973, the Nobel Prize in Medicine and Physiology was given to three ethologists – Konrad Lorenz, Niko Tinbergen, and Karl von Frisch – for their discoveries of how to understand animal instincts.

In the latter half of the twentieth century, a few individuals began applying ethological theory and methods – as worked out primarily on fish, birds, and insects – to the study of humans. Much of this early work involved observation (often with the use of documenting film), description, and applying the theory of instinct, developed in the lower animals by the early ethologists, to some of the more basic human behaviors – courtship, mother–infant interactions, children playing behavior, etc. Much of human ethology's current methodology is still inductive. Because of the strong observational methods used in human ethology and because the main topic of study is

behavior, which is observable, human ethology can be said to be in the late descriptive phase in its development as a science, still struggling to discover theoretical propositions with which to understand the more complex and variable behaviors of human beings beyond the simple, coordinated motor patterns and reflexes. Much human behavior appears to be outside of the realm of understanding by current human ethological methods and theory.

Characteristics

In comparison to the other biological disciplines, ethology is distinctive in that behavior (the movement of an individual) is always the object of study, even if the particular study is asking one of Tinbergen's four questions about behavior. There is overlap of ethology with a number of other disciplines, although ethology is distinctive in a number of ways. The emphasis in behavioral ethology is on observing movements directly. This is in contrast to what people say about how they behave or would behave or how they answer questionnaires on how they behave.

Other disciplines that include behavior in their area of study often make the actual movement of the individual an ancillary item or do not study it at all. Sociobiology, which can be considered the deductive sister discipline of the more inductive discipline of ethology, starts out with a theoretical proposition generated from some aspect of evolutionary theory and then predicts the behavior of individual organisms. Ethology more often starts out with the behavior of a single organism, dyads, or groups of organisms in a particular species and then sees the degree to which the principles governing the behavior are species-specific or illustrative of a more general principle that extends over a wider taxa. That methodology has been criticized.

Because human ethology developed out of nonhuman animal ethology, primarily fish, birds, and bees, human ethologists have at times been rightly accused by other disciplines that study human behavior of studying humans as though they did not talk. There has been much

more emphasis on understanding "body language" in humans ethologically than vocalized or written symbolic language.

Cognitive ethology is distinct from cognitive psychology and cognitive science in terms of the emphasis on cognitive phenomenon as seen in natural environments. The same applies to neuroethology as compared to neuroscience in general. In neuroethology, the emphasis is on the proximate, neurophysiological causes of behavior in natural environments. To date, most neuroethology has been on simpler organisms. However, with functional brain imaging, at least some type of neuroethology of humans is now possible.

Relevance to Science and Religion

Human ethology is definitely a newcomer to the scientific study of religion when compared to other scientific disciplines. Although in the 1970s and 1980s, there were comments about religious behavior from some of ethology's sister disciplines, such as sociobiology, biosocial anthropology, and behavioral ecology, an early book about religion by someone who is an ethologist was *Why God's Persist: A Scientific Approach to Religion*, published in 1999 and written by Robert A. Hinde (1999). In the past 10 years, there have been a number of edited books about the evolution of religion that have contained a few chapters that can be considered ethological, at least in method, and where behavior was the object of study (Volland and Schiefenhover 2009). Human ethology during the 1970s and 1980s was primarily interested in other aspects of human behavior, such as courtship, children's play behavior, agonistic behavior, dominance relations, and political behavior. During this same period of time – the late 1980s to present – a new academic discipline called evolutionary psychology was emerging. Many of the individuals who had been attracted to human ethology in the 1970s and 1980s found themselves more drawn to evolutionary psychology where the emphasis was less on behavior per se and more on the "ultimate functions" or

adaptiveness of behavior. At the same time, the main journal publishing human ethology studies changed its name from *Ethology and Sociobiology* to *Evolution and Human Behavior*, reflecting the growing influence of evolutionary psychology and the waning influence of human ethology on the evolutionary and biological approaches to studying and understanding human behavior.

Human ethologists organized themselves into The International Society for Human Ethology (ISHE) in the 1970s. This small society, which has somewhat over 200 members, has met biennially to the present. It also publishes the *Human Ethology Bulletin* (ISSN 0739-2036). At the 19th biennial meeting of the society at the University of Bologna in 2008, a symposium was held on “The Biology of Religious Behavior: A Human Ethological Perspective on Religion.” That was the first time that the society targeted religion as an object of study. There were 12 papers on the biology of religious behavior given within the symposium. That symposium inspired the book of a similar name Feerman (2009).

Human ethology’s relevance in the science religious dialogue is that ethology in general and human ethology in particular tend to concentrate on that which is observable as the object of study. As such, the ethological study of religion concentrates on the observable aspects of religion that can be studied in a scientific way. This type of understanding can aid in understanding some of the ways at the biobehavioral level that different religions are similar. This similarity across religions can aid in bridging the religious divide as well as in coping with religion’s excess, as in fanaticism.

Sources of Authority

As a science, the sources of authority are those authors whose work has been peer reviewed and published and who have had the most influence on other people in the field. The most influential sources of authority in ethology are its founders Konrad Lorenz (1903–1999), Niko Tinbergen (1907–1988), and, to a lesser extent, Karl von Frisch (1886–1982). All three men won the

Nobel Prize in Physiology and Medicine in 1973 for their paradigm-changing work as ethologists.

There are of course many individuals who preceded them whose names are all but forgotten by people who today consider themselves ethologists. Such names include Charles Otis Whitman, Oskar Heinroth, George Romanes, and others. Both Konrad Lorenz and Niko Tinbergen had students who studied under them and who also became influential in the field. In the 1970s and 1980s, the two most influential students in terms of their impact on human ethology were Desmond Morris, a student of Niko Tinbergen, and Irenäus Eibl-Eibesfeldt, a student of Konrad Lorenz. Morris published a number of general readership books, such as *Manwatching*, on the application of ethology to human behavior. Eibl-Eibesfeldt is known best for his 1989 book, *Human Ethology*.

Another individual whose work is clearly human ethology, but who is not really identified by that name, is Paul Ekman, Professor of Psychology in the Department of Psychiatry at The University of California, San Francisco. His work on the emotions, especially in the face, has had wide influence in many different fields.

There are a small number of “F2 generation” academic descendents of the Nobel Prize generation, whose work today is continuing human ethology. In addition, there are a number of other individuals who were not direct academic descendents of the three Nobel Prize winners in human ethology but who have had a major impact on the field. Michael T. McGuire, Professor Emeritus at UCLA and founding Editor in Chief of the journal *Ethology and Sociobiology*, is one such individual. Some other influential people in human ethology include William Charlesworth, the late Daniel G. Freedman, and Robert A. Hinde. Today, there are a few young people still being attracted to the field of human ethology, many of whom are from eastern Europe. However, the influence of the discipline of human ethology both in influencing how human behavior is conceptualized and in attracting new students to the field peaked in the 1970s and 1980s.

Ethical Principles

As a scientific discipline, human ethology subscribes to the basic ethical principles that guide all science. These principles include empiricism, objectivity, and openness to all research-supported assertions, critical thinking, and respect for all people, the environment, and animal life.

Because human ethology often observes and sometimes films or videotapes the behavior of human beings in naturalistic settings, informed consent is an ethical issue. However, it is not an issue that is much discussed. The general consensus appears to be that behavior in public places can be filmed or videotaped, even without explicit consent. Exceptions might be where the behavior is out of the ordinary, would embarrass or be otherwise detrimental to the person being videotaped, or might reveal personal information not intended to be public by the behaving individual.

Many of the early human ethology films were made by Irenäus Eibl-Eibesfeldt on a number of tribal societies. These films are currently being archived in Vienna, Austria. The technique to film unstaged, naturalistic behaviors, often in tribal villages, was the use of a mirror lens. This was a telephoto-looking lens that had a mirror prism in it which actually captured images at a 90° angle from where the front of the lens was pointing.

There is nothing in the official constitution of the International Society of Human Ethology, the Bulletin, or on the society's web site that addresses ethical principles of the discipline. Ethical behavior was however a topic that was addressed from an ethological perspective in general, such as how did it evolve. It was not addressed as it pertains to work done by human ethologists.

Key Values

If values are the rank order of different beliefs within a value system, human ethology has the following key values. The proper study of human behavior is human behavior itself, not what

people say about their behavior. The proper place to study human behavior is in a naturalistic setting that comes close to the type of setting in which such behavior would have evolved or is currently a setting in which the behavior is occurring. This is often called a naturalistic or seminaturalistic environment. In addition, there are some core values of all ethologists, such as separating the form or structure of a behavior from the proximate function of the behavior.

Conceptualization

Nature/World

Nature is the environment in which humans find themselves and to which their structures adapt. Whereas the current environment is not the same as the ancestral environment in which many human adaptations developed, the current environment would still be considered "nature" for modern human beings. The world is synonymous with the planet earth. Nature for human beings is that part of the planet earth which humans inhabit.

Human Being

A human being is defined as a member of the species *Homo sapiens*. Ethologists conceptualize human beings as having evolved from hominid-like ancestors over the past several million years as the result of Darwinian natural selection. Our closest living relatives would be the chimpanzee and bonobo, which are great apes from which we diverged approximately 6 million years ago. Human beings are distinguished by their cognitive capacities that include their intelligence and their use of symbolic language and reasoning. Human beings also have a degree of self-awareness and self-consciousness that allow for reasoning about their own being and behavior, which allow for moral capacities not possible in lower forms of life.

Life and Death

Ethology, as a life science, sees life as combinations of organic and inorganic elements capable of replicating and adapting to changing

environments with changes in the structures of the organism through natural selection. The origin of life is of course unknown. However, ethologists presume that the transformation from nonliving to living matter occurred by natural, rather than supernatural, means. Death of an individual is conceptualized as the termination of life. Death is inevitable for individual organisms. The organism that is dead is no longer capable of self-maintenance. The elements of the organism return to the earth from which it sprang. Most ethologists would subscribe to the concept that human beings are “carriers” of the DNA that made us and that evolution and natural selection is adapting DNA to changing environments, which is accomplished by various mechanisms including new species formation. Human beings are such a species and a relatively new one at that. Human ethology does not take a position on life after death or a continuation of consciousness after death.

Reality

Reality is conceptualized as the extra-individual environment to which the organism, in this case the human species, adapts. The perception of the individual, by which subjective reality is known, is not considered the same as reality, as each species only perceives those aspects of reality that are required to foster the survival of the species in a natural environment. As such, absolute reality is unknowable from an ethological perspective.

Knowledge

Is the adaptive application of information (that which is necessary to make decisions). Adaptive means that the information is applied in a way that fosters reproductive success or survival of the bearer (or the bearer’s kin) of the knowledge. The theoretical basis for human ethology is critical realism. The presumption is that every adaptation in an organism reflects a fitness-improving feature to reality outside of the organism.

Truth

Truth is what is. Science in general and human ethology in particular cannot determine what is true, only what is not true. In some way, if the

parameters can be defined, truth is what is left when what is not true is eliminated. Human ethologists can study humans as they attempt to determine what is true. However, in the process of natural selection, what is contributory to survival and reproductive success is more important than what is true. As a result, humans harbor many beliefs (that which is held to be true), which may not be true. Many of these beliefs have to do with religion and politics.

Perception

The adaptive modification of sensory information so that it is potentially actionable. Within cognitive ethology, the issue of subjective perception is an issue. For the behaviorist branch of ethology, perception can be determined experimentally as those features of a stimulus which are required to get a specific response. Often, only certain features of a stimulus are attended to and therefore needed.

Time

The directional interval between behaviors (movements) that are not done simultaneously or the interval between the repetition of the same behavior, as measured in standard units, such as seconds, hours, days, etc. Ethology only deals with time at a proximate and practical level. It does not address the bigger issues in terms of the relationship between time, space, gravity, etc., that physicists contemplate.

Consciousness

An awareness of one’s awareness, where awareness is defined as the ability of a stimulus to cause a change in behavior. A conscious individual is aware that specific stimuli are causing a change in behavior. Organisms can be aware but not conscious, but all organisms that are conscious are also aware. Consciousness also allows for an awareness of self, but awareness of self is not a requirement of consciousness. Most ethologists presume that humans are not the only species that has consciousness, as it may be present in all birds and mammals. However, based on experimentation, only some taxa like the great apes and perhaps some sea mammals may have an awareness of self as part of their consciousness.

Rationality/Reason

Rationality is the adaptive, cognitive processing of information by evolved algorithms. Cognitions reconstruct the structures of reality outside the subject from sensory impressions perceived as projections of these structures. The capacity for *a posteriori* and *a priori* reasoning is thought to have evolved by Darwinian natural selection. Konrad Lorenz's *Behind the Mirror* (Lorenz 1977) is a treatise on how *a priori* reasoning could have evolved by natural selection. The main difference between *a priori* and *a posteriori* reasoning is that in *a priori* reasoning, the objects of reasoning are symbols with attributed meaning, rather than objects in the natural environment.

Mystery

Mystery would be anything that is not known within the realm of scientific certainty. As such, much of nature and the world and the laws that govern them are still mysteries.

Relevant Themes

Additional issues and themes that are relevant for human ethology, put in the form of questions, are as follows:

1. What are the proximate mechanisms by which religion has such a powerful influence on human behavior?
2. What are the actual biological factors and mechanisms that make being religious the default position for most human beings?
3. Is there a critical period for the acquisition of religion, like the critical period thought to be necessary for the acquisition of language?
4. What are the mechanisms of faith by which humans believe things that are counterfactual and counterintuitive?
5. What are the mechanisms of subjective religious experience?

Ethology, in conjunction with other biobehavioral sciences, has the capacity to answer all of these questions. However, whether these questions will be answered will depend on the priority that ethologists and other biobehavioral scientists

give to these types of questions. Religion must compete with other areas of human life for the attention of the biobehavioral scientists who study these types of questions. However, given the fact that religious differences now are dangerously dividing the world, perhaps more ethologists and other biobehavioral scientists will turn their attention toward religion.

Cross-References

- [Biology](#)
- [Body](#)
- [Clinical Psychology](#)
- [Cognitive Science of Religion](#)
- [Comparative Neuroscience](#)
- [Collective Behavior](#)
- [Evolution](#)
- [Evolutionary Psychology](#)
- [Love \(Affective, Sexual\)](#)
- [Natural Selection](#)
- [Social Psychology](#)

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Biological Evolution

► Evolution, Convergent

Biological Hierarchies

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Biologists have in the course of their activities constructed two kinds of hierarchies, which have different logical bases (Salthe 2002, 2012). Before getting into details about these, consider a very commonly acknowledged example of ► **hierarchy** – the organization of an institution like the army. Here we have, in simplified form, a general (in corporations, it would be a CEO), who controls several staff officers, who in turn each control several officers of lower rank, who each control many soldiers. A diagram of this would show lines of command from the general at the top branching downward as an upside-down tree. There are two kinds of hierarchies involved in the relations here.

On the one hand, we can see that the social role of a general, his sphere of interest and influence, is geographically much greater – for example, an entire battlefield – than that of any of his subordinates, while a soldier at the bottom of the hierarchy would be concerned only with the immediate surroundings of his own current position. So the social role of a general actually encompasses that of a soldier, whose social role is contained within it, even though the soldier's body is not contained within the general's body. The logic of this “structural command hierarchy” is that of a *compositional hierarchy* (Ahl and Allen 1996; Morrison and Morrison 1982; Salthe 1985; Weiss 1971). The general's social role encompasses those of his subordinates.

On the other hand, we can examine the trajectory of a particular command. The general might deliver his order that the army should next carry

out some maneuvers to surround enemy forces as soon as possible. A staff officer will translate this into a more particular order, supplying, for example, a date and time when this should be carried out. A lower ranking officer will then further modify this into directions that take into account the particular terrain his group is confronting. And so the general's order is gradually refined, being made more particular with much greater detail added along the way. The logic of this flow of command is that of a *subsumptive hierarchy* (Polanyi 1968; Sabelli 2005; Salthe 2012). The general's order subsumes those of his subordinates.

Turning now to biology, beginning with Linnaeus in the eighteenth century, the discipline of biological systematics (Schuh 2000), which is concerned with determining genealogical relationships among the many different species in the world, has been constructing a “tree of life.” This form, which is that of a subsumptive hierarchy, looks like the tree in the structural command hierarchy discussed above, but its meaning is very different. At the base of this tree is represented the oldest ancestral taxon. Branching from this are waves of descendant taxa gradually approaching contemporary, living ones at the tips of the branches. In evolutionary biology, this picture represents the evolutionary generation of new taxa from ancestral ones, as genetic information (like a command) is passed on from extinct species to more recent ones. The latter carry an increasing amount of information generated by various kinds of mutations along the way. And so the tree of life could be thought of as being connected by way of genetic information. The older genetic information subsumes any current information, which was gradually built up from it. Of course, many taxa become extinct along the way, and so any portion of a genealogical tree does not necessarily keep adding branches, thereby growing in span (The number of lowest level entities that are parts of, or subsumed by, the apex, or base, of a hierarchy, given some number of levels). For example, the genealogical tree of hominid primates, culminating at present in humans, has lost branches more recently rather than gaining them, leaving only us.

Biologists, beginning in the nineteenth century, realized that larger than microscopic living things, like plants and animals, are materially composed of smaller units – biological cells – and also that the plants and animals themselves in turn do not live their lives alone. Rather, living things necessarily belong to local groups of interbreeding individuals referred to as demes (which would form a genealogical tree within a species). At the same time, ecologists realized that organisms exist in more or less socially organized groups – biological populations, making up local flocks, troops, schools, etc., in animals, and stands in plants. These interact with other such groups in a ► [biome](#) by way of passing energy from one species' population to others. (Deme and population are frequently, but not always, the same group.) So we have populations/demes composed of organisms which are composed of cells, all connected by energy transformations, together forming compositional hierarchies.

We can discern in the biological applications of the two kinds of hierarchy two ways of looking at the world – as a realm of energy transformations, or as a framework for passing along accumulated information.

Using the compositional hierarchy, animals, for example, can be seen to marshal energy resources in order to react to some event. This involves energy expenditures in the brain, the nervous system, and in muscles. In their cells, we find that this is most often based on the conversion of the chemical ► [ATP](#) to ADP and Pi (inorganic phosphate), a chemical reaction that releases free energy that can be used by a cell. Cells act in unison as groups in a tissue (muscle) or organ (brain), which then produces the animal's motion. This motion might result in the capture of some food, some of which gets assimilated into the body by other cells, resulting in ATP being regenerated from ADP and Pi by capturing energy from a chain of chemical reactions involved in the breakdown of the food. Plants, on the other hand, will have deployed their leaves, mostly by way of growth, so as to optimize their ability to capture some of the energy of sunlight by way of photosynthesis in

the leaf cells. This is captured in the form of manufactured sugars, which can be carried throughout the plant by way of its circulatory system. Since the energy in both cases is chemical, and so microscopic in amount, we can see that it would be impossible to understand the lives of plants and animals without taking into consideration the fact that they are structured as compositional hierarchies. All biological energy expenditure is microscopic, and so only cooperative activity by many cells wherein this happens allows these microscopic energies to be marshaled for macroscopic activity and growth.

Concerning the informational relations in biology, we understand that genetic information has been passed on through many millions of generations since the origin of the genetic system. Many genes have been preserved by repeatedly being copied over very long periods of time, so that some of ours are not very different from those found in insects. But many new regulatory genes have been added in the different lineages of living things. Since it is reproductive activity in demes that results in passing genes on to new generations and species, the question arises as to how to represent a *genealogical hierarchy*. We can use the formal property of a compositional hierarchy – [higher level, larger scale [lower level, smaller scale]] – to form the following hierarchy:

[lineage[biological species[deme[family
[individual organism]]]]]

These are all entities that can be said to hold genetic information. A biological species, for example, would contain all the information held in its many demes. This may be compared with a similarly constructed *ecological hierarchy* in the same compositional hierarchy format.

[biogeographic region[biome[population
[flock, troop, etc.[individual organism]]]]]

In this case, these are all entities that could be held to engage in energy transactions that are informed by the genetic information held within organisms, and that are actually carried out by those organisms.

Note that these hierarchies have the form of trees branching to the right, and so in these representations there would be many organisms in any troop or family, fewer families and troops within a deme or population, still fewer demes and populations with a species or biome, even fewer species and biomes contained in only one lineage or biogeographic region. Note that the ecological hierarchy is made of actual material objects, while the genealogical hierarchy is composed of relationships.

From the point of view of the subsumptive hierarchy, these relationships would be represented as:

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{kingdom{order{family{genus
    {species{subspecies}}}}}}
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This would represent one branch of many in the tree of life or Linnaean hierarchy. There could be branching at each level here; thus, for example, one genus might hold many species in its span. The genes used for coding proteins might be almost the same in all the levels, but increasing numbers of regulatory genes would be found in the subordinate taxa. Only the genetic information that is identical in all the contained subspecies would be considered to be held in the species in question, and only the genetic information found in all the species would be considered to belong to the genus in question, and so on. As with a command, genetic information gradually becomes more particular as it is imagined in each succeeding level. This shows that these standard taxa of biological systematics are classificatory categories, not actual material entities.

Cross-References

- [Biological Hierarchies](#)
- [Biology](#)
- [Biology, Theoretical](#)
- [Collective Behavior](#)
- [Complex Systems](#)
- [Evolution](#)
- [Logic](#)
- [Ontology](#)
- [Reductionism](#)

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Biological Psychology

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Related Terms

[Behavioral neuroscience](#); [Biopsychology](#); [Cognitive neuroscience](#); [Physiological psychology](#); [Psychobiology](#)

Description

Biological psychology can be concisely defined as the scientific study of the biological processes underlying or influencing mind and behavior. In this regard, it is basically a materialistic approach to the human condition since it provides methods and strategies to investigate the natural causes

and aims of (human) behavior. It is one of the few scientific disciplines at the crossroad between humanities and natural sciences. Dewsbury (Dewsbury 1991) argued that the synonym *psychobiology* was probably coined at the beginning of the twentieth century, but some authors have dated its first use many years earlier. Some students of *biological psychology* may have used this term or its synonyms to distance themselves from mainstream psychology, which some find insufficiently based on biology or natural science as a whole. American psychologist Knight Dunlap (1875–1949) was undoubtedly one of the pioneers of *biological psychology* (or *psychobiology* as he preferred to call it) and defined it in his book “An Outline of Psychobiology” (Dunlap 1914) as the study of the relationships between mental and physiological functions.

Biological psychologists will use experimental techniques from behavioral science as well as concomitant methods and strategies from neuroscience and biology – their experimental subjects can be human volunteers, brain-diseased patients, or laboratory animals (most commonly rats or mice, sometimes nonhuman primates). A common strategy used by biological psychologists is the introduction of a biological manipulation in experimental animals (brain lesions, drug administration, genetic procedures including selective breeding and transgenic or RNA interference techniques, etc.) and the ensuing observation of its effects on behavior. These manipulations are often used to construct an animal model of a neurological or psychiatric disease that can be behaviorally studied and used in preclinical behavioral studies to assess the efficacy of a therapeutic procedure (e.g., preclinical assessment of the efficacy of antidementia drugs or environmental enrichment in prevention or reversal of learning and memory defects in rodent models of dementia). Recent advances in biological imaging and electrophysiological recording techniques have contributed to their use in biological psychology. Noninvasive functional imaging techniques including ► [functional magnetic resonance imaging \(fMRI\)](#), positron emission tomography (PET), or single-photon

emission tomography (SPECT or SPET) are often used to record brain activity in human or animal subjects during the performance of specific behaviors or mental operations (e.g., brain imaging in a human volunteer who is reading a text or solving a mathematical problem). More invasive techniques are sometimes used in experimental animals to record electrical activity in specific brain regions or even in single brain cells, or the release of minute amounts of brain chemicals, during behavioral performance. Stimulation electrodes can be implanted to investigate the effects of local brain stimulation on behavior in freely moving animals.

Many biological psychologists have been involved in specific aspects of the research on behavioral genetics and behavioral pharmacology (psychopharmacology). One of the most exciting recent developments is the gradual emergence of the subdiscipline of molecular psychology that focuses on the molecular neurobiology of behavior. The term was first used by science journalist and Pulitzer laureate Jon Franklin in his 1987 book “Molecules of the Mind” (Franklin 1987). According to Franklin, the origins of the subdiscipline coincide with crucial discoveries in the discipline of psychopharmacology (notably in the lab of Johns Hopkins neuroscientist Solomon Snyder). This view would relate the biological causes of psychology mainly to molecular processes taking place at the contacts (synapses) between nerve cells (neurons). More recently, molecular psychology has been recoined in relation to the discovery of complicated signal transduction pathways inside living cells that form the basis of the molecular processes underlying neural and behavioral plasticity. Specialists feel that progress in this still largely unexplored subdiscipline may eventually contribute to novel treatments for presently incurable brain diseases.

Biological psychologists usually hold an academic degree in psychology and/or are working in psychology departments of a scientific institute. The emphasis of their work is on behavior or behavioral disorders, but apart from measures that originate from the field of psychology, they tend to use also a variety of research techniques

from biology and biochemistry, pharmacology, or biomedical science, depending on the level of explanation they are interested in. Biological psychologists investigate proximate as well as ultimate causes of behavior. Some may even try to integrate these complementary levels to reach a more comprehensive explanation of behavior as ethologist Niko Tinbergen (1907–1988) proposed more than 40 years ago. Proximate explanations may include neurochemical processes (interactions between molecules in the nervous system, cellular metabolism, molecular pharmacology, etc.), processes at the cellular level (interactions between neurons or between neurons and glial cells, transmission of neural impulses, electrophysiological functions of the neuron, etc.), or those at the level of different brain systems (e.g., interactions between different anatomical brain structures or between functionally/neurochemically distinct parts of the central nervous system). More ultimate explanations of behavior would include those that relate to ontogenic development during an organism's life or to the tentative reconstruction of evolutionary history within its ecological context (i.e., the subdiscipline of evolutionary psychology).

Self-identification

Science

Biological psychology definitely self-identifies as an empirical science and applies scientific methodology to the study of the biological basis of mental processes and behavior. It accumulates knowledge and builds theories through discovery- or hypothesis-driven observation and experimentation. All data and methodology are stored, documented, and archived as a precondition for statistical examination of their validity and reliability and should be available to other researchers for reproduction and verification. None of the theories or hypothesis in *biological psychology* should be considered absolute truths or unquestionable knowledge. The field focuses on the relationship between psychological processes and the underlying physiological, genetic, and molecular mechanisms, and it thus aims to

uncover the biological basis of behavior, emotion, motivation, perception of internal and external stimuli, sleep, learning and memory, etc. By comparing these processes across different species, it is related to comparative psychology. Some research in *biological psychology* could be called truly fundamental in that it has no primary practical purpose, but much of it is geared to solving clinical problems or to improve the human lot in some other way. Notably, knowledge acquired by biological psychologists may improve the treatment or prevention of brain disorders (e.g., Parkinson's or ► [Alzheimer's disease](#)).

Religion

Methodology and theories, history, and recent progress, *biological psychology* accept observable, empirical, and measurable evidence as its only source of knowledge and formulates hypotheses and theories that are experimentally validated. However, it does remain a typically human activity and may thus not be as value- or culture-free (or objective for that matter) as it claims to be, but all of its students will most strongly agree that none of its theories are entirely incontestable and that the science of *biological psychology* remains a work in progress.

Characteristics

Defining *biological psychology* rather generally as the empirical study of the biological attributes of behavior renders it very difficult indeed to distinguish this discipline from behavioral neuroscience, neuropsychology, biological psychiatry, comparative neurology or psychology, ethology, etc. The crucial issue, however, is mostly one of identification, and thus, the distinction might be least fuzzy at the level of the methods used and/or the basic training of workers in these obviously highly related disciplines. For example, behavioral neuroscience is probably the most similar discipline, largely identical in scope and practice to *biological psychology*, but this term is commonly used to denote the *multidisciplinary* study of neural processes at the basis of behavior.

Specialists trained in biology, biochemistry, pharmacology, or biomedical science (including psychiatrists and neurologists), who investigate behavior or behavioral disorders, may all, at a certain point in their scientific career, identify as behavioral neuroscientists, but scarcely as biological psychologists. Also, the related discipline of ethology is considered to be a distinct subdiscipline of biology that includes the study of animal behavior in its ecological or evolutionary perspective, but the topics of interest and the methods used, as well as the journals that publish ethological findings, show a high degree of overlap with *biological psychology*. Animal psychologists, on the other hand, might be interested in animal behavior and behavior modification without their link to biology. Finally, neuropsychology is mostly identified as a clinical discipline that includes the use and development of psychodiagnostic instruments in neurological and psychiatric clinical practice and the study of the psychological characteristics of brain-diseased patients.

Sources of Authority

Famously, Galileo Galilei (1564–1642) has been attributed to have said that in science “the authority of a thousand is not worth the humble reasoning of a single individual.” Like other empirical sciences, *biological psychology* does not formally acknowledge the absolute authority of individuals or sources, but it does have its giants with regard to the pioneering aspect or sheer volume of their contributions. The crucial insight that the brain must be the seat of the mind was held already by Greek philosophers like Pythagoras (BC 570–510) and Plato (BC 427–347). The renowned Persian polymath Avicenna (980–1037) linked physical and psychological illnesses together and, notably, reported an association between changes in pulse rate and emotions.

The start of modern *biological psychology* in the late nineteenth century was inspired by the works of Ernst Weber (1795–1878) and Gustav Fechner (1801–1887), who applied methods of physiology to psychology Schultz and Schultz

(1992). Obviously, Charles Darwin’s (1809–1882) theory of evolution had a broad and far-reaching influence on many fields of psychology as well and inspired the study of mental processes in animals and their comparison across species. One of the founders of scientific psychology, William James (1842–1910), actually treated psychology as a biological science and recognized the importance of the brain for consciousness, but the great Russian physiologist and 1904 Nobel Laureate Ivan Petrovich Pavlov (1849–1936) might arguably be considered the first real biological psychologist.

British physiologist, Charles Scott Sherrington (1857–1952), made seminal contributions to many fields of neurophysiology and devoted his later work to mind-body dualism and the nature of mind. Sherrington was convinced that the mind must be material and argued vehemently against Descartes’ view that nonhuman animals are “automata without a mind.” In the early 1920s, Swiss Nobel Laureate Walter Rudolf Hess (1881–1973) pioneered the use of stimulation electrodes to investigate the effects of local brain stimulation on behavior. In experiments with cats and dogs, Hess observed that applying current to electrodes in the diencephalon or hypothalamus resulted in instantaneous behavioral changes. Hess’ technique has been instrumental, for example, to the study of reward centers in the brain, which has contributed to our understanding of addiction, and the development of the technique of electrical self-stimulation of the brain.

Karl Lashley (1890–1958) assessed the effects of brain damage on learning and memory in laboratory animals. Early in his career, he collaborated with behaviorist John B. Watson (1878–1958) on animal behavior and later with Shepherd Franz (1874–1933) on the effects of cerebral lesions on retention and habit formation in rats. His student, Canadian psychologist Donald Olding Hebb (1904–1985), explored how neural functions contribute to psychological processes and outlined knowledge about behavior and mind in his seminal 1949 book “The Organization of Behavior” (Hebb 1949). Hebb might be rightfully called the father of cognitive psychobiology,

whose ideas exert a persistent influence on neuroplasticity research, and contemporary cognitive and computational neuroscience.

Burrhus Frederic Skinner (1904–1990) is one of the most influential figures in psychology. His stringent methods for the experimental analysis of behavior and operant conditioning are still used by biological psychologists around the world. Also, the work of biopsychologist and 1981 Nobel Laureate Roger Sperry (1913–1994) is still of major significance today. Sperry contributed to our understanding of the functions of the cerebral hemispheres and is still cited for his work on split-brain patients. Torsten Wiesel (1924) and David Hubel (1926) studied information processing in the visual system and the mechanisms of cortical neuroplasticity. In addition, the work of these two Nobel Laureates proved critical for the treatment of visual impairment in children (e.g., congenital cataract and strabismus).

Finally, two psychiatrists-turned-neuroscientists largely determined the face of contemporary *biological psychology* and its modern focus on neuromolecular mechanisms. The first is Eric Richard Kandel (1929), who received the 2000 Nobel Prize in Physiology or Medicine for his research on the cellular basis of memory storage. Realizing that the neuronal mechanisms of learning and memory do not reside in the properties of the neurons themselves but in those of the connections between neurons, he worked on a simple model animal, the giant marine snail *Aplysia* that has a nervous system with a small number of large, easily identifiable cells. During the most recent part of his scientific career, Kandel turned to the study of the mechanism of learning and plasticity in the mammalian brain. The second researcher of interest is Solomon H. Snyder (1938), who is cited for his work on the molecular basis of psychiatric disorders and several major discoveries on the neurochemistry of behavior.

Ethical Principles

As an empirical science, *biological psychology* subscribes to the principles of rigorous and reliable observation and experimentation and to

international legislation and rules that govern scientific publication and authorship. It acknowledges human equality and freedom and the intrinsic value of human and animal life. In as much as *biological psychology* is a laboratory science, it subscribes to the principles of *Good Laboratory Practice*, and the ethical rules for the experimental use of human and animal subjects. In Europe, strict legislation has been included at the level of the *European Union* that applies to the use of animals and humans in research. It is generally accepted, and part of contemporary legislation that the use of animals in research should be justified and evaluated by ethical review procedures. The use of nonhuman primates deserves particular consideration because of their high level of social and cognitive performance and their neurobiological similarity to our own species.

Key Values

Central to this field is the accumulation of empirical knowledge and its application to the benefit of the human condition. Specific values of *biological psychology* include (1) continuous search for biological mechanisms underlying mind and behavior in a purely scientific, reproducible way; (2) cross-species comparison of these mechanism to identify evolutionary principles; (3) application of research findings for the diagnosis, prevention, and treatment of brain disorders; and (4) replacement of invasive methods of investigation by noninvasive techniques (e.g., noninvasive brain imaging).

Conceptualization

Nature/World

The physical world including the dynamics and properties of organic matter, organisms, etc. The human species is part of nature.

Human Being

A primate that evolved as a result of biological evolution and natural selection and a member of the biological species *Homo sapiens sapiens*. Although biological psychologists tend to regard

humans as part of a biological continuum that stretches from unicellular organisms through vertebrate species, they do acknowledge the special family-like responsibility that humans have with regard to other members of their kind. This special responsibility, which is laid down in legislation and ethical principles, obviously includes young children and mentally impaired individuals as well, even though from a purely biopsychological point of view, such human beings might have more limited mental capacities than some of our highly developed animal relatives. Notably, this responsibility is the principal justification for the use of animals in *biological psychology* and other fields of science.

Life and Death

Although not a direct object of their scientific work, biological psychologists would consider that life on earth has originated from natural causes. Most of them would hypothesize that the processes of biological evolution form the emergent origin of biodiversity and life on earth, and that, consequently, the human species is a result of natural selection. Life is defined in its biological sense and its relation to physical activity, metabolism, and reproduction. Since it is definitely one of the central tenets of this discipline that biological processes determine the human psyche – the cessation of these biological processes hence coincides with death. For all practical reasons, human death is defined as a state without brain activity.

Reality

The living and nonliving matter that can be perceived by organisms at a variable qualitative and quantitative degree depending on the complexity and performance of their sensory cells or organs. Individual representations of reality after sensory processing can be stored by nonhuman organisms in specialized cells or brain and by humans, additionally, in written form or on electronic media. Humans have increased their ability to perceive reality by taking advantage of physical devices that can measure modalities/traits of reality that otherwise would not be accessible.

Knowledge

Collectivity of skills, expertise, information, and data about the external and internal world, passed on across generations traditionally by means of writing, speaking, imitation of the behavior of relatives or conspecifics (also important in some animal species) and nowadays electronically. Acquisition of knowledge involves complex cognitive processes like perception, association, learning, communication, and reasoning. Biological psychologists aim to unravel the cognitive and neural mechanisms that underlie these processes. Knowledge is classified into categories (animals), disciplines, and theories and kept/stored either collectively in the brains of a given population or in books and on electronic media.

Truth

There are obviously no absolute truths in *biological psychology*, but there are facts, propositions, theories, and hypotheses. Notorious evolutionist Thomas H. Huxley (1825–1895) argued that truths often begin as heresies and end as superstitions, illustrating the relativity of truth or verity. Truth is practically defined by scientists as the propositional status of being in accordance with existing knowledge, in concordance with reality, or the result of experimental verification of hypotheses. The truth or verity of an assumption, hypothesis, or theory can be tested and falsified. It can be demonstrated by putting it to practice, or as stated by William James (1842–1910), “the ‘true’ is only the expedient in our way of thinking, just as the ‘right’ is only the expedient in our way of behaving” (James 1911).

Perception

The process whereby sensory stimulation is translated into biologically/physiologically meaningful information that is further processed, reconciled with existing experience (knowledge), leading eventually to the instant activation of certain behavioral programs like defense, flight, etc. Historically, Gestalt psychologists like Max Wertheimer (1880–1943), Kurt Koffka (1886–1941), and Wolfgang Köhler (1887–1967) tried to identify brain mechanism that account for

perception. Gestalt psychology supposed that perceptual organization reflects innate properties of the brain itself. Thus, perception and brain functions were considered to be formally identical. At about the same time, behaviorism, founded by John B. Watson (1878–1958), described behavior using objective terms such as stimulus and response. Behaviorism denied that perception is amenable to direct investigation, but rather its properties can be inferred from objectively measured behavior.

Time

Time is a fundamental dimension of the surrounding world and all mental and physiological processes. Organisms have adapted to time-dependent changes in their environment (e.g., daily, seasonal, lunar, and tidal geophysical cycles) by developing internal clock mechanisms allowing rhythmicity in internal body functions and behavior that are maintained even during constant environmental conditions (e.g., polar night). In mammals including humans, the most important cycle is the circadian cycle that is driven by hierarchically organized internal clock mechanisms that are synchronized by the day-night rhythm of the sun. At the core of the mammalian circadian system is the oscillatory expression of several “clock” genes such as *Period* (*Per1–3*) and *Cryptochrome* (*Cry1–2*) within the hypothalamic suprachiasmatic nuclei (SCN) that is regulated by autoregulatory transcriptional/posttranslational feedback loops. This clock/pacemaker in the SCN acts as a master clock synchronizing remote clock mechanisms in other central neural circuits, peripheral organs, and tissues and synchronizes these rhythms to each other and to solar time (Challet 2007). Many studies have highlighted the dominant role of the circadian clock system in the organization of 24-h patterns of behavior and physiology. It not only permits humans to estimate time in the absence of clocks and other sensory cues but also allows anticipatory physiological changes even before the periodic change in the environment occurs (e.g., in transmitter and hormone levels). Biological rhythms also depend

on temperature (e.g., experiments in human subjects have shown that time between events is underestimated when body temperature increases). Biological time, as determined by the internal clock system and developmental genetic programs, can be measured and is thus distinguished from “psychological time” (i.e., subjective/private time that is vitally important in many cognitive processes).

Whereas the seventeenth-century English philosopher John Locke (1632–1704) thought time to be only perceived as a relation between successive sensations, William James (1842–1910) used the term “specious present” for the span of time covered by a single act of awareness. He argued that at a given moment of time, a person is aware of events a short time before that time. Humans (and probably higher primates as well) have an awareness of the passage of time even during sleep. However, if knocked unconscious or during anesthesia, this awareness is lost and psychological time appears to stop. Amnesic patients with functional deficits in brain regions that are important for memory storage and recall lose the ability to estimate the passage of time accurately at the scale of hours, months etc., although their biological clock is often intact. This suggests that the processing of time and certain types of memory must share some common mechanisms and pathways.

The psychological sensation of equal periods of time can be quite different, depending on attention and emotions (cf. psychological time when we are waiting anxiously for the start of an exam). The mechanism that is responsible has been termed “interval timer.” Its main constituents are neural oscillators in the cerebral cortex that are all firing at different rates; spiny neurons in the striatum that keep track of elapsed time by using these distinct, cortical firing patterns; and neurons in the substantia nigra that create on/off signals by releasing the neurotransmitter dopamine into the striatum and thalamic neurons, which feedback to the cortex upon completion of time recording. Whereas the precision of the “interval timer” is rather low, its flexibility is remarkable, and it can be stopped at any time by

conscious control or even ignored (Meck et al. 2008). Notably, drugs like cannabis, mescaline, and methamphetamine and brain disorders like schizophrenia, Parkinson's and Alzheimer's disease have been reported to alter the sense of time.

Consciousness

Consciousness involves a set of loosely related thoughts, perceptions, and emotions. Biological psychologists tend to define it as the ability to perceive your experiences and to be self-aware. It is a mental state based on the function of specific brain regions that include prefrontal cortex and thalamus. Consciousness may be altered in brain disease or damage and influenced by psychoactive drugs. Some primatologists argue that forms of consciousness definitely also exists in apes (notably chimpanzees and bonobos) – and other highly developed animals may experience some form of conscious awareness (e.g., cetaceans), which is by and large difficult to determine or define.

Rationality/Reason

This is the ability to act, behave, think, and infer (1) within their evolutionary boundaries; (2) to the benefit of the group (of congeners) the particular organism belongs to; (3) in accordance with acquired experience and knowledge; and (4) consistent with conclusions and imaginations that can be (logically) derived from the former. Rationality is based on the rejection of conventional religion and pseudoscience. It may be impaired in brain disorders or influenced by psychoactive drugs.

Mystery

Mystery is of no particular professional concern to biological psychologists, but there are unsolved questions and staggering complexities in relation to brain and behavior. All things material (including the human brain and its capacities and attributes) can be the object of scientific investigation. Our knowledge about many natural phenomena is still very incomplete, but it merely requires the right equipment and methods, as well as scientific stamina, to tackle these topics in due

course. All that is not part of the natural or physical world is beyond the scope of the empirical science of *biological psychology*.

Cross-References

- ▶ [Aging, Psychology of](#)
- ▶ [Anatomy of the Brain](#)
- ▶ [Animal Theology and Ethics](#)
- ▶ [Biological Hierarchies](#)
- ▶ [Biological Psychology](#)
- ▶ [Biology of Religion](#)
- ▶ [Clinical Neurophysiology](#)
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- ▶ [Cognitive Science Psychology](#)
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- ▶ [Neurotheology](#)
- ▶ [Reductionism](#)
- ▶ [Social Neuroscience](#)
- ▶ [Theory of Mind](#)

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Biological Sciences

► Biology

Biologically Based Computers

► Computational Memories

Biology

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Related Terms

[Biological sciences](#); [Biomedical sciences](#);
[Contemporary biology](#); [Life sciences](#)

Description

Biology (derived from the Greek word “bios” meaning “life” and “-logia” meaning “study of”) is a science of living systems (also called organisms) and their processes, including their origin, evolution, development, structure, function, distribution, and classification (or taxonomy). Although the term originated in Germany in the late eighteenth century, the systematic

study of life traces back at least to Hippocrates (ca. 460 BC–370 BC) and Aristotle (384 BC–322 BC). Just as physics can be divided into macroscopic physics (or classical physics) and microscopic (i.e., quantum) physics based on the discovery of the quantum of action by M. Planck (1858–1947) in 1900 and the subsequent emergence of quantum physics in the 1920s, so biology may be divided into macroscopic biology (i.e., the traditional or classical biology dating back to 500 BC or earlier) and microscopic biology (or molecular biology) beginning with the discovery in 1953 of the double helix structure of DNA (deoxyribonucleic acid) by Watson (1928–) and Crick (1916–2004). Two of the most important advances in microscopic biology are (1) the cell theory formulated by T. Schwann (1810–1882), M. J. Schleiden (1804–1881), and R. Virchow (1821–1902) between 1839 and 1855; and (2) the theory of evolution proposed by Darwin (1809–1882) in 1859.

The generally accepted cell theory includes the following elements: (1) All organisms are made up of one or more cells; (2) all living cells, except those originating from abiotic system at the origin of life 3–4 billion years ago, arise from preexisting cells; (3) the cell is the basic unit of structure and function of all organisms; (4) the free energy, without which no cells can survive, is supplied by the chemical reactions (i.e., metabolism including photosynthesis) occurring within cells; and (5) the genetic information which is necessary to regulate metabolism, and hence the energy supply to cells is encoded in the nucleotide sequences of DNA that is transmitted from one cell generation to the next.

According to E. Mayr (1904–2004) (Mayr 1991), Darwin’s theory of evolution is not just a single theory but contains at least four sub-theories: (1) Organisms are not permanent but change in time; (2) species multiply by branching into daughter species or by forming founder populations that evolve into new species; (3) evolutionary changes occur gradually and not by the sudden production of new individuals belonging to a new species; and (4) evolution occurs through (a) variation of heritable traits and

(b) selective survival of individuals adapted to their environment.

Of these sub-theories, (1) and (2) have been amply confirmed by empirical data. Sub-theory (3) seems inconsistent with both paleontological data (Eldredge and Gould 1972) and the generalized Franck-Condon principle, a principle imported from physics and found to apply to a wide range of living processes (Ji 2012, pp. 21–24). Concerning the component (a) of sub-theory (4), the mechanisms underlying the “variation of heritable traits” can include not only *random mutations* as widely accepted in modern synthesis (also called neo-Darwinism) but also *nonrandom mutations* such as recombination (i.e., breaking and rejoining of DNA strands to form new molecules of DNA with a novel set of genetic information) and what was recently referred to as “active complexification” (Ji 2012, pp. 127–129, 496–498) as exemplified by “facilitated variations” of Kirschner and Gerhart (Kirschner and Gerhart 2005).

There are many noteworthy developments that have occurred since 1953 when the era of “microscopic biology” (also called “molecular biology”) began. Some of these developments are described below:

DNA Sequencing Revolution. The era of microscopic biology may be said to be ushered in with the determinations of the 3-dimensional structures of DNA and myoglobin by Watson (1928–) and Crick (1916–2004) and by J. Kendrew (1917–1997) and M. Perutz (1914–2002), respectively, in the mid-1960s, using the X-ray crystallographic method invented by W. L. Bragg (1862–1942) and W. H. Bragg (1890–1971) about a half century earlier. The linear sequence structures of DNA molecules began to be determined in 1977 by Maxim and Gilbert and Sanger et al. (Tucker et al. 2009) leading to the development of the massively parallel and high-throughput, *next-generation DNA sequencing technologies* in the beginning of the twenty-first century (Tucker et al. 2009). The cost of sequencing a genome (i.e., the totality of an organism’s genetic information encoded either in DNA or RNA, the genome including the

protein-coding and noncoding sequences of DNA/RNA) has gone down by three orders of magnitude since 1977 and is expected to go down by a similar factor in the near future to about \$1,000 per genome (Tucker et al. 2009). The high-throughput, massively parallel DNA sequencing technologies are expected to generate massive amount of sequence data, the correct interpretation of which will require experts trained in *bioinformatics*, the new field applying computer science and information technology to biomedical sciences. Bioinformaticians must be knowledgeable in algorithms, databases and information systems, web technologies, software engineering, data mining, image processing, structural biology, modeling and simulation of dynamic processes, signal processing, discrete mathematics, control and system theory, circuit theory, network sciences, and statistics, in addition to the basic laws and principles of theoretical cell biology. The combination of the high-throughput DNA sequence data and their correct interpretations provided by bioinformaticians are expected to open up a new era in biomedical sciences in the coming decades including personalized medicine and rational drug design and discovery researches around the globe.

What Is a Gene? The history of the concept of the gene is at least one and a half centuries old, but its definition is still in flux. The concept of a gene as a heritable trait was established through the experiments with pea plants performed by the Austrian monk G. Mendel in the mid-nineteenth century. The term “gene” itself was coined by W. Johannsen in 1909 in analogy to the term “pangene” used by Darwin in formulating his ill-fated pangenesis hypothesis. The modern idea of a gene as a sequence of nucleotides in DNA was established by three main discoveries: (1) Avery, MacLeod, and McCarthy found that DNA is the carrier of genetic information; (2) Watson and Crick discovered that DNA is a double helix formed from two complementary strands of deoxyribonucleic acid; and (3) the discovery by Crick, Brenner, Watts-Tobin, Nirenberg, Matthaei, and Khorana that triplets of nucleotides code for amino acids. These and other historical facts about the evolution of the

gene concept have been reviewed in (Gerstein et al. 2007). Prior to 2007, when the results of an international research effort known as the ENCODE (Encyclopedia of DNA Elements) Project was announced, the definition of gene was simple: *DNA segments encoding RNAs leading to protein synthesis*. But the ENCODE project has revealed numerous findings that cannot be readily accommodated by such a simple conception of a gene, and a new definition of a gene is called for. One way to overcome the problems brought up by the ENCODE project was suggested to be to postulate that there are two classes of genes – the S-genes and P-genes, where S and P stand for “structure” and “processes.” The former is identified with the pre-ENCODE conception of genes, also called the Watson-Crick genes, and the latter is a new class of genes called the Prigoginian genes (Ji 2012, p. 232). S-genes are analogous to *sheet music* (or written language), and P-genes are analogous to *audio music* (or spoken language). Just as the sheet music is converted into audio music by a pianist, so the Watson-Crick genes are postulated to be transduced into Prigoginian genes by enzyme systems acting as *molecular machines* driven by *conformons*, the sequence-specific conformational strains (Ji 2012, p. 231–243). It is possible that the failure of the pre-ENCODE conception of a gene can be traced ultimately to the following fact: *Biologists have been measuring the functions of genes (which belongs to the class P of processes) and attempted to reduce the results to nucleotide sequences of DNA (which belongs to the class S of static structures), without specifying the requisite molecular mechanisms (which belongs to the class M of mechanisms)*. In other words, they equated P and S which belong to two different classes (and hence could not be equated) rather than relating P and S through M, the critical link.

Blackbody Radiation-Like Equation (BRE). The last decade of the twentieth century witnessed two revolutionary experimental techniques to emerge in molecular and cell biology – the *single-molecule manipulating techniques* and the *DNA microarray technique*. In 1998, using the optical tweezer technique, Xie and his group for the first time measured the rate constants of

a single molecule of cholesterol oxidase (Ji 2012, Sect. 11.3). One of the most unexpected findings is that the rate constant of the catalytic activity of one enzyme molecule is not fixed as previously thought but varies from one catalytic cycle to the next. They measured about 1,500 rate constants (also called waiting times) from a single molecule of the enzyme over a period of 5 to 20 min. When these rate constants are grouped into bins (i.e., rate constant classes) covering the range from 10 to 250 ms, the frequency of each bin is counted, and these are plotted on a 2-dimensional graph, a histogram was obtained. The shape of this histogram was non-Gaussian and found to fit a mathematical equation called the “blackbody radiation-like equation” (BRE) that is similar in form to the blackbody radiation equation discovered by M. Planck in 1900 which introduced the concept of “quantization” of energy into physics. The fitting of the single-molecule enzymic data into BRE thus can be interpreted as indicating that the Gibbs free energy level of an enzyme molecule is quantized (Ji 2012, Sect. 11.3.3). One consequence of this interpretation is that the rate constant of an enzyme molecule is completely determined by the ground-state Gibbs free energy levels of the enzyme. What is even more unexpected is the finding that the BRE also fit the experimental data obtained from two other biological processes – the protein folding Gibbs free energy data and the whole-cell RNA level data measured from budding yeast (Ji 2012, p. 436).

DNA Microarray Revolution and Intellectual Crisis in Biology. In the mid-1990s, biologists at Stanford University developed a revolutionary technique known as DNA microarrays. A DNA microarray consists of a microscopic slide, typically 2 cm by 2 cm in dimension, divided into 10,000 squares, on each of which are chemically attached hundreds of copies of a whole gene or its characteristic fragments that encode an RNA molecule (http://en.wikipedia.org/wiki/DNA_microarray). Thus, using one microarray, it is possible to measure simultaneously the levels of 10,000 RNA molecules in a biological sample. It is becoming increasingly clear that the massive amount of genome-wide expression

(i.e., transcription of genes to RNA molecules) data generated by the DNA array technique can no longer be rationally accounted for solely on the basis of the principles and knowledge gained from *test-tube* molecular biology alone, but new *whole-cell* approaches and perspectives need to be developed in order to enable biomedical scientists to correctly interpret DNA microarray data and extract biologically meaningful information from them. It is truly astounding to find that most of the papers published since the invention of the microarray method in the mid-1990s have erred in interpreting microarray data, resulting in false-positive and false-negative conclusions (Ji et al. 2009) which led some biologists to conclude that there exists “an intellectual crisis in the field of DNA microarray data analysis” (see Appendices C, D, E and F in (Ji 2012)). Despite these difficulties in interpreting microarray data in molecular terms (i.e., genes and gene expression), microarray techniques, used as a phenomenological tool, however, are making valuable contributions to both basic biomedical sciences and medicine. For example, two important findings have merged in recent years from the DNA microarray data measured from budding yeast undergoing nutritional stress (i.e., changing the energy source from glucose to galactose) – (1) the quasi-determinism of genotype-phenotype coupling, an observation that indirectly supports the cell language theory (Ji 2012, pp. 159, 420–433); and (2) and the quantization of the Gibbs free energy levels in the living cell, an evidence for the existence of the cell force (Ji 2012, 444–461) (see below).

Quasi-deterministic Genotype-Phenotype Coupling. A genotype refers to a unique nucleotide sequence pattern in a DNA molecule, and a phenotype is any effect (e.g., shape of a cell, color of hair) or products (e.g., DNA, RNA, proteins) produced by a gene either directly (e.g., through transcription) or indirectly (e.g., by coding for a transcription factor that affects the transcription of other genes). In principle, there are four possible genotype-phenotype relations – (1) one-to-one (i.e., one gene codes for one phenotype), (2) one-to-many (i.e., one gene codes for many phenotypes), (3) many-to-one (i.e., many

different genes code for one phenotype), and (4) many-to-many (e.g., an identical set of genes code for many different phenotypes). These relations can be divided into two groups – deterministic and quasi-deterministic. The one-to-one relation is deterministic in that a gene, for example, completely specifies not only the nucleotide sequence but also the copy number of its RNA, and the other relations are quasi-deterministic in the sense that a gene can specify completely only the nucleotide sequence but not the copy number of its RNA molecule (Ji 2012, Sect. 12.9).

The RNA trajectories measured by Garcia-Martinez et al. (2004) provide indirect experimental evidence for the quasi-deterministic relation between structural genes and their phenotypes, that is, their RNA levels in the cell. Each of the over 6,000 RNA traces (or trajectories) measured by Garcia-Martinez et al. (2004) using DNA microarrays in budding yeast undergoing glucose-galactose shift carries two kinds of information – (1) the name of the gene encoding the RNA molecule whose concentration is being measured, and (2) the time-dependent change in the intracellular concentration (or copy number) of the RNA. The former can be represented in the N-dimensional sequence (or *genotype*) space, where a point represents an N nucleotide-long RNA molecule, and the latter in the 6-dimensional concentration (*phenotype*) space, wherein a point denotes the kinetic trajectory of an RNA molecule measured at six time points. Thus, for any pair of RNA molecules in budding yeast, it is possible to calculate (1) the *genotypic similarity* as the degree of the overlap between the pair of nucleotide sequences (using the ClustalW2 program on line) and (2) the *phenotypic distance* as the Euclidean distance between the corresponding two points in the 6-dimensional concentration space. When the *phenotypic distances* (PD) of a set of all possible RNA pairs (y values) were plotted against the associated *genotypic similarities* (GS) (x values), a scatter lot was obtained wherein all the points were found to lie under a *diagonal line* with a negative slope. This triangular distribution indicates that structural genes have an effect on the intracellular levels of their

own transcripts, because, otherwise, *the distribution of the points on the GS vs. PD plot should be random. On the other hand, if structural genes had a complete control over their intracellular transcript levels, all the points should lie on or along the diagonal line*, but only a small fraction of the points actually was found to lie close to it. More than 95 % of the points were found to be contained in the region below the diagonal line. So the relation between genotype and phenotype as revealed in the GS vs. PD plot embodies some regularities, but these regularities are unpredictable, leading to the conclusion that the genotype-phenotype relation is *stochastic* or *quasi-deterministic*, reminiscent of the principle of rule-governed creativity or arbitrariness of signs in linguistics (Ji 2012, Sects. 12.9 and 12.10).

Cell Language. Language is not the monopoly of humans. Living cells are found to use language on the molecular scale. Cell language is defined as “a self-organizing system of molecules, some of which encode, act as signs for, or trigger, gene-directed cell processes” (Ji 2012, p. 164). What is surprising is the finding that 10 out of the 13 design features of human languages characterized by linguists have molecular counterparts in cell language, leading to the notion of the *isomorphism between human and cell languages*. Just as human languages are based on *double articulation*, that is, the formation of sentences from words (called *first articulation*) and the formation of words from letters (*second articulation*), so cell language embodies a double articulation in that there are two and only two kinds of mechanisms for changing molecular structures – *conformational* (also called noncovalent) changes corresponding to the first articulation and *configurational* (also called covalent) changes corresponding to the second articulation. In both human and cell languages, double articulations appear necessary for efficient communication, that is, the storage, transfer, and transformation of information.

The Cell Force. The microarray data measured by Garcia-Martinez et al. (2004) can be mapped onto a cluster of points in a 6-dimensional *RNA concentration space* wherein each point represents an RNA trajectory consisting of a set of

six RNA levels. The similarity between the shapes of any pair of RNA trajectories can be calculated as the Euclidean distance between two points in the concentration space. It was found that most (70–90 %) of the Euclidean distances between all possible RNA pairs belonging to a given metabolic pathway obeyed the black-body radiation-like equation (BRE), $y = (a/(Ax + B)^5) / (e^{b/(Ax + B)} - 1)$, where x is distances between RNA trajectories, y is the frequency of observing a given distance class, and a , b , A , and B are constants. The fitting of the RNA data into BRE has been interpreted as the evidence (1) that *thermal fluctuations* (or Brownian motions) of transcriptosomes (catalyzing the transcription of DNA to RNA) and degradosomes (catalyzing the degradation of RNA) play an important role in the control of their activities and (2) that the Gibbs free energy levels of transcriptosomes and degradosomes are *quantized*. Just as the quantization of the energy of electrons in an atom led to the notion of atomic orbitals in physics almost a century ago, it appears that the quantization of enzyme complexes (e.g., transcriptosomes and degradosomes) in living cells may indicate the existence of “cell orbitals” which determine their catalytic activities. Again, just as atomic orbitals can be visualized in terms of geometric objects (e.g., spheres, lobes) which are invariably symmetric, “cell orbitals” can be visualized as a 5-dimensional Gibbs free energy surface whose topology (i.e., shape and curvature) varies in space and time. Such a dynamic geometric object was named the “time-dependent Gibbs free energy landscape” (TGFEL) (Ji 2012, p. 460), which can be viewed as the geometric representation of the *cell force*, the causal agent postulated to be responsible for the metabolic organization of the living cell (Ji 2012, pp. 444–461). It may turn out *that TGFEL is to the cell force that the Calabi-Yau manifolds are to the strong force* (Yau and Nadis 2010). If analytical geometers can prove the validity of this conjecture in the future, we would be able to state with confidence that there exists a new force in nature (in addition to the strong, weak, electromagnetic, and gravitational forces) that is responsible for life.

Conformons and Molecular Machines. According to Bruce Alberts of the University of California, San Francisco, the cell, the basic unit of life, is “a collection of protein machines,” *protein machines* being synonymous with *molecular machines*. We now have experimental evidence (Ji 2012, pp. 231–246, 444–448) (1) that all molecular machines are driven by packets of the mechanical (i.e., conformational) energy (called *conformons*) stored in sequence-specific sites in molecular machines themselves and (2) that the motions of millions of molecular machines in a given cell are not random but organized in space and time in order to accomplish gene-directed cell functions through the action of the *cell force*. The cell force is defined in analogy to the strong force in physics: *Just as the strong force holds nucleons (i.e., protons and neutrons making up atomic nuclei) together against electrostatic repulsion, so the cell force holds together biopolymers and small molecules together in the living cell in functional states despite the randomizing effects of thermal motions* (Ji 2012, pp. 444–461, 679–689). It appears logical to conjecture that the cell force can be represented geometrically as the curvature of the time-dependent Gibbs free energy landscape (TGFEL) (Ji 2012, Fig. 12.32), just as the gravitational force can be represented as the curvature of space-time and the other fundamental (i.e., strong, weak and electromagnetic) forces as the curvatures of corresponding Calabi-Yau surfaces or manifolds (Yau and Nadis 2010).

Molecular Theory of the Living Cell. Although the *cell theory* maintaining that all organisms consist of one or more cells was formulated by the early decades of the nineteenth century, there was no theoretical model of the living cell published until the Bhopalator was proposed in 1985 (Ji 2012, pp. 269–279). The Bhopalator model of the cell contains four theoretical components – conformons proposed in 1972–1974, IDSs and the cell force both proposed in 1991, and the cell language theory formulated in 1997. But it took another decade and a half to recognize that these theoretical components are not independent of one another but inseparably

interlinked, representing different aspects of the same object, that is, the living cell. This idea is represented geometrically as a body-centered tetrahedron (Ji 2012, p. 278) (Fig. 1):

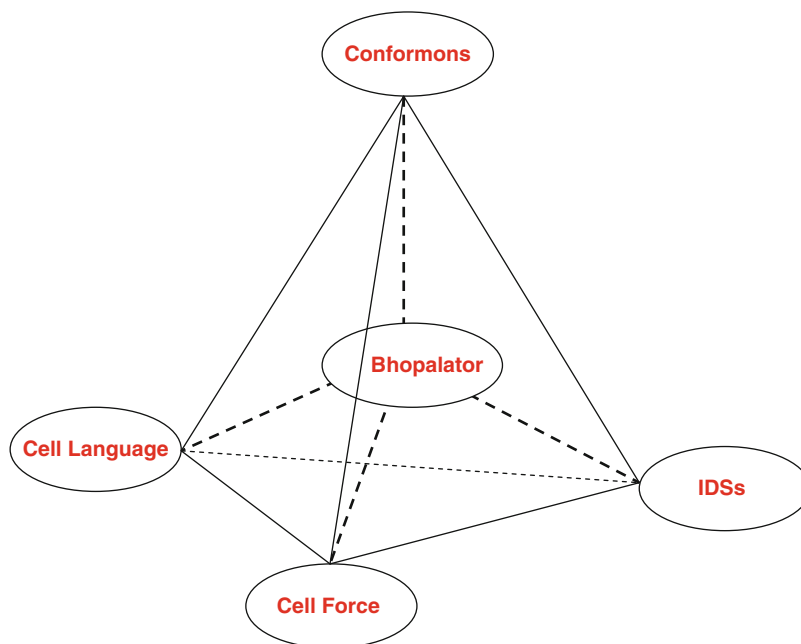
Cell Biological Theories of Evolution. Darwin’s theory of biological evolution was published in 1859 and, according to E. Mayr (1904–2005), consists of the following four sub-theories:

1. Organisms are not permanent but change in time.
2. Species multiply by branching into daughter species or by forming founder populations that evolve into new species.
3. Evolutionary changes occur gradually and not by sudden production of new individuals belonging to a new species.
4. Evolution occurs through (a) variation of heritable traits and (b) selective survival of individuals adapted to their environment.

Items (1) and (2) have been confirmed by empirical data. Some evolutionary biologists may dispute the validity of item (3) based on the theory of punctuated equilibrium. Applying the generalized Franck-Condon principle to evolution, it can be predicted that phylogenesis (i.e., the evolutionary development of groups of organisms) will be rate limited by the speed of geological changes (Ji 2012, p.23), which would be consistent with the idea of punctuated equilibria. Item (4) may also be viewed as confirmed by empirical data, although the microscopic mechanisms underlying the variation of heritable traits are still poorly understood.

As is well known, Darwin’s theory of evolution is a controversial topic and has been attracting the interest of both scientists and lay public, ranking among the most widely discussed subjects on the Internet. For example, *evolution theory* has been visited by more people than *Einstein’s relativity theory* as of August, 2009, and is comparable to the topic of Obama’s cabinet in terms of the number of visitors. Darwin’s theory of evolution is a *macroscopic* theory formulated one and a half centuries ago in order to account for the then-available *macroscopic* data about organisms. Consequently, the key elements

Biology, Fig. 1 The molecular theory of the living cell geometrically represented as a body-centered tetrahedron containing four external vertices connected through six external edges. The internal node is connected to the four vertices via three internal edges



of Darwin's theory (see above) may be remote from, and shed little light on, the microscopic (i.e., molecular and cellular) data on organisms that have been accumulating in biology since the publication of Darwin's theory of evolution. Just as Newtonian mechanics formulated in the late seventeenth century failed to account for the microscopic observations made in the late nineteenth century (e.g., blackbody radiation, atomic line spectra, the photoelectric effect), so it would not be surprising to find that Darwin's theory of evolution published one and a half centuries ago sheds little light on certain molecular aspects of living systems that were measured only in the twentieth century (e.g., the role of DNA in inheritance and morphogenesis, the genetic codes, signal transduction cascades, the cell cycle, cell differentiation, genetic drift). This is why it is essential to formulate a *microscopic theory of biological evolution* that can not only account for molecular data on living systems but also subsume the Darwinian theory of evolution, just as quantum mechanics subsumes Newtonian mechanics. Such theories (referred here as *cell biological theories* of evolution) have begun to appear in recent

decades (reviewed in (Ji 2012, pp. 494–506)), which should shed new light on the contemporary debates on biological evolution.

Self-identification

Science

Natural sciences are characterized by systematic studies of nature using measurements/observations, analysis based on existing theories, hypothesis building, and hypothesis testing against experimental observations followed by modification of existing theories if necessary. Biology contains all these aspects, and hence, there is no doubt that biology is a scientific field.

Religion

Depending on how one defines a religion, biology may be included as a member of such a religion. To some biologists, the distinction between *theory* and *theology* can be blurry. Thus, it is not uncommon to witness prominent experimental biologists referring to what theoretical biologists do as "theology." Just as we can regard topology

and geometry as the global and local definitions (or as type and token), respectively, so it may be useful to distinguish between global and local definitions of religion.

Characteristics

Biology is the science of life and living systems. In this sense, it differs from physics and chemistry, both of which study primarily nonliving systems.

Relevance to Science and Religion

Biology is relevant to the science-religion debate/discourse because biology provides a scientific perspective on life, whereas religion provides a higher and more global perspective on life which is beyond the domain of scientific inquiry.

Sources of Authority

The source of the authority of biology resides in the fact that all the regularities and laws of organisms and their components were established through the rigorous method of observations, critical analysis, and hypothesis testing by a community of investigators.

Ethical Principles

Probably, the foremost ethical principle in biology, as in other branches of natural sciences, is honesty, which naturally leads to the objectivity of observations and measured data so that they can be reproduced by any biologists anywhere and at any time.

Key Values

The principles and accumulated knowledge of biology are essential in understanding the phenomenon of life at the deepest level, leading to

practical applications in basic sciences, physiology, psychology, medicine, and the philosophy of mind.

Conceptualization

Nature/World

Biologists regard nature as the material world that is accessible to their observations and measurements. They accept whatever model of nature that is established in physics based on microphysical and astrophysical observations in the form of the Standard Model and theories of quantum mechanics and relativity.

Human Being

Human beings are systems of 10^{12} – 10^{13} cells that are organized in space and time, driven by genetic information and free energy supplying chemical reactions. Biologists believe that anatomically modern humans evolved from their earlier ancestors in Africa between 400,000 and 250,000 years ago. The earlier ancestors of *Homo sapiens* ultimately trace their origin to the first living cells that originated on this planet some 3–4 billion years ago through spontaneous generation of self-reproducing chemical reactions-diffusion systems likely driven by thermal gradient on the earth surface or deep in the ocean floor.

Life (and Origins of)/Death

Most biologists believe that life originated on this planet 3–4 billion years ago in the form of unicellular organisms through the interactions among certain rare chemical and physical processes obeying the laws of physics and chemistry and under the constraints of the then-extant environmental conditions.

Reality

Biologists view reality as something that exists in nature prior to measurements and yields records upon being subjected to measurements, accurately reflecting what it (i.e., reality) actually is. Many biologists believe that what cannot be measured does not exist and hence that theoretical biology is of secondary importance as compared to

experimental biology. This way of thinking pervading the contemporary biological community is probably the result of the almost exclusive funding of experimental biological researches over theoretical biological ones. This situation may be slowly changing because of the massive accumulation on the Internet of the biological data measured on living systems and the realization that these data cannot be understood without the help of computers supported by sophisticated statistical analyses and deep biological theories. It is interesting to note that, in physics, there are more theories than can be evaluated by existing data, whereas, in biology, there are more data than can be understood by existing theories. This calls for more experiments to be done than theories in physics and more theories to be developed than experiments in biology. Dozens of international organizations invested billions of dollars to create the LHC (Large Hadron Collider) in Switzerland to produce data to test the validity of many theories proposed by hundreds of theoretical physicists (including Professor P. Higgs) that are published. In contrast, the US government alone has invested billions of dollars to support biological research over the past half a century or more, but there is practically no general biological theory available that can provide the theoretical framework to extract biologically meaningful information from the vast data.

Knowledge

A system of organized information that can be applied to solving practical problems.

Truth

A statement or proposition that has been formulated based on logic and found to agree with experiments or our daily experience.

Perception

The sum total of the stimuli that enters our consciousness leaving behind some registered traces in our nervous system.

Time

A physical parameter that increases unidirectionally just as the entropy of an isolated system does that undergo changes of whatever kinds.

Consciousness

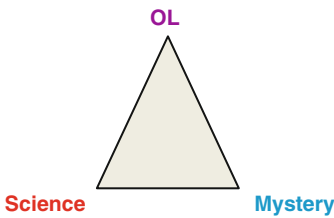
The property of our nervous system that is aware of its own activity, that is, self-awareness.

Rationality/Reason

The ability of our mind to carry out thought processes in accordance with a set of logical rules as well as natural laws.

Mystery

Biology is replete with mysteries. For example, despite the research efforts by hundreds, if not, thousands of biologists around the world during the past half a century or more and the availability of the 3-dimensional X-ray crystallographic and associated amino-acid sequence data of hundreds of proteins, we still do not understand how the amino-acid sequence of even a single protein determines the 3-dimensional structure of the protein. That is, we still cannot predict, based on the laws of physics and chemistry alone, the 3-dimensional structure of a protein from its amino-acid sequence. This may indicate that there exists one or more fundamental laws hidden in protein folds that either have not yet been discovered in physics or chemistry or are beyond these scientific disciplines. One possible solution to this dilemma was suggested to be to postulate that protein folding is determined by two mutually exclusive kinds of factors referred to as the *synchronic* (e.g., physical and chemical) and *diachronic* informations (e.g., linguistic principles) and that the laws of physics and chemistry, representing synchronic information, are necessary but not sufficient to account for protein folding and the evolutionary history, representing the diachronic information, needs to be relied on in addition (Ji 2012, pp. 159–173). Of course, one of the most important mysteries of biology that is relevant to the science-religion discourse is the problem of the origin of life (OL). It may be that OL has two complementary aspects – the *scientific* aspect that is amenable to scientific explanations and the *mystic* aspect that accounts for the gap left behind by science. This idea may be diagrammatically represented as shown in Fig. 2.



Biology, Fig. 2 The scientific and mystic aspects of the origin of life (OL)

Relevant Themes

The relevance of the contemporary biology to the science-religion dialogue was recently summarized in (Ji 2012, p. vii):

The cell is arguably one of the most complex material systems in nature, in no small part because it is the building block of all living systems, including us. *We are cells, and cells are us.* To know how cells work, therefore, will contribute to understanding not only how our bodies work, which will advance medicine, but also how our mind works, which may help answer some of age-old philosophical and religion-related questions from a new perspective. It is hoped that the molecular theory of the living cell presented in this book will contribute to the emergence of ‘the new science of human nature’ that can lead ‘to a realistic, biologically informed humanism.’ (S. Pinker 2003)

In a more practical vein, the emerging molecular theories of living systems may have significant contributions to make in resolving some of the elusive problems raised in contemporary evolution-religion debates.

There are two kinds of empirical data that are involved in debates on evolution – macroscopic (or phenomenological) data such as those Darwin collected during his 5-year trip (1831–1836) around the world on the HMS Beagle and microscopic (or molecular, cellular) data such as those on the role of DNA in genetic inheritance that became available only during the past century. Since fact-based debates on evolution must utilize either one or both of these two kinds of empirical data, we can logically divide all debates on evolution into four main types, depending on the kinds of empirical data that inform the debates (see Table 1).

Biology, Table 1 The four types of debates on biological evolution

Types of debate/ debaters	Based on or implicating	
	Macroscopic data	Microscopic data
I	Yes	No
II	No	Yes
III	Yes	Yes
IV	No	No

One utility of the typology given in Table 1 may be that it provides us with a “selection rule” stating that no two debaters of different types can reach a fruitful conclusion or that, when the debaters belong to two different types, it is impossible for them to reach a fruitful consensus.

All the debates on evolution before molecular biology was born around the mid-twentieth century belong to what is referred to as the type I debates in Table 1. The evolution-creation debates that began in Darwin’s days and continue today are mostly between scientists (types II or III) and some Christians acting as type I or even type IV debaters. Macroscopic data on evolution are of such a nature that they may not be able to provide an objective basis for rationally resolving any type I evolutionary debates. In contrast, new kinds of debates, here called types II and III, arose as the results of analyzing experimental data on the molecular biology of inheritance that began most notably with the discovery of DNA double helix by Watson and Crick (1953) and the subsequent discovery of the genetic code, and these debates are waged among biologists and other scientists who are types II and III debaters who are likely to reach fruitful results.

Type II debates arise when a given set of molecular data obtained from biological experiments can be interpreted in terms of more than one molecular mechanism, for example, the relative importance of random mutations vs. nonrandom recombinations in determining the genotypic variations of an organism. A molecular mechanism is defined here as a set of molecular processes that is thought to underlie a given empirical observation. Type III evolutionary debates are concerned with the question as to how the macroscopic and microscopic aspects

of biological evolution can be bridged. Similar problems of connecting the macroscopic and microscopic events were encountered and successfully resolved in simpler sciences, physics, and chemistry in the past by introducing major novel concepts such as the concept of quantum of action in physics and the periodic table in chemistry. Similarly, connecting the macroscopic Darwinian theory of evolution and the microscopic theories of molecular and cell biology may require invoking one or more new concepts (e.g., conformons, the cell force; see above). Finally, for a logical completeness, it is necessary to include type IV debates on evolution that are based neither on macroscopic (e.g., fossil records) nor microscopic empirical data (e.g., coevolution of DNA sequences among different species) but only on religious beliefs such as found in the Old and New Testaments of Christianity or in other world religious writings.

Cross-References

- [Biology, Theoretical](#)
- [Biosemiotics](#)
- [Body](#)
- [Chemical Thermodynamics](#)
- [Complex Systems](#)
- [Conformons](#)
- [Creationism](#)
- [Evolution](#)
- [Functionalism](#)
- [Hyperstructures](#)
- [Medical Genetics](#)
- [Mysticism](#)
- [Philosophy of Mind](#)
- [Reductionism](#)
- [Scientism](#)
- [Semiotics](#)
- [Theory of Mind](#)

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Biology of Aesthetics

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Description

Somewhere along our evolutionary path, the human lineage developed an obsession with beauty in sounds and objects. The clue to understand the biology behind this phenomenon lies in a dictionary definition of beauty: “A quality that gives pleasure to the mind.” Humans are equipped with several types of senses, but only the two based on eyes and ears transmit signals associated with aesthetics. Thus, the pertinent

question when it comes to understanding the biology of aesthetics is “Why are certain visual and auditory stimuli processed in a way that gives us pleasure?”

The brain receives a continuous flow of sensory information. Most signals are neutral, some may be repulsive, but a considerable variety of signals have the potential of eliciting some sort of pleasure. The term aesthetics within biology, however, is generally limited to stimuli derived from sounds or objects produced with the aim of eliciting a positive experience. In other words, aesthetics is about man-made creations that offer pleasure based on our auditory and visual senses.

Evolution did not give us eyes and ears for the purpose of idle pleasures. They are part of a survival kit. Looking at a painting or listening to music is unlikely to help you survive, yet people spend a fair amount of time doing just that. This entry tries to explain why. For a more comprehensive text, see (Grinde 2012).

The Many Components of Art

A concern for aesthetics appears to be a universal feature among human cultures, strongly suggesting that there are innate mechanisms behind. The evolutionary perspective may, therefore, help explain why we care about beauty, and, possibly, suggest what aspects of music and art that tingle our brain in a way that causes satisfaction.

First, one needs to dissect what art is about, that is, to distinguish between aesthetic elements and other aspects. Aesthetics serves several cultural functions, such as communication with God, and influencing people’s political ideas. Moreover, art has obvious economic aspects, not just in the value of pieces of art, but also in the use of aesthetics to sell products. Another highly relevant feature is the potential that art has in offering status to those with relevant skills – a point that is particularly relevant when it comes to attracting a mate.

Another way of dissecting art is to distinguish between pure aesthetic elements and experiences based on the associative content; for example,

a love song may stimulate some of the positive feelings involved in love, and a painting of a baby may warm the heart of adults.

This entry focuses on the elements that add what may be referred to as *aesthetic value*. It is assumed that these elements operate independent of cultural implications and associations involved. This statement is backed by the observation that people tend to agree upon what is good, or not so good, in art derived from different cultures. It implies that there are vaguely definable aesthetic rules, employed by the artists, which add a particular artistic quality. These rules, or elements, are what we look for when distinguishing between a bowl with solely functional value and a bowl with added aesthetic value; or cherished music compared to just noise.

While many aspects of art depend on particular individual or cultural parameters, the underlying aesthetic elements appear to rely on innate features of the human mind. These more intuitive elements are not necessarily the most important, but they are the focus of this entry. Other aspects of art, not the least its function in mate choice, have obvious biological implications, but they are considered less relevant when discussing aesthetics.

Brain Rewards

The intuitive aesthetic elements are a question of what sort of visual or auditory signals that are likely to be processed by the brain in a way that gives the observer a positive feeling. In order to appreciate this perspective, it is important to have a basal understanding of why the brain offers positive and negative experiences. As a general rule, feelings serve one of two functions: they either encourage or discourage particular types of behavior. Food taste good, so you eat. It hurts to burn your finger, so you avoid fire. In other words, feelings tend to come in two flavors: positive or negative. This is, of course, a simplified version of reality. In many instances, the value is less obvious and quite often it depends on the situation. Some people enjoy the thrill of a dangerous task, such as climbing a mountain, while others consider it a totally unpleasant

affair. Still this bipolar view of brain instigation is useful for the present purpose. Thus, I shall use the terms brain rewards and brain punishments to signify sensations experienced as respectively positive and negative.

Some further comments are called for. Employing your brain or body to do what they are designed for is generally positive, in the sense that it is good for your genes, and therefore, connected with rewards. This implies that even sadness may “feel good” because it is a reaction that under certain circumstances serves you well. Signs of sadness may, for example, elicit help from others. Several Hollywood productions testify to the potential value of sorrow – people flock to movies that make them cry.

Another important point to note is that reward-type mechanisms for directing behavior are not necessarily adaptive in the situation we live in at present. The reward of an orgasm feels good regardless of contraceptives. For the genes, unproductive sex can be seen as a waste of time, but the genes did not foresee the invention of contraceptives. Likewise, adding aesthetic value to an object or a work of art does not necessarily give any evolutionary advantage. The essential feature of aesthetics is to evoke feelings perceived as positive. The feelings do not need to be cheerful, neither is any engagement in art necessarily adaptive. The brain offers “rewards” because directing your attention to particular types of sensory input was adaptive at some point in our evolutionary history.

Visual Aesthetics

Our ancestors began to walk upright some 3–4 million years ago, thereby freeing their hands for more advanced manipulation of tools. Tools can be of obvious importance for survival, the surprising part is that at some point people started to add beauty to the objects. Today we have moved one step further: We create objects of art with no apparent practical value.

The first obvious signs of this propensity, in the form of cave paintings and the production of figurines, date back some 40,000 years. However,

archaeologists have discovered signs of similar behavior at least 100,000 years ago, in the form of presumed shell necklaces and the use of pigments. Most likely artistic behavior goes back much further, but direct evidence is difficult to find due to the lack of lasting objects. In fact, even chimpanzees appear to take delight in producing art – which is not surprising, as the aesthetic elements to be discussed below presumably have a long evolutionary history (see Grinde 1996).

Elements of Visual Aesthetics

Balance and Symmetry

One of the few rules of aesthetics that has won a certain acceptance is the principle stating that the main motif in a picture should divide the canvas in a ratio of approximately 3:5. What the principle suggests is that placing an object in the middle is boring, while placing it too far to one side produces an unbalanced appearance. The ratio of 3:5 is supposedly the optimal compromise between these two undesirables. The disagreeable effect of the unbalanced picture is possibly connected with our fear of falling. Falling is not a common problem for an animal stationed on the ground, but our ancestors did at one point live in trees. Furthermore, even ground-dwelling animals would be conscious of the possibility that an unbalanced rock may roll. A dominant object on one side of a picture gives the unpleasant impression that this side is tilting unless a balance is added on the opposite side. On the other hand, we tend to cherish a bit of excitement. Thus, the choice is much a question of what sort of subconscious feelings the artist aims for: thrill or calmness. Both offer possible brain rewards.

In some cases, an exact balance may add particular value. Symmetry is appreciated. Perfect symmetry in a person's anatomy, or in a prey animal, is a sign of gene quality, which is to be desired. The positive value of symmetry in connection with aesthetics is most obvious in architecture. Many buildings considered to be great works of art have symmetrical features.

Color

Many plants offer nourishment to animals in exchange for helping their seeds. Tomatoes, for example, are meant to be eaten – the perfect start for the seeds of this plant is to end up in feces. In order to signal that the fruit is ready to be eaten, a conspicuous color is usually added. Animals have evolved the ability to respond accordingly. They have a visual system enabling them to spot ripe fruit. Fruits and berries are important for human sustenance. To induce us to find them, we presumably developed appropriate brain rewards, that is, an appreciation of colorful objects that contrast with the surroundings. I believe these rewards constitute an element in the biology of aesthetics. In line with this notion, we do indeed appear to prefer warm colors, such as red or yellow – particularly as opposed to brown. Ripe fruit is typically red or yellow, while feces, a substance to be avoided, are brown. Colors that are light and fresh tend to be considered pleasant while darker, and muddier, colors, particularly brownish or grayish, tend to be depressing. Humans thrive in daylight. However, as pointed out above, even sadness can be conceived as a positive sensation. Thus, the artist may very well create a great painting using dark brown rather than brilliant red.

Curiosity and Attention

Some animals are specialists. Cows, for example, concentrate their attention on a limited range of visual impressions, such as the quality of grass. Humans are quite the opposite. We are specialists in nonspecializing. We are stimulus-hungry and have an inclination to gather all sorts of information from our surroundings. Survival often depends on careful observation, such as finding the way, gathering food, and recognizing faces. Exploratory behavior is, therefore, connected with brain rewards. The term “boring” is used in aesthetics when there is not sufficient variation or novelty in a work of art. The object lacks sufficient detail to attract attention. On the other hand, complexity stimulates our curiosity and is, therefore, pleasing.

A too complex visual input may, however, prove adverse. The mind needs to find clues that

can help it organize the details. Thus, there should be a unity in the diversity. In the aesthetic tradition of the Chinese, there is a concept called “The rule of five,” referring to the limitations of the human attention span: The mind can without too much effort grasp five elements at a time. If too many unconnected elements are added, the impact may be stressful. As a rule of thumb, the complexity should not move beyond the attention potential of the human brain.

Depth and Movement

Binocular vision is typical for primates. This feature is probably connected with the visual requirements of living in trees. Moving from branch to branch demands an accurate ability to measure distances. In order to take full advantage of the various potentials of the brain, we need practice. Children are encouraged to practice by participating in play activities. The purpose of play is to learn tasks that the brain has a rudimentary potential for performing, but which yet require further training. The brain rewards us for developing our potentials. Our ability to measure depth and calculate movements requires practice. We may, therefore, be rewarded for processing visual input relevant to this task.

A typical criticism of amateur paintings is that they appear flat. We appreciate a painter who manages to create the perception of depth. It is possible to lure the brain into perceiving motion by adding dots of different colors, but the same light intensity. Furthermore, a picture may contain lines that the eyes are induced to follow, and thus offer the viewer a sense of movement.

Functionality

The idea that the functional is also visually attractive was particularly influential on architecture in the 1930s. A central doctrine then was that form should follow function. A related idea is that art should try to perfect nature. Beauty has been described as a “comprehensible representation of the perfect.”

There are obvious reasons why looking for functionality and perfection should be connected with a reward. Consuming rotten food may be

dangerous, whereas eating the best specimens keeps you healthy. Moreover, it is important to recognize the functional qualities of tools. Receiving a pleasant sensation when viewing the right objects helps the individual to distinguish good from bad, and stimulates us to try to obtain the better items.

Art as Hedonism

The above list of elements is not necessarily exhaustive. The focus has been on presenting a way of understanding aesthetics. The list includes what I believe to be the more important factors. Our visual system, including the accompanying reward mechanisms, was developed for viewing nature, not artificial objects. The attributes of our vision, as well as the characteristics of nature, may guide us in an attempt to find and utilize aesthetic elements.

Obviously, there are numerous ways of eliciting rewards. Thus, the theory presented here does not restrict the artist to narrow rules. The present understanding of aesthetics is related to a dominant philosophy of art sometimes referred to as the *hedonist school*. Its central idea is that aesthetics is about creating images that induce pleasure. The biological model adds substance to this theory. It agrees with the central notion, but by using the word “pleasure” in a broader sense, the model helps resolve a paradox of the hedonist school: Why so many of the great works of art reflect sadness and tragedy? As explained above, the feeling of sadness is not necessarily negative.

Auditory Aesthetics

Music can arouse a surprisingly intense emotional response. The biological approach to understanding the human mind may offer an explanation.

Again, the answer depends on insight into why certain sensory stimuli are processed in a way that engaged reward-type nervous circuits. Although musical appreciation is clearly influenced by

nurture, several arguments favor the notion that the appreciation of music is an innate trait. One line of evidence for a genetic influence is the universality of musical appreciation. Most cultures make use of music, if not with advanced instruments, in the form of song and rhythm. Playable flutes that are almost 9,000 years old have been found in China, and a piece of bone discovered at a Neanderthal site had holes drilled into the hollow part, suggesting that even they made flutes. The observation that musical appreciation apparently arises spontaneously in children offers further evidence, and so does the powerful effect music has on the human mind. The Neanderthal lineage diverged from the lineage leading to present-day humans more than half a million years ago. Thus, the ability to appreciate music may have been present in hominids for a long time (for further reading, see Grinde, 2000).

The Language Connection

Accepting that our passion for music is based on an innate tendency, the question is: Why is the human brain designed to connect certain forms of auditory signals with pleasurable sensations? In other words, what sort of evolutionary forces carved this tendency into the human mind?

Oral language is the most obvious advantage associated with complex sounds. A possible evolutionary connection between language and music has been discussed by several authors, starting with Darwin in his “Descent of Man.” I shall expand on this connection, in an attempt to develop a coherent theory for the evolution of musical appreciation. The language connection is the pivotal element, but other forces are presumably also involved.

The way human infants learn language is different from the way birds learn to vocalize. The sound-producing capacity of most birds tends to be fixed. Some are able to learn by imitation and to elaborate on themes, thus creating both dialects and individual signatures, but their song is mainly hard-wired. Humans are born with an innate capacity for language, but this is only a template; extensive practice is required in

order to learn to produce and decipher language. Physical play is necessary for infants to develop the nerve circuitry required for muscular coordination. Focusing the mind on the production and interpretation of sounds is presumably adaptive behavior because it helps develop the nerve circuitry required for language. As such, this activity should be coupled with positive sensations.

According to this hypothesis, our appreciation for music was designed by evolution primarily in order to improve brain structures involved in language. It might be argued that the hypothesis would predict that a preoccupation with music, as with other play behavior, should be associated with children. In response to that, it may be noted that even when the main circuitry has been established, the mind presumably continues to pay attention to sounds for two reasons: Firstly, as adults we may still need to exercise our sound-producing and interpreting capacity. Secondly, we are stimulated not just to improve our senses, but also to use them in exploratory behavior. Exploratory behavior, that is, taking an interest in our surroundings, may decrease upon ageing, but does not disappear.

The concept of agreeable sensations designed for the purpose of improving the capacity for oral communication, as well as for stimulating an interest in sounds, can help explain music but then why are not all sounds equally pleasing? A further analysis is required to understand why we distinguish between noise and music – that is, we need to describe the features that cause auditory signals to be pleasing.

Elements of Auditory Aesthetics

Complexity and Coherence

As in the case of visual art, a certain complexity of sounds presumably has a positive effect on the listener. A single, pure tone is not that interesting to explore. A measure of intricacy is required to excite human curiosity. Sounds that are too complex, however, tend to be overwhelming. We presumably prefer some sort of coherence, that is, a principle that connects the various sounds and make them comprehensible.

Purity and Harmony

The tendency to prefer pure sounds is a central element in the enjoyment of music, and a possible consequence of the language connection. The preference for purity and consonance appears to be innate. One reason why these qualities are favored may be because they enhance oral communication. The capacity to produce pure sounds is most advanced in animals in which auditory signals are the prominent form of communication, such as songbirds and whales. A pure tone presumably carries further, and although language typically includes a mixture of relatively pure (vowels) and dissonant (consonants) sounds, harmony is expected to reduce ambiguity. The brain centers involved in the production and processing of sounds are probably predisposed to prefer sounds with suitable qualities.

Some languages are referred to as tone languages; that is, the meaning of a particular sound depends on the pitch. Speakers of these languages appear to be more able to recognize variations in pitch compared to speakers of non-tonal languages. It is conceivable that the first human languages were more like song, or at least depended on pitch, which would lead to an augmented interest in this aspect of sounds.

Temporal Patterning and the Human Touch

A main feature of human language, as opposed to oral communication in apes, is the importance of the temporal patterning of sounds. Single sounds are in most cases not sufficient to convey meaning, whereas when put together in a sequence they form words and sentences. Temporal patterning is equally important in music – if the tones are not in some way tied together sequentially, people are unlikely to show appreciation.

The temporal patterning is related to what the musical literature refers to as melody. It is conceivable that music requires similarities to language, such as complexity and melody, in order to be valued, because only then does it utilize the brain resources involved in processing spoken words.

Another element in the appreciation of sounds, as in visual arts, is the communicative aspect. Humans seek to gain knowledge about other individuals as part of our social nature. When a

person creates sounds, we tend to search for a message, or at least we expect that something about that person's emotional life can be inferred. A voice satisfies this criterion, the same goes for an instrument in the hands of a skilled musician, while it is difficult to program a computer to display emotion. In other words, the complexity should have a human flavor. It is interesting to note that people tend to agree, at least to some extent, on what emotions a given sequence of music reflects.

Safe and Relaxing Sounds

The appreciation of music depends on a variety of qualities of sounds, the language connection does not necessarily explain them all. Music can have a relaxing effect not only on humans, but on animals as well.

One possible explanation for the relaxing effect is that music is continuous and rhythmical. In a natural environment, danger tends to be accompanied by sudden, unexpected sounds. A background of constant noise suggests peaceful conditions; discontinuous sounds demand more attention. Even soft discontinuous sounds that we consciously realize do not signal danger can be disturbing, for example, the dripping of a leaky tap. A continuous sound, particularly one that is judged to be safe, relaxes the brain. As to the soothing effect on humans, it may also be pointed out that music presumably is intuitively understood to be man-made, and as such normally not related to dangerous situations.

Rhythm

One of the most characteristic features of music is rhythm. In tribal music, rhythm instruments are often the main element, but even elaborate music seems to require rhythm in order to be appreciated. The rare cases of experimental music without a beat have, as expected, not enjoyed commercial success. Rhythm is probably appreciated because it helps us organize the sound, and because it is a comforting feature. The comfort can be related to the absence of danger associated with rhythmic sounds, but also to a resemblance to the pulse of the mother's heart imprinted prenatally. Newborns appreciate sound in the form of voices, vocal music, or heartbeats.

The Chill

The above suggestions may explain a general appreciation for music, yet the emotional response is sometimes more overwhelming than what would be anticipated. Particular passages can generate an intense pleasurable experience described as a chill or a thrill.

It is not an expected evolutionary strategy to encourage a certain type of behavior in excess of what is adaptive. A person who is preoccupied with song or music pays less attention to other tasks or to possible dangers. For example, if you are engrossed in singing you are unlikely to detect an approaching predator. Thus the rewards associated with sounds should not divert our attention to a greater extent than what the contribution to survival suggests. The chill appears to be excessive encouragement.

Certain qualities of music that tend to produce chills point toward a possible explanation. Research suggests that chills are evoked more often by sad music than by happy music, by familiar music rather than an unknown piece, and intense passages, such as crescendos, are particularly chilling. Chills are more commonly experienced by women than by men. It is conceivable that chills hook directly onto the brain's primitive emotional circuits; more specifically, that music has some sort of relationship with the call of an infant crying for its mother. Separation calls are expected to evoke powerful feelings in parents – especially in mothers. Human separation calls have properties related to chill-producing sounds: the cry of a baby is at once intense, familiar, and sad. Long before the development of language, the genes had presumably designed the brain to offer ample rewards to ensure attentiveness to the call of infants. It is possible that a chill is an accidental sensation evoked when music happens to approach the sounds we are programmed to react to as caregivers.

However, it is also conceivable that a chill can be explained by the way evolution tends to utilize structures already present for novel purposes, as exemplified by the way legs evolved from the fins of fish. The need for positive sensations to encourage the processing and production of

sounds, which I suggest appeared as a consequence of the introduction of language, may have triggered evolution to recruit the emotional pathways associated with parents' attention to the cries of their babies.

Sexual Selection

An artist may feel that reducing aesthetics to an innate trait does not do either music or art justice. It is important to stress that the biological approach reflects only one of several possible perspectives relevant to the understanding of art. Moreover, in present society art has gained a "life of its own," partly independent of our innate preferences for particular qualities.

The suggested elements, and concomitant rewards, promote a preoccupation with certain types of sounds and visual stimuli. Obviously, the particular taste of an individual is governed by personal and cultural traits. Thus, the observation that the same music or painting may produce pleasure in one person and discomfort in another does not contradict the suggested aesthetic elements.

It was pointed out already that art serves several cultural functions, such as communication with both humans and spirits. It is possible that these functions contributed to the evolution of our innate preoccupation with art. Communication involves obtaining attention. However, both attention and communication may be achieved without adding beauty. A traffic sign is perfectly designed for attracting attention, yet few would treasure it as a work of art. Paintings, on the contrary, are sometimes very subtle and quiet. Furthermore, much of the art produced, such as that of children or amateurs, is apparently made solely for the satisfaction of the creator, and not for communicating with others. The greatest works of art are probably produced when aesthetic elements are used to enhance the communicative content. The aesthetic rewards are then added to associative rewards, creating a particularly strong impression.

It is also likely that sexual selection spurred the evolution of our aesthetic disposition; that is,

mate choice may have depended to some extent on musical and visual artistic abilities. Most of the advanced acoustic signals in nature are courtship signals. It is easy to imagine that competence in singing, or in following a rhythm, has improved the odds of success in a human courtship situation. The theory would help explain why love is the most popular theme for songs. Skill in decorating the body may have served a similar purpose.

Although cultural functions, particularly in terms of sexual display, probably contributed to the evolution of aesthetic appreciation, it seems unlikely that they represent the primary mover. I believe the aesthetic elements of the type described in this entry preceded possible social benefits. Sexual selection tends to expand particular features, among the more famous are the peacock's feathers, but generally the feature to be expanded was present before sexual selection started using it. In the absence of the aesthetic elements, the other functions of art would probably not have emerged.

For the Service of Life Quality

The life of dogs depends on a keen sense of smell. Dogs are unlikely to insist on going to a concert, or to an art exhibition, but they certainly would appreciate a "gallery" where they can sniff interesting odors.

Compared to dogs, we are expected to derive more pleasure from auditory and visual signals, and less from olfactory signals, simply because the auditory and visual signals are more important for human survival. Present music and art are designed to hit pleasure circuitries in the brain with maximum power. The artist accentuates the elements capable of stimulating brain rewards. That is, they offer exaggerated stimuli akin to the way a nesting bird will prefer a plastic egg if it is bigger than the real egg.

The role of art in present society is far from being adaptive in a biological sense. Then again, there is no reason why it should be. It seems more rational to define the purpose of life as improving life quality, rather than maximizing procreation.

The term *Darwinian Happiness* offers an expansion of this way of looking at quality of life. The various reward mechanisms activated by aesthetics offer an excellent strategy for happiness (Grinde, 2012). Artists, who are capable of finding novel ways of hitting the relevant rewards, should be valued.

Cross-References

- [Aesthetics \(Philosophy\)](#)
- [Biological Anthropology](#)
- [Biological Psychology](#)
- [Biology, Theoretical](#)
- [Evolution](#)
- [Evolutionary Psychology](#)

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Biology of Religion

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Related Terms

[Anthropology](#); [Biological](#); [Celibacy](#); [Development](#); [Evolutionary history](#); [God](#); [Infectious disease](#); [Life](#); [Life sciences](#); [Living](#); [Neurotheology](#); [Primatology](#); [Proximate causes](#); [Religious](#); [Reproductive success](#); [Survival](#)

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What Does Biology Have to do with Religion?

Although it would be understandable for someone to ask, “What does biology have to do with religion?” the answer is easily given. Biology is the study of life or of living organisms. Humans are living organisms. Humans engage in religious behavior. In fact, except in some modern industrialized Western societies that have been secularizing for the past few centuries, religious behavior has been as much of a species-characteristic trait of human beings as the way we walk, talk, smile, and cry. It is easier for biology to concentrate on religious behavior rather than the subjective aspects of religious experience if for no other reason religious behavior is observable. However, biology has also modestly contributed something to our understanding of certain aspects of religious subjectivity by a new field of functional brain scanning, sometimes called “neurotheology,” in which areas of brain that are metabolically active during such things as prayer and feelings of transcendence can be studied (Newberg et al. 2001).

Ways of Studying Religious Behavior Biologically

Most biological studies on religion address religious behavior, looking at its evolutionary history, its development in the lifetime of the individual, its proximate causal mechanisms, and whether exhibiting it increases one’s survival and reproductive success. These are the four areas of investigation that are used in trying to understand the biology of any behavior, a method suggested many years ago by behavioral biologist Niko Tinbergen (Tinbergen 1951).

Literature on Biology and Religion

The first book to specifically address biology in reference to religion was Alister Hardy’s *The Biology of God: A Scientist’s Study of Man the Religious Animal* (1976). This was followed

by *The Biology of Religion* by Reynolds and Tanner (1983). In the last several years, two edited volumes have addressed the biology of religious behavior (Feierman 2009; Volland and Schiefenöhovel 2009).

Assortative (Preferential) Mating and Religions

Because in modern industrialized societies people tend to marry persons of their same religion with a greater than chance probabilities, religions can also be thought of what in biology would be called a “breeding (or mating) population.” That of course has lots of biological consequences. There are very few religions that do not have rules and regulations regarding the sexual behavior of their members. And they do that for good reason, given what appears to be one of religions functions.

Religion, Celibacy, and Biology

Religious celibacy as one more relationship between biology and religion. Religious all-male communities, as seen in Buddhism and Roman Catholicism, are somewhat “natural,” as they are similar to nonreproducing social groups or bands of nonhuman, normatively social, male primate species. No normatively social primate species has been described in which females form nonreproducing bands save human beings in terms of Roman Catholic women religious communities, an anomaly in primatology for certain. Lone males, which could be considered the current biological characterization of diocesan Roman Catholic priests, have much less precedence in primatology in a normatively social species, such as our own.

Disease and Religion

There is another rather interesting relationship between biology and religion, which has to do with disease in general and infectious disease in

particular. In human religious history, shamans and medicine men were the first religious practitioners. One of their primary roles was the treatment of various diseases, which they accomplished primarily through ritual.

Religion has another relationship to infectious disease. In traditional tribal societies religious diversity (i.e., more religions per area) correlates positively with the area’s pathogen prevalence, which means that there is more density of tribal religions in the parasite-rich tropics compared to temperate areas (Fincher and Thornhill 2008). Religious differences, often phrased as differences over religious beliefs, are a known cause of, and perhaps even a mechanism of, human tribal groups dividing (Price 2009).

Survival, Reproductive Success, and Religion

In advanced industrialized societies today, and for reasons unknown, persons of faith, who are practicing religious behavior, also have better survival and reproductive success than their secularist neighbors (Bloom 2009), a correlation with lots of biological significance.

Cross-References

- ▶ [Altruism](#)
- ▶ [Biological Psychology](#)
- ▶ [Biology](#)
- ▶ [Body](#)
- ▶ [Epistemology, Evolutionary](#)
- ▶ [Evolution](#)
- ▶ [Love \(Affective, Sexual\)](#)
- ▶ [Natural Theology](#)
- ▶ [Neuroimaging](#)
- ▶ [Neurotheology](#)

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Biology, Theoretical

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The meaning of the word “theoretical biology” depends on what we understand by the word “theory.” Here, we assume that a theory is a compact set of concepts and principles able to unify and explain a certain class of facts, in this case related to the phenomenon of life. In exemplary fashion, the conceptual apparatus used is abstractive enough to be formalized in terms of mathematics. In the course of the history of science, we can distinguish only a few systems of views that are worth to be termed the biological theory. Some of these are reviewed below in the order of their original formulation.

Circulation Theory. In a sense, this theory goes back to traditional Chinese medicine and a concept of Zang Fu including five pairs of organs connected by five “fluids,” among which

we distinguish Xue (blood) (Ross 1989). Contrary to Western medicine, the Eastern, Chinese medicine was more theoretical than experimental, though both have finally the practical purposes. It was William Harvey (1628) who, underpinning the mechanistic, “European” methodology of Rene Descartes, described the human circulatory system as composed of heart, the pump, and the vascular system of arteries and veins. Later on Marcello Malpighi discovered capillaries connecting arteries and veins, and the whole human circulatory system has been divided into the closed cardiovascular system, transporting blood, and the open lymphatic system, transporting lymph (Wright 2012). The physical theory of hydrodynamics can be applied for description and explanation of the circulatory system action, using such notions as the velocity and the pressure fields, and transport through semipermeable membranes (Elad and Einav 2003). The theory explains the flow and diffusion of gases, electrolytes, nutrients, signaling molecules, antibodies, and the whole movable cells. Recently, the system of capillaries has been described in terms of fractal networks (Pereira 2010). Contrary to the circulatory system, the nervous system of higher animals cannot be directly described in physical terms, as the nerve conduction is not a simple electric conduction. A special nonphysical theory of neural networks has been developed, but there are still too many questions involved to treat it as a complete biological theory.

Cell Theory. The cell was first observed and described by Robert Hooke (1665) and Antonie van Leeuwenhoek (1674), who were among the constructors of the microscope. Almost two centuries of continuous improving, the optical microscopic technique entitled Theodor Schwann and Matthias Schleiden (1839), and Rudolph Virchow (1855) to formulate a theory the main theses of which can be expressed in the following three statements (Harris 2000):

- The cell is the most basic unit of life.
- All living individuals are either unicellular or composed of many cells.
- All cells come either from division of preexisting cells or by conjugation of two generative cells.

We distinguish simple prokaryotic cells from much more complex eukaryotic cells, which probably originated from the symbiotic conjugation of several prokaryotic cells of different kinds. The origin of the first prokaryotic cell is a separate problem. It is a matter of definition of life whether viruses are alive or not.

The cell theory, in natural way, divides mathematical modeling of the biological phenomena onto two levels. A subcellular organization is the object of cellular biology that deals with structure, dynamics, and function of a single cell (Lodish et al. 2000, Chap. 1). Two complementary theoretical approaches to cellular biology have been developed, namely, the reductionist molecular biology (Lodish et al. 2000) and the holistic systems biology (Palsson 2006). Molecular biology uses the theoretical apparatus of molecular biophysics and biochemistry. Systems biology on the other hand starts from an informational content of the cell genome and uses the mathematical apparatus of the theory of evolution (see below). A supracellular organization of living matter is the object of developmental biology (Wolpert 2011). It deals with the cell differentiation and the origin of higher levels of organization – tissues, organs, and, in particular, the circulatory system. The theory of morphogenesis initiated by Alan Turing (1952) uses mathematical language of partial differential equations describing a system of chemical reactions coupled to processes of spatial diffusion of controlling agents (Harrison 2005).

Theory of Inheritance (Smith 1997, Chap. 3). The fundamentals of this theory were formulated by Gregor Mendel (1865) who investigated inheritance of discrete traits of organisms called genes. Each gene can occur in different versions called alleles. The organism inherits one allele from each parent; hence, each gene is represented twice. Some alleles are dominant and some recessive, and this fact determines the corresponding trait. Forgotten at first, Mendel's work was rediscovered at the beginning of twentieth century by Hugo de Vries (1901), who introduced the concept of mutation and mutant; William Bateson (1905), who coined the word "genetics"; and Wilhelm Johannsen (1909), who introduced

the concepts of genotype as the complete set of all the genes of a given organism, and phenotype as the complete set of all the observable traits. Mendel's laws of inheritance of a single trait were generalized to whole phenotype by Godfrey Hardy and Wilhelm Weinberg (1908). Probability theory and mathematical statistics appeared ideal tools for predicting inherited traits (Edwards 2000).

Introduction of genetics onto the cellular level was done by Thomas Hunt Morgan (1910) who argued that genes are located on chromosomes at definite positions referred to by him as loci. Variation in heredity is not entirely due to gene mutations but to gene recombination in the process of crossing-over of homologous pairs of chromosomes. Linear order of genes along individual chromosomes makes probabilities of occurrence and variation of the corresponding alleles mutually correlated.

However, the greatest turning point was introduction of genetics onto the molecular level. It was done by Oswald Avery and coworkers in 1944, when the genetic information carrier was identified with DNA. The DNA double helix model discovered by James Watson and Francis Crick in 1953 explains the genetic information replication, point mutations, and the crossing-over as well (Lodish et al. 2000). The knowledge of genomes, the sets of all genes along the DNA chain, from viruses through yeast to men (2003), started the new era of theoretical biology. Although mathematically inclined researchers hope to ultimately achieve mathematical analyses of genetic information included at the DNA (genomics), mRNA (transcriptomics), and protein (proteomics) levels (Palsson 2006), these omics may be too complex to be so analyzed and require utilizing additional nonmathematical tools including linguistics, semiotics (the science of signs), and algorithms (Ji 2012).

Theory of Evolution (Smith 1997; Bowler 1989). The idea that evolution is driven by natural selection comes from Charles Darwin (1859). His reasoning can be summarized in three sentences.

- Due to heredity, offspring is similar to parents.
- However, small variations during reproduction occur, giving rise to different fitness to

habitat of particular individuals in the next generation.

- There is a surplus in reproduction with respect to resources; thus, only the fittest can survive.

The process results in accumulation of gradual changes in subsequent generations which can culminate in the emergence of new species. The theory explained exclusivity and hierarchy of the biological taxonomy. Darwin's view was very revolutionary. Unfortunately, two of its main propagators in the second half of nineteenth century hampered rather than helped the future triumph. The analogy between phylogenesis and ontogenesis proposed by Ernst Haeckel was rather shallow, whereas the idea of Herbert Spencer to generalize survival of the fittest to the human society (Social Darwinism, the "struggle for life") appeared simply dangerous (Bowler 1989).

A weak point of Darwin's original theory was the lack of the knowledge concerning the heredity mechanism. The rediscovery of Mendel's theory of heredity at the beginning of twentieth century did not result directly in combination of the both theories. Even Thomas H. Morgan doubted the theory of evolution, asserting that all individuals have the same "wild" genotype because all the mutants are eliminated by natural selection. An actual combination of Darwinian evolution by natural selection with Mendelian inheritance was initiated in Soviet Union by Sergei Chetverikov (1926) and in Great Britain by Julian Huxley (1927), a grandson of Thomas H. Huxley, a famous partaker of the first debate on the theory of evolution. Ronald A. Fisher, John B. S. Haldane, and Sewall Wright (1931) introduced the concept of genetic drift within populations, which together with natural selection and gene flow between populations are considered by the modern evolutionary synthesis, formulated by Ernst Mayr (1942) as the three main mechanisms of evolution (Bowler 1989).

The objects of mathematical models of the theory of evolution are populations, the more or less isolated collections of individuals of the same species. The numerical force of individual populations and its variation in time are considered by population dynamics. In the course of

development of this theory, let us mention the logistic model by Pierre-Francois Verhulst, the oscillating predator-prey model by Alfred J. Lotka and Vito Volterra, the autocatalytic hypercycle model of Manfred Eigen and Peter Schuster (1979), and the evolving networks model by Sanjay Jain and Sandeep Krishna (1998) (Sneppen and Zocchi 2005).

On a deeper level, the population is represented by a probability distribution in a genome space. On assuming that the evolution is a Markov process, the genetic drift can be modeled by diffusion in the genome space in which the selection is determined by some fitness landscape. Various landscapes have been proposed (Sneppen and Zocchi 2005). R. A. Fisher (1930) in his simple theory of evolution assumed a constant gradient of fitness which caused the initial distribution to move steadily to higher fitness. There was no mechanism of speciation. Such a mechanism was proposed by Sewall Wright (1945) who envisioned that barriers between local maxima of fitness to be quickly overcome. The evolution was treated as an optimization process, which later on found an application in numerical techniques of the evolutionary algorithms. Quite opposite mechanism of speciation was proposed by Motoo Kimura (1983) in the neutral theory of evolution. The fitness landscape is flat, but there are many bottlenecks in reaching particular regions in the genome space by unfitted genetic drift. Yet another mechanism of speciation, related to localization in a random fitness landscape, was proposed by Manfred Eigen (1971, 1989) (Eigen et al. 1989).

A turning point in the theory of evolution appeared in the concept of punctuated equilibria formulated by Niles Eldredge and Stephen Gould (1972) (Gould 2007). Basing on a large material of fossil records, these authors argued that, contrary to original gradualistic approach of Darwin, evolution did not occur uniformly but in jumps between shorter or longer periods of equilibria of the duration time distributed approximately according to a power law. The diffusion theory of genetic drift was too weak to explain this phenomenon and so did the theory of random

Boolean networks considered by Stuart Kauffman (1969). Only cellular automata formalism applied by Per Bak and Kim Sneppen (1993) and that of evolving scale-free networks applied by Sanjay Jain and Sandeep Krishna (2001) succeeded in explaining the phenomenon which is now known as self-organized criticality (Sneppen and Zocchi 2005).

Biology and Medicine. The notion of “theory” we assumed opposes the notion of “experiment”. However, very often the word “theory” is used in another sense, as opposing the word “practice.” This is a rule in the case of medicine, an art rather than a science, for which biology is the scientific background. Three theories understood in the second meaning influence strongly the contemporary medicine. *Germ Theory of Infectious Diseases*, commonly linked with the names of Louis Pasteur and Robert Koch in the 1870 s, attributes their cause to the action of pathogenic microbial agents. Now we know that these can be prions, viruses, bacteria, fungi, protozoa, or multicellular parasites as well (Waller 2004). *Receptor Theory of Pharmacology*, foundations of which are due to Paul Ehrlich in the beginning of twentieth century, relates action of drugs with inhibition or activation of particular cell receptors of either the patient or the pathogenic organism (Maehle et al. 2002). And the most recent *Gene Theory of Carcinogenesis*, for which the names of J. Michael Bishop and Harold E. Varmus in the 1980s seem to be the most meritorious, relates malignant transformation of a normal cell with mutation of some genes. These can be “proto-oncogenes,” whose products participate in cellular growth-controlling pathways or tumor-suppressor genes coding proteins that stop the cell cycle if its previous step has occurred incorrectly or if DNA has been damaged (Lodish et al. 2000). All the three medical theories refer to fundamental fields of biology, mainly cellular biology and immunology, in line with the disciplines discussed in more details above.

Biology and Physics. Certainly, all the biological organisms are simultaneously physical systems and thus can be described and explained in terms of physics. The problem of the reduction of biology to physics depends strongly on meanings

given by various investigators to particular concepts and it is not my aim to discuss it here. I only feel that some life processes can be better explained in terms of theoretical physics and others, in terms of theoretical biology. It is worth pointing out the main difference between the methodology of physicists and biologists which seems to appear when comparing the ways of thinking of the two greatest theorists in both sciences, Isaac Newton and Charles Darwin. For the physicist Newton, the most important were common properties of all the bodies of the Solar System. His splendid idea was to treat all of them as points differing only in masses and influenced by the same gravitational forces. For the biologist Darwin, in contrast, the most important were numerous differences between the individuals, because exactly these differences were the object of natural selection.

The physical and the biological ways of applying statistics and the probability theory are different. The physical approach proves correct if the number of individuals is much greater than the number of possible internal states of each individual, and the biological approach proves correct if the number of the possible internal states is greater than the number of individuals (Sneppen and Zocchi 2005). There is a strong experimental evidence that the native state of proteins and nucleic acids with an established primary (i.e., chemical) structure consists of an astronomical number of different conformational (i.e., spatial) substates with the spectrum of relaxation times to equilibrium comprising many orders of the magnitude (Kurzynski 2006). This raises the question, unanswered till now, as to whether the physical or the biological statistical approach is more correct in the description of various molecular processes involving such biomolecules. These include the DNA to RNA transcription, the protein folding, and the enzymatic catalysis as well.

Cross-References

- [Bioinformatics, Computational](#)
- [Biology](#)

- [Biosemiotics](#)
- [Complex Systems](#)
- [Creationism](#)
- [Evolution](#)
- [Natural Selection](#)
- [Reductionism](#)

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Biome

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B

A biome is a particular local ecosystem with a name, like a river, beach, or forest in some actual geographic location. Examples would be Chesapeake Bay, the Adirondack Mountains, or the Sonoran Desert. They do not usually have clear boundaries.

Biomedical Sciences

- [Biology](#)

Biomedical Systems

- [Cyborgs](#)

Biopsychology

- [Biological Psychology](#)

Biopsychosocial Model

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A way of conceptualizing health and illness that incorporates a systems approach and proposes that biological, psychological, social, and environmental factors are all equally important and must be simultaneously considered in order to gather a complete understanding of human

functioning. Further, it is not simply consideration of these factors (or levels, subsystems) as distinct parts of a whole that is crucial but rather it is the continuous interactions among and between these aspects of functioning that produces new emergent properties vital to understanding the vitality of the organism. Living organisms, such as humans, are open systems residing in a changing environment and material and energy are exchanged across the organism-environment boundary. As such, humans are actively involved with their environment in a reciprocal and interactive relationship. This model was most notably proposed by Engel in an article in the journal *Science* in 1977.

Biosemiotic

► Biosemiotics

Biosemiotics

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Related Terms

[Biosemiotic](#); [Semiosis](#)

Semiotics

Up until twentieth-century semiotics, the study of sign processes (semiosis), that is, processes of communication and signification, has been concerned mainly with that unique sign system which is human language. When in 1963 the American linguist Thomas A. Sebeok suggested that the science of ethology did also in a sense belong to semiotics, namely, as *zoosemiotics*, the study of animal sign systems, very few of his colleagues were ready to follow him

(Sebeok 1963, 1979). The Cartesian divide between the sciences of nature and culture was, and to a large degree still is, a vital ingredient in the matrix of beliefs on which human and natural sciences alike are based. However, this privileging of human speech, as a different matter altogether than sign processes as they play out in natural systems (scents, roars, cries, alarm calls, animal tracks, fever, coughing, etc.), was challenged more than hundred years ago by the American scientist and philosopher Charles S. Peirce (1839–1914) and long before him by the churchman Augustine (354–430) who defined a sign as “anything perceived which makes something besides itself come into awareness” (quoted from Deely 2001, 221).

In Peirce’s semiotics, the sign only takes on its signhood in the actual act of interpretative activity. An alleged sign becomes a sign only to the extent it provokes the formation of an *interpretant* (see below) in a receptive system consisting in the drawing by the receptive system of a suitable relation between the alleged sign and its object, that is, the thing or concept to which the sign is taken to refer. In Peirce’s own terms, a sign is “something which stands to somebody for something in some respect or capacity.” Thus, to take a simple case, smoke is something that to a human observer stands for fire. Smoke, observer, and fire thus are connected through a *triadic sign relation* where the smoke takes the position of the *primary sign*, fire takes the position of the *object*, and brain processes in the human observer is seen as the *interpretant*. It is important to observe in this connection that when Peirce uses the term *somebody*, he is not necessarily, nor exclusively, referring to a human person. The Peircean *interpretant* is a general category that in no way is unique to the semiotic activity of human beings, but is defined rather through its position in the triadic logic of the sign relation. Neither should the *interpretant* therefore be confused with the distinctly different notion of an *interpreter*. Since the three elements, sign, object, and interpretant, may belong to various orders of reality as single objects, general classes, fictions, mental representations, physical impulses, biological events, human actions,

organic activities, or natural laws, what constitutes the sign relation in its logical form is the particular way in which this triad is bound together.

Now, returning to the example of smoke as a sign, we should notice that a baby will not know that smoke signifies fire; the baby's brain will not produce an interpretant relating smoke to fire, sign to object. Perhaps the baby will make a more simple interpretant, an icon, relating the smell of smoke to other previously experienced unpleasant sensations. In the world of signs, there is no unambiguous connection between a sign and a signified; it all depends on the receptive system and the context in which the interpretant is formed. A Peircean sign is therefore radically different from the concept of signal or information as used in biology or biochemistry as, for instance, when we talk about *transcription* and *translation* of genetic information. In spite of the semiotic nature of such terminology, biology does not ascribe any interpretative capacity to the cellular system where these processes take place. Rather such processes are understood as perfectly normal causal chains of processes to be exhaustively described in molecular terms. Thus, here and in countless other places, semiotic terminology is understood as only metaphorical, and it is assumed that in due time, they can be and will be reduced into the chemical and physical interactions that produce the effects or functions so labeled.

Biosemiotics

The introduction of a semiotic sign conception into scientific biology marks off the biosemiotic approach relative to its two parent disciplines, biology and semiotics (Sebeok and Umiker-Sebeok 1991; Hoffmeyer and Emmeche 1999; Favareau 2008). Biosemiotics studies the webs of sign processes as they occur in natural systems including the human body. As in other border disciplines, there are vivid and as yet unsettled discussions in the biosemiotic society concerning the exact delimitations relative to human cognitive processes, prebiotic processes, and artificial

life systems, respectively. Most students of biosemiotics take the cell to be the simplest system capable of genuine sign action, *semiosis*, but others subscribe to a more general view of semiosis in which semiosis may even be seen as inherent to our universe (*physiosemsiosis*). Regardless of which position one chooses on this question, it remains a challenging question for biosemiotics to explain how the full-blown semiotic activity of whole cells could possibly have evolved in the world. It has recently been suggested that rather than trying to determine a distinct borderline between semiotic and presemiotic or protosemiotic systems, one should apply the notion of an evolutionary threshold zone comprising a series of intermediate steps connecting asemiotic prebiotic systems to cellular semiotic systems (Kull et al. 2009).

A major distinction in biosemiotics has been drawn between so-called *endosemsiosis* referring to sign processes inside the body (the level of physiology and biochemistry) and *exosemsiosis*, that is, the sign processes that take place between organisms (the level of ethology and ecology). This endo-exo asymmetry is not always clear, however, since the concept of an individual is not itself clear-cut. Thus, to take an example, are the bacterial floras in our guts – without which we could not survive – made up of billions of distinct individuals or should it rather be seen as an integral part of our body so that the semiotic interactions of these bacteria with surface cells of the gastrointestinal tract are in fact endosemiotic and not exosemiotic?

In most cases the exo-endosemiotic distinction is quite convenient because it more or less follows the traditional division between disciplines, but it should be emphasized that the focal locus for biosemiotic analysis is the membrane. Biomembranes are semipermeable encapsulating structures canalizing a highly selective flow of chemicals across themselves. As such the membrane defines an asymmetry between an “inside” and an “outside” and a need for semiotic activity that connects the “outside world” to the “inside world” so as to permit the processes of the encapsulated system to help the system to deal appropriately with its surroundings. This kind of

connection forms the core of semiosis, the meaningful interpretation inside the system of the cues that reaches it from the environment. Multicellular organisms are not just covered by an external “membrane” in the form of skin (or chitin), but underneath this outer surface there are new membranes around organs, tissues, and individual cells, and inside cells we again find new membranes enveloping the cell organelles and filling up the cell volume with sack-formed structures such as the endoplasmic reticulum and Golgi apparatus. Thus, the total area of human biomembranes has been estimated to be some 30 km², and the maintenance of these extended areas of membranes is extremely costly as measured in metabolic energy.

Biosemiotics implies a major change in our conception of the role of the genetic material, the genome. Whereas the traditional view sees the developmental process and thus the phenotype as specified by the genetic setup of the organism, the genotype, biosemiotics makes us consider the overall process as one of interpretation rather than one of specification. The so-called genomic instructions are buried deeply inside the nuclei of individual cells that cannot for good reasons “know” which destiny or function in the adult organism they are “meant” to occupy, and the cellular apparatus is therefore utterly dependent on external “instructions” to tell it which genetic “instructions” to execute at each moment. External cues derived from neighboring cells or tissues, or from body glands, or “traveling cells” such as the cells of the immune system (lymphocytes) must be picked up by specific receptors located on or in the cell membrane and translated to intracellular processes (signal transduction) that interact with the protein complexes involved in transcription and translation of DNA as well as with the targeting of virgin proteins either to their final positions in the landscape of the cell or to excretion into extracellular space. At each step in this complex chain of linked processes, contextual factors may interact significantly with the outcome. Obviously the gene does not therefore in any ordinary sense of the word *determine* its own “reading,” and neither is it justified to talk about this process as

a *specification*. The process is best described as an interpretation with the implication that epigenetic and environmental factors must be seen as autonomous resources for ontogeny and phenotypic activity.

The fact that ontogeny is nevertheless very rigidly controlled has been taken as evidence for a dominating conservative mechanism linking the genetic setup to the functional phenotype through well-buffered chains of causal processes. In biosemiotics this explanation is supplemented or replaced by the notion of *semiotic scaffolding* (Hoffmeyer 2008): Processes at all levels of organismic function are controlled by semiotic interactions between components that incessantly adjust biochemical or physiological activity to changing situations. This network of semiotic controls establishes an enormously complex semiotic scaffolding for living systems. Semiotic scaffolding safeguards the optimal performance of organisms through semiotic interaction with cue elements which are characteristically present in dynamic situations. At the cellular level, semiotic scaffolding assures the proper integration of the digital coding system (the genome) into the myriad of analogical coding systems operative across the membranes of cells and cell organelles. The big advantage of this mechanism is that contrary to physically based interactions, semiotic interactions do not depend on any direct causal connection between the sign vehicle and the effect. Instead the two events are connected through the intervention of an interpretative response. The point is that in semiotic interactions, the causal machinery of the receptive system is itself in charge of producing the behavior and it thus only needs to acquire a sensitivity toward the sign as an inducing factor. The biochemical machinery underlying the response is not, therefore, restricted by any bonds deriving from the chemistry of the releasing sign. (Thus any volatile compound, pheromone, may be taken up and used by the evolutionary process as a vehicle for the sign process whereby a certain behavior is released in an given insect no matter what the exact chemistry of that pheromone is. This absence of a direct involvement of the sign in the biochemistry and physiology of behavior of

the receptive organism removes the hard limitations on causal mechanisms that would otherwise have to be obeyed.) When functionality first arises at a holistic level (e.g., the level of the tissue rather than the individual cells making up the tissue), any mechanism that will stabilize such functionality will be favored by selection, and in this context semiotic interaction patterns provides fast and versatile mechanisms for adaptations, mechanisms that depend on communication and “learning” (By learning at this level, we refer to cells’ acquisition of internal structural markers that reflect past events and influence future activity) rather than on genetic preformation.

The emergence of this sophisticated kind of stabilizing agency poses important challenges to our conceptions of evolution. In many cases semiotic scaffolding might work as a possible forerunner for natural selection: Due to its stabilizing capacity, semiotic scaffolding implies that natural selection may take routes that have been semiotically prepared for it rather than being directed by the haphazard events of fortunate chance mutations. Thus, biosemiotics holds that while genetic fixation may ultimately be the most secure mechanism for the stabilization of new traits or behaviors, such traits and behaviors were probably often initially stabilized through semiotic loops and thus kept functional for an indefinite period of generations allowing the time needed for the much slower mechanism of supportive genetic change to take place. Especially in the later states of evolution, such semiotic preparation is likely to have had an important influence on the actual outcome of selective solutions.

The introduction of a semiotic understanding has significant implications for ethology. Rather than reducing organismic behavior to inherited holistic lumps of reflexes, so-called instincts, biosemiotics suggests new subtle kinds of learning in situ associated with the establishment of semiotic scaffolding. The eventual appearance in big-brained animals such as birds and mammals of an experiential world would also be less of a mystery in the biosemiotic perspective than it is normally seen to be (and certainly not the

meaningless epiphenomenon that it is claimed to be by some philosophers). Since the sign itself is a pure relation (and cannot be identified with any of the three entities it brings together), biosemiotics necessarily accepts the reality of a causality that is directed (but not effectuated) by the influence of pure relations, which suggests the possibility that the experiential worlds might be analyzed as a realm of pure relations - interfaces - connecting environmental cues and sensomotoric brain modules to contextual patterns dependent on memory and intentions.

At the ecological level, biosemiotics requires us to extend our concept of an ecological niche to embrace the *semiotic niche*, that is, the totality of cues around the organism (or species) which the organism (or species) must necessarily be capable of interpreting wisely in order to survive and reproduce. One important aspect of the semiotic niche concerns the semiotic interactions between individuals from different species. Most notably among these, of course, stand predator-prey relations but just as significant perhaps is the range of interactive behaviors connected to symbiotic relations. When symbiosis is seen as a semiotically controlled kind of interspecific interaction, it becomes evident that symbioses encompass a lot of subtle interaction forms that are not normally seen as belonging in this category. An illustrative case is so-called *plant signaling*. Undamaged fava beans (*Vicia faba*), for instance, immediately started to attract aphid parasites (*Aphidius ervi*) after having been grown in a sterilized nutrient medium in which aphid-infected fava beans had previously grown. The damaged beans thus had managed to signal their predicament through the medium to the undamaged beans, which then immediately started to attract aphid *parasites*, although no aphids were, of course, available for parasites to find.

The difference between this kind of *semiotic mutualism*, involving a delicate balance of interactions between many species, and symbiosis proper is one of degree rather than one of kind, and biosemiotics takes semiotic mutualism to be not only widespread in nature but nearly ubiquitous. This implies that the relative *fitness* of

changed morphological or behavioral traits becomes dependent on the whole system of existing semiotic relations that the species finds itself a part of and, accordingly, the firm organism-versus-environment borderline will be dissolved, and a new integrative level intermediate between the species and the ecosystem would have to be considered – that is, the level of the *ecosemiotic interaction structure* (Hoffmeyer 2008). Clearly, this possibility becomes most interesting in cases where experience and learning enter the interaction pattern, as will often be the case in mammals and birds. Such learning might on occasion even subsume the evolutionary process, as is the case in human culture. Conversely, one might wonder if a relatively autonomous ecosemiotic interaction structure is precisely what is needed for learning to evolve in the first place. In this way, eventual increases in semiotic freedom, that is, the capacity of a system to derive useful information from complex signs, will be prone to feed back into the evolutionary process by strengthening the advantages of possessing semiotic freedom. It follows that the evolutionary dynamics would possess an inbuilt tendency to invent and establish species exhibiting more and more *semiotic freedom* in the sense that their behavior would be increasingly underdetermined by the constraints of natural lawfulness and increasingly dependent on the in situ interpretative capacity of individual organisms.

Biosemiotics and the Science-Religion Debate

Biosemiotics has strong implications for the science-religion question: (a) It rejects the dualistic conception of mind and matter as well as the derived distinction between materialism and idealism, (b) it introduces a notion of semiotic causality and thus of agency in organismic life, (c) it suggests a naturalistic account of the experiential world and thus locates the human being in all its dimension as a natural being, and (d) it introduces a changed conception of individuality and thus of life and death.

Rejection of Dualism

Pondering what kind of thing a sign is, we must find an answer to the question of what makes a thing to be *of* or *about* another. The classical answer to this question has been that it takes human intentionality to produce this effect. According to Brentano and Husserl, we can define mental phenomena as those phenomena which contain an object intentionally within themselves. For all we know, a rock will not itself take any interest in its own past, whereas a geologist or even a climber most likely in their minds would form some idea of the rock's now absent past and they would do so even while sitting at home and thinking about the rock. The rock does not possess intentionality but humans do. Up through the twentieth century, this understanding has legitimated the so-called glottocentric character of semiotics. From Saussure and onward, human speech was considered the paradigm case of semiosis.

But what about the apes? A biologist immediately has to ask such a question for since nothing in evolution comes for free, there must be some line of argument telling us why humans possess such an unlikely capacity as intentionality when the rest of nature patently is deprived of it.

According to biosemiotics all living systems are constitutively sign users, and as support for this view, most biosemioticians would commit themselves to a Peircean understanding of the sign. As we saw the Peircean sign is “pure relation” connecting three entities irrespective of their kind in an act of forming an interpretant.

The implication of this is that pure relations may have causal power in the world – signs make things happen – but to suggest such a thing implies a negation of the distinction between materialistic and idealistic ontology. It must immediately be remarked here that relations do not, of course, have causal power per se. The black cloud I saw a few minutes ago was clearly related to the heavy rain falling now, but the reason I brought an umbrella is not this relation itself but the fact that an interpretant was formed in my mind relating these two phenomena into a triadic sign relation. By far the most relations in this world have absolutely no effects

upon the world; thus, the relation between planet Jupiter and my thumbnail is not likely to ever be implicated in any material events in the universe. (The funny thing is that because I just wrote this true sentence, it is no longer true. In fact the relation between Jupiter and my thumbnail has now entered my intellectual world and thereby changed the pattern of ink in my printed manuscript and successively, I must expect, will it change the pattern of ink and paper a great many copies of the present book. To the extent my mention of the relation has provoked thoughts in my reader, it may even have caused further sorts of unpredictable results.) But when life first originated on the cooling Earth, some physicochemical regularities must already have become sufficiently stable for primitive life forms to use them as predictive tools, that is, as signs, telling them how to adjust their activities. Living systems are per definition anticipatory systems, and in the anticipatory process, simple dyadic relations, that is, regularities, must have been the basis for the formation of genuine triadic sign relations. I have suggested we call this phenomenon *semiotic causality*, that is, the bringing about of things under guidance of interpretation in a local context.

Semiotic Causality and Agency

To account for the evolutionary appearance of semiotic causality is probably the most challenging problem in the whole complex of questions treated under the umbrella of “origin of life.” Several approaches to this problem have recently been proposed drawing on new developments in studies of complexity and self-organization. The deep question at stake here, of course, is whether it is possible to give a naturalistic account for the teleological character of natural systems. As we have already seen, biosemiotics rejects the eliminativist attempts to explain away this problem by claiming that the telos of natural systems is only an “as if” telos that may ultimately be accounted for in terms of natural selection. The reader is referred to a recent consensus paper by Kalevi Kull, Terrence Deacon, Claus Emmeche, Jesper Hoffmeyer, and Frederik Stjernfelt for a deeper treatment of this question (Kull et al. [in press](#)).

Needless to say, semiotic causality is related to that most tabooed kind of causality normally called final causality. The concept final causality however has been contaminated with misunderstandings and also hijacked for a variety of purposes that were never implied by Aristotle himself when coining the term. Rather than entering this confusing discussion, I shall call attention to the obvious fact that semiotic causality depends on ordinary efficient causality for its operation. Sign relations do not themselves “move” the world; what they do is to organize the “moving power” under an intentionality inherent to the interpreting system. Thus, my taking the black cloud to be a sign fortunately organized my muscular power so as to fetch my umbrella and thus prevent me from getting wet.

Semiotic causation is the very core principle behind the *agency* of life. Nonhuman organisms do not ever try to survive (for the simple reason that they do not know that they shall die). But all of them do exhibit agency: They ceaselessly strive to find nourishment, find shelter, escape predators, and find mating partners or whatever is necessary for them to do in their life.

Humans Are Natural Beings

On this background we can now make the assertion that the sign relation, as exhibited by the very first life forms, was the germ form for what through billions of years of evolution gradually developed to become – among many other things – human mind. Thus, biosemiotics implies that the spiritual life of humans need not be a result of supranatural intervention but may instead be seen as a peculiar and highly elaborated instantiation of semiotic dynamics inherent to life as this has unfolded on Earth from its first beginnings.

To work out a theory of how to explain the natural basis for the function of human mind processes is of course a mighty challenge and one we do not expect can ever be solved in detail. What concerns us here is just to point out that contrary to classical nonsemiotic neurobiology, biosemiotics, that is, neurosemiotics, does have a tool set that makes it possible to attack the problem in a nonreductionistic way.

Biosemiotics on Life and Death

Seeing human life in a biosemiotic perspective has important consequences for the evaluation of the many new challenges to our ethical judgment posed by the technological development in general and biomedicine in particular. Perhaps most significantly biosemiotics dissolves the borders around individual life and suggests a much more nuanced conception of life's beginning and its end.

The semiotization of biological life implies a loosening of the narrow binding of life to certain privileged and distinct structures (such as the genome or the individual) in favor of a conception that instead identifies the phenomenon of life with unbroken semiosis, growth, and cell division. In prokaryotes (that make up by far the majority of all living creatures on Earth), life is indeed an unbroken chain of daughter cells following upon daughter cells in a continuous flow of cell growth and division. To ask when, exactly, any one of these given cells started its life is utterly abstract – since the cell, both as far as its substance (cytoplasm) is concerned and as concerns its form (both its membrane and its genome), is connected to all ancestral organisms in the same unbroken line. In multicellular organisms such as plants or animals, one may of course speak of an *individual's* life that starts with the establishment of a single cell (the zygote in organisms that sexually reproduce) that multiplies through a web of cellular divisions, leading to the formation of an adult individual. But as soon as one turns to consider the life cycles found in fungi, it readily becomes clear that the concept of the *individual* that seems suitable for the life cycles of animals and humans cannot be generalized to life processes per se. Many fungal species, for example, spend the major part of their life cycle carrying two autonomous nuclei (one male and one female) in each cell. Conception has been frozen in place, so to say, at the moment right before these two nuclei would normally fuse in plants or animals. The fusion of the two nuclei takes place only at the ultimate end of this phase of dikaryotic life (*karyon* = cell nucleus) whereby, finally, a proper diploid cell is formed. This “normal” diploid cell, however,

does not last for long but instead quickly divides itself again under the formation of haploid spores (sex cells with only one set of chromosomes). These haploid cells are then ready to fuse with haploid cells of the opposite sex whereby a new phase of *dikaryotic* life begins.

Thus, in these fungi, the diploid phase – that condition that we humans without further reflection take to be a proper *individual's* life – is reduced to only one short intermezzo in between two extended phases of tight common haploid life. Here the process of fertilization has been stretched, so to say, to occupy nearly the whole of the organism's life. Diploid life, such as we know it from ourselves, cannot therefore biologically be seen as being the privileged form of individual life. And one consequence of this is that *the starting point of an individual human life is not a biologically meaningful concept*. To the extent this concept has any meaning at all, it is a meaning that is derived elsewhere than from biology. For human life, just like all other forms of life, is, from the biological perspective, an unbroken chain of growth and cell divisions.

However, the fact that every human being nevertheless is very intimately connected to just one individual life therefore calls for an explanation that cannot be derived from the mere biological fact that human beings are living creatures. If we want to explain why human life is seen as so narrowly connected to our experience as individuals, we had better search for the explanation in the peculiarity of the human form of life and not as the result of life processes in general. And here the overarching distinguishing mark between the human form of life and all others is the extraordinary semiotic agility possessed by this big-brained animal.

From these deliberations follows a conclusion of deep significance for ethical discussions in the medical area: *The individuality of a human life cannot be justified by its uniqueness as a particular genetic combination, but must be justified by its uniqueness as a particular semiotic creature*. Semiotic uniqueness is different in kind from genomic uniqueness because it depends on a potential that bears an inherent *indeterminacy*

and *creativity* – a potential, furthermore, that we humans know much better how to evaluate and enjoy than is made possible through the severe determinacy of genomic specification. *Human* uniqueness, then, is not *molecular*, but *semiotic*. And from this it follows that the readily felt irreplaceability of a human being is rooted in its *semiotic individuation process*.

This conclusion leads us to the emotionally troublesome consequence that an objective answer cannot be given to the question of *when* a human life starts and stops being irreplaceable. Considered as a genome, it is irreplaceable from the moment of fertilization – and the ethics of irreplaceability within the viewpoint of genomic individuality logically leads to a rejection of any and all manipulation with embryos. But if instead we ask the question of when the semiotic individuation process of a fertilized egg cell is sufficiently far advanced that an abortion would be a violation of a human life, no clear answer presents itself.

The biosemiotic understanding in reality forces us into an evaluation of a more-or-less situation. Humanhood thus becomes a more-or-less property! And thus – as with most other essential questions of life – the question of whether a technical intervention destroys a *human* life depends on a process of reflexive pros and cons, and thus, each single instance of technical intervention must be evaluated through a concrete analysis. There simply is no *unitary procedure* – neither rational nor ethical – upon which such ethical judgments can otherwise be safely based.

Through this loosening of *individuality* from the genomic absolute, the inviolability of life becomes not theoretical and absolute, but specifically embodied and concrete. The stricture that you must not kill another human being does not then depend on a principle of human inviolability, but upon the fact that such an act will lead to the elimination of an invaluable semiotic richness – one that demands our deepest empathy. It is the existential ability to identify ourselves with other semiotically free systems that stands as the pivotal point of ethics within the biosemiotic perspective.

Cross-References

- [Bioethics in Christianity](#)
- [Biology, Theoretical](#)
- [Emergence, Theories of](#)
- [Natural Selection](#)
- [Reductionism](#)

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Biosocial Anthropology

- [Biological Anthropology and Human Ethology](#)

Black Holes

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A region of space having a gravitational field so intense that no matter or radiation can escape it. It is formed when a massive star runs out of fuel and can no longer hold itself up under its own gravity. It collapses with the emission of a supernova

explosion, leaving behind an exceedingly dense core that is believed to end up as a point, or singularity. It is surrounded by an event horizon which is a theoretical surface enclosing the region from which there can be no escape. Black holes are also thought to be formed at the centre of galaxies through the progressive capture of the stars in that region. Black holes are described in general relativity theory as regions where the curvature of space is particularly pronounced.

Blindsight

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Related Terms

[Residual vision](#); [Unconscious sight](#)

A Brief History of Blindsight

The term “blindsight” denotes a type of unconscious vision observed in neurological patients whose *primary visual cortex* (V1, striate cortex) was damaged or denervated. Such brain damage causes *homonymous visual field defects* in the half-field contralateral to the lesioned hemisphere. If the field defect is *absolute*, the patients are blind in the affected region and fail to report visual stimuli and objects that are confined to it. This is the “blind” in “blindsight.” The “sight” refers to the visual functions that can be demonstrated despite the loss of conscious vision the patients experience. “Blindsight” captures the dissociation between their visually guided responses and their perceptual report.

Before blindsight was described in human patients, experimental psychologists including Heinrich Klüver (1949) and Lawrence Weiskrantz (1986) had demonstrated that

monkeys whose primary visual cortex was surgically removed in one or both hemispheres could recover some responsivity to visual stimuli. The discrepancy between the loss of conscious sight that human patients reported to suffer from destruction of V1 and the visual responses demonstrated by monkeys despite similar destruction was interpreted as evidence for the monkeys’ lesser *corticalization*. Their residual visual functions appeared to indicate reduced functionality rather than blindness, implying that their sight was less dependent on visual cortex than that of man. This hypothesis lost appeal when patients, instead of only being asked whether they saw the visual stimuli presented in their cortically blind field, began to be tested with *forced choice methods*, like the monkeys. Asking a patient to point her eyes or hand to where she thought a briefly presented stimulus might have been, or to guess whether or not it had been moving, even if she did not see it, revealed that patients too responded much better than what could be expected from chance guessing (Pöppel et al. 1973). Blindsight, human blindsight, owes its discovery to the combination of testing procedures that ask for perceptual report with those suited to uncover implicit or covert stimulus processing.

The early reports of human blindsight that were published in the 1970s met with skepticism. Neuroendocrine or reflexive responses elicited from the blind field would have been easy to accept as they are under little if any voluntary control and indeed visual reflexes can be elicited with blind-field stimuli. But the notion that man could respond voluntarily and non-reflexively to information he/she could not consciously see or know seemed preposterous. Methodological points of critique – like detection of stray light, eye movements bringing the stimuli from the blind into the sighted field, decision criteria stricter in the affected than the normal field – were raised to suggest the results were artifactual (Campion et al. 1983). Blindsight research painstakingly addressed them, and its methods clearly profited in the process. The phenomenon however persisted, and, together with covert memory in amnesic patients, became a prime example of implicit processes in neurological patients.

Meanwhile, research further detailed the discriminations that could be demonstrated in the absence of primary visual cortex in man and monkey. Stimulus localization, detection of light, discrimination of stimulus intensity, orientation, motion direction, amount of contour, wavelength, and shape were examined, revealing closely corresponding residual functions in human and simian subjects. The “hard” question of whether monkeys have blindsight like human patients was addressed in 1995, when two groups published results of experiments designed to learn whether *hemianopic* monkeys “saw” the blind-field targets to which they responded. In brief, both groups used target localization tasks and confirmed that their monkeys could quite accurately touch or look toward stimulus positions in the blind field, but added different twists to learn about stimulus awareness. Arguing that unlike patients, monkeys were not given an option to indicate that they did not see a stimulus, the first group added a *detection task* to the localization that their monkeys had already mastered. As before, the position where brief visual stimuli, brighter in the blind field to compensate its loss of sensitivity, appeared was to be touched to gain a reward. But on new no-stimulus (“blank”) trials, monkeys were to touch a special outlined region on the screen. Would they touch it only on blank trials, indicating “no” when no physical target was present? Or would they also touch it on blind-field target trials, indicating that they did not see the physically present target? The results were clear. Hemianopic monkeys treated blind-field stimuli as blanks when given the option to signal “no stimulus” (Covey and Stoerig 1995). The second group argued that their monkeys would not direct their eyes to a blind-field stimulus unless they either saw it or, if blind, were cued as to its presence (not position). Omitting the dimming of the fixation point that had served as a cue indeed caused a massive drop in the blind-field performance of adult-lesion animals (Moore et al. 1995). This evidence of monkey blindsight completed the loop of the trajectory of blindsight research: Beginning with the cortical blindness patients reported, it moved to the visual functions of

monkeys devoid of (striate) visual cortex and on to similar functions in hemianopic humans, and finally arrived at blindsight in man and monkey (Stoerig and Covey 1997).

Blindsight is not a discipline. It is a phenomenon that has attracted experimental psychologists, neuroscientists, neurologists, cognitive scientists, and philosophers, who study the phenomenon and pursue the in-roads to a better understanding of consciousness in general and visual awareness in particular that it promises. Questions blindsight may help to answer include: What is its neuronal basis, and how does it differ from that of conscious sight? What species have it, and do they then have conscious sight too? What is it good for, what are its limits? What are the functions and advantages of conscious versus blindsight? Certainly blindsight is not a religion either, but some of the issues it raises do impact on both ethical considerations and religious beliefs. I will address the questions posed above in turn.

The neuronal basis of blindsight. Destruction of V1 causes degeneration of the dorsal lateral geniculate nucleus (dLGN) of the thalamus. Transneuronally, this process will affect the retinal ganglion cells that normally provide the retinal input to the dLGN which in turn transmits it on to V1; the retinal ganglion cell layer will shrink where its cells lost their target neurons. Factors like age at lesion, primate species, retinal eccentricity, and ganglion cell type impact extent and speed of transneuronal degeneration. Blindsight must be mediated by the surviving ganglion that project to midbrain as well as thalamic and hypothalamic structures. These transmit the retinal information to further nuclei that, directly or indirectly, pass it on to higher visual cortical areas. The participation of visual cortical areas has been demonstrated physiologically in monkey and, with functional neuroimaging, in man; it indicates that blindsight is not blind because it relies solely on subcortical processing. Moreover, the engagement of a host of retino-recipient structures suggests that different blindsight functions rely on pathways that also mediate this type of function in the healthy brain. Indeed, extensive series of experiments conducted to elucidate how different residual

functions displayed by anopic monkeys were affected by additional cortical or subcortical lesions revealed how different functions ranging from brightness discrimination to manual localization and shape discrimination depend on pretectal, collicular, and higher visual cortical regions (Pasik and Pasik 1982). The missing ingredient that is responsible for the blindness is still being sought in precise temporal neural interaction, in integration of visual and unspecific thalamic, respectively, frontoparietal processes, or in blindsight's dependency on occipitoparietal more than occipitotemporal processing.

Blindsight in different species: Investigations of blindsight have predominantly been performed on man, other primates, and cat. Whether blindsight is always and completely blind however is still debated in the first two and has not been addressed in cats or the other, often rodent species that have been studied. As blindsight implies voluntary visual responses when conscious sight has been lost due to V1 damage, experimental designs need to implicitly or explicitly capture a feature that distinguishes, as convincingly as possible, between these two types of sight.

Functions of blind- and conscious sight: Knowing what one can do based on conscious but not blindsight, or vice versa, would help greatly to zero in on such features. Experimental evidence comes from a recent study of human blindsight that showed that blind-seen distractors seem more difficult to suppress attentionally than consciously seen ones (Stoerig 2011). More comes from Humphrey's famous bilaterally de-striated monkey Helen who exemplarily demonstrated both how stunningly her visual abilities improved when she went from being tested in her cage to eventually taking walks in woods and meadows, and how her discriminability suffered when stimuli were matched for salience or when she was frightened (Humphrey 1974).

These three questions are interdependent; answers to one will help sharpen and refocus approaches to the others. But there are clearly more such questions not explicitly posed here. Those addressing the possibility of improving blindsight, circumstances under which conscious sight will recover, and means to further this

recovery are among them, and contained in the definition of blindsight as residual visual functions that remain or recover in fields of absolute *cortical blindness*. There is potential in blindsight to impact rehabilitation as well as enquiries along the borderline between conscious and unconscious functions.

Cross-References

- [Anatomy of the Brain](#)
- [Cognitive Neuroscience](#)
- [Comparative Neuroscience](#)
- [Neuropsychology](#)
- [Perception](#)

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Blood Banking

- [Transfusion Medicine](#)

Blood Components

- [Transfusion Medicine](#)

Blood Libels

- [Transfusion Medicine](#)

Blood Transfusion

- [Transfusion Medicine](#)

Bloodletting

- [Transfusion Medicine](#)

Bodhi (Sanskrit & Pāli)

- [Awakening](#)

Bodhisatta [ideal] (Pāli)

- [Bodhisattva Ideal](#)

Bodhisattva Ideal

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Related Terms

[Bodhisatta \[ideal\] \(Pāli\)](#)

Description

According to Buddhist tradition, a bodhisattva is one who has embarked on the path to becoming a Buddha in the future. Behind the idea of following such a path stands a distinction in Buddhist thought between different types of fully awakened beings. One such type is the arhat (Pāli arahant), who has reached the consummation of the early Buddhist soteriological path to liberation in dependence on having received the teachings of a Buddha. A Buddha, on the other hand, is a fully awakened being who has accomplished the goal of complete liberation without the guidance of another (further distinguished into the Pratyekabuddha, who does not teach others, and a Buddha, who delivers teachings).

Buddhist tradition holds that, unlike arhats in the narrow sense of the word, a Buddha manifests only on rare occasions in the history of the universe. In the early texts, a Buddha is depicted as unique, in the sense of being without equal, and is held invariably to be a male from a high class. In contrast, any number of arhats can coexist with each other, and an arhat can be of any gender or social class.

A bodhisattva is thus one who, instead of aspiring to become an arhat, wishes to reach the unique position of becoming a Buddha in the future – that is, at a time when the teachings given by a previous Buddha have disappeared – thus becoming one who on his own discovers the truth anew and then teaches it to others.

The term bodhisattva, literally an “awakening being,” according to modern scholarship, appears to be a wrong Sanskritization of an original term that would have been more correctly rendered into Sanskrit as *bodhisakta*. On this understanding, the term would refer to someone who has wholly “attached [himself or herself] to awakening,” in the sense of being fully intent on reaching this goal.

The concept of a bodhisattva is already found in the texts of early Buddhism, where it stands predominantly for the historical Buddha Gautama during the period in his last life that preceded his attainment of awakening. Already

within these early texts, some developments can be discerned which would eventually have led to the evolution of the bodhisattva concept into becoming an ideal to be emulated by others (Anālayo 2010).

The early stages of the bodhisattva ideal appear to have evolved within a context related to ascetic conduct and a forest lifestyle. The aim of compassionate activity for the sake of others seems to be a slightly later element, in spite of its eventual prominence as the defining characteristic of a bodhisattva, who is willing to sacrifice even himself in order to be able to lead others to awakening.

As a full-fledged ideal, the bodhisattva path differs from the path to awakening undertaken by one who aspires to the goal of arhatship. A disciple of a Buddha, a *śrāvaka*, who aims at becoming an arhat, needs above all to develop the noble eightfold path (► [Truths, Four Noble](#)) and the seven factors of awakening – mindfulness, investigation of phenomena, energy, joy, tranquility, concentration, and equanimity.

For the bodhisattva who aspires to Buddhahood – thus being one who has aroused the *bodhicitta*, the mind (that aspires) to the awakening (of a Buddha) – another set of qualities are of central importance. These are the perfections (► [Pāramitā](#)), standard listings of which comprise either six or ten qualities that need to be perfected. Common ground among the two listings can be found in the qualities of generosity, morality, patience, energy, and wisdom. While the sixfold listing adds the meditative development of absorption to the aforementioned five qualities, the tenfold listing adds instead renunciation, truthfulness, resolution, loving kindness, and equanimity.

Besides emphasizing different sets of qualities as the medium of progress, another difference concerns the stages of progress. The aspirant to arhatship proceeds through four levels of awakening: stream entry, once return, nonreturn, and arhatship (► [Awakening](#)). These four stages of awakening can in principle be attained within a single lifetime.

The bodhisattva, according to a listing in a well-known text by the name of

Daśabhūmika-sūtra, instead proceeds through what are ten distinct stages (Rahder 1926). As regards the stages of a bodhisattva's progress, however, considerable variety in listings and interpretations can be found in different textual strands and at times even within the same scripture.

The path to becoming a Buddha is also held to require dedicated practice over a series of lifetimes. This mirrors the belief that the historical Buddha had been preparing himself over innumerable past lives – some of which are described in the so-called *jātaka* collections, tales of past lives of the Buddha – so as to acquire all the qualities required in order to fulfill the role of a Buddha. Given the need to maintain continuity of practice over many lives, a bodhisattva at some point makes a firm resolve to embark on the path to Buddhahood, a resolve that is traditionally referred to as the bodhisattva vow. An important element of the aspiration to reach the awakening of a Buddha is the ritualized undertaking of bodhisattva precepts. In due course of time, the bodhisattva then receives a prediction of his future successful achievement of Buddhahood from another Buddha.

The aspiration to become a Buddha in the future is a common feature of the various Buddhist traditions and, somewhat against common belief, not the sole property of the Mahāyāna traditions. For many centuries, the bodhisattva ideal has had and still has its followers among eminent members of the Theravāda tradition (⇒ Buddhist schools and traditions), lay and monastic alike (Ratnayaka 1985; Samuels 1997; Harvey 2007). What distinguishes the Mahāyāna traditions is an emphasis on the bodhisattva path as the chief goal of one's aspiration, whereas in the Theravāda tradition the path to Buddhahood is considered only an alternative – a considerably more demanding alternative – to the path to arhatship.

The term Hīnayāna – the “lesser vehicle” usually contrasted to the Mahāyāna – does in fact not refer to the Theravāda tradition or to any other living Buddhist tradition but rather derives its meaning from the context of certain polemical strands found in Mahāyāna scriptures. The conceptual backdrop to these strands is

the notion that the path of the bodhisattva is the supreme form of practice which leads to a type of awakening that is superior to the full awakening attained by the disciple of a Buddha (► [Awakening](#)).

In sum, the bodhisattva ideal, although not found in the earliest strata of Buddhist texts, has played a central role throughout the history of Buddhism and is still a common property of the different extant Buddhist traditions, motivated by the wish to combine the freedom of awakening with the compassionate aspiration to alleviate the suffering of others.

Cross-References

- [Empathy](#)
- [Love](#)

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Bodhisattvabhūmi

- [Pāramitā](#)

Body

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Description

In the opening word of his text, “Theologies of the Body: Humanist and Christian,” Benedict Ashley writes, “I exist and live as a body in a world of bodies” (p. 3). On one hand, Ashley’s statement seems as intuitively obvious as the sky is blue; however, on the other hand, like the color of the sky which can contain the colors of the spectrum, Ashley’s confession that he “exist[s] and live[s] as a body in a world of bodies” may require additional thought. The question of the relationship between the subjective “me” and the body has been fodder for philosophical, scientific, and theological reflection for two millennia. The issues of the soul and self are addressed in other entries. But what about the body?

The body is most generally defined as the physical structure and material substance of an entity. This definition is a helpful entry into the great variety of ways in which “body” is utilized in science and religion discourse. “Body” can be employed in literal, symbolic, and/or metaphorical uses. It can refer to the human body, planetary bodies, a “body” of literature within a field, or the “body” of Christ, just to name a few. In the first two examples, the word “body” refers to the physical structure or material substance of the entity; however, in the latter two examples, “body” takes on a more symbolic or metaphorical sense. Within the sciences, natural and social, bodies are often sites of inquiry and investigation. Bodies are also tools for engaging in scientific research. We use our senses to interact with and gain knowledge

about all other bodies we encounter during our lifetime. We also employ our bodies to communicate our experiences and insights to others. We are highly embodied creatures.

Western philosophical and theological views of the body are highly reflective of the legacy of mind-body dualism. Dualism gained popularity and notoriety due to the work of René Descartes (1596–1650); however, it has historical antecedents in the thought of Plato (428–347 BCE) and, in a modified form, Augustine (354–430). Dualism effectively placed a wedge between the body and the mind, soul, or self to the extent that “mind,” “soul,” and “spirit” are often considered antonyms of “body.” The mind, soul, and spirit are more subjective phenomena and have captured the attention of philosophy and theology, while the body as an objective entity garnered the attention of science. Consequently, the body has rarely been attended to with the same precision, attention, and favor as the mind, soul, or self by Western philosophy and theology. Fortunately, the body is gaining more attention within philosophy and theology as a locus of research. Philosophy and theology’s turn toward the body has been most pronounced among feminist and environmental scholars.

The world’s religious traditions share ambivalence toward the body. In the *Bhagavad Gita* of Hinduism, the body is likened to a garment. “Worn-out garments are shed by the body. Worn-out bodies are shed by the dweller within the body. New bodies are donned by the dweller, like garments” (*Bhagavad Gita* II.22). In Buddhist thought, the body is considered the site of pleasure and pain that impede one’s path to enlightenment; however, enlightenment is within the human realm. Therefore, the body can be trained via meditation and discipline to approach a state of enlightenment. In the Abrahamic religions – Judaism, Christianity, and Islam – bodies are a part of the created order that is declared “good.” Human bodies are also considered to be in a “fallen” and “sinful” state. Consequently, the “goodness” of bodies as we encounter them is in question.

Given the ambivalence toward the body present within each of the major world religions and

the scientific understanding of the body as a site of inquiry and investigation as well as an instrument in investigation, how is “body” articulated and utilized in science and religion? It is perhaps not surprising to note that “body” manifests in a variety of ways, depending on the particular crossroad of disciplines and religious traditions. Bodies can be treated as inherently valuable and good, divided and analyzed according to their constitutive parts, or viewed as soon-to-be unnecessary material limiting the individual’s full potential. Bodies can be organic and living or inorganic. Bodies can be theological or philosophical concepts. All of the following types of bodies are discussed in science and religion literature. There are three main ways in which science and religion have addressed body: from within the mind-body discussion, by focusing on a specific part of the body (specifically the brain), and in conversation with technology. Each of these approaches primarily, though not exclusively, engages the human body.

The mind-body problem and question of mental causation has been a perennial concern for scholars from a variety of philosophical, scientific, and theological disciplines and traditions. Consequently, the question of the relationship between the mind and body is ripe for interdisciplinary attention. Concepts of the soul, immortality of the soul, reincarnation, and resurrection prompt religious and theological reflections as well as involvement in the philosophical question. Nancey Murphy, a theologian/philosopher, and Warren Brown, a psychologist, have spent considerable time on the issue and promoted the idea of a “nonreductive physicalism.” Philip Clayton provides a different approach by drawing on theories drawn from quantum physics and cosmology to the concept of emergence in order to negotiate the space between reductive physicalism and dualism. Although the idea of mind-body dualism is historically well established, it remains a fertile ground for thinking about the body in science and religion.

The second most prevalent way in which science and religion address the body is by focusing on one particular part of the body.

Interdisciplinary research has often focused on the brain as a site of inquiry. The brain is of particular interest due to its unique role in cognitive capacity and identity formation. For many scholars, the brain is the place in which the mind and the body intersect. Consequently, in recent decades, there has been an explosion of interdisciplinary research utilizing the cognitive sciences, including neuroscience, neuroimaging, and psychology, to investigate religious phenomena. For example, Andrew Newberg and Eugene D'Aquili employ neuroscience to argue that religiosity is rooted in the biology of the brain, while James Ashbrook and Carol Rausch Albright show that neuroscience and religious belief can challenge and enrich each other. The focus on the body employed by each of these interdisciplinary approaches and those like them is a focus on the brain as a part, arguably a unique part, of the body.

Finally, scholarship in science and religion has investigated the ways in which bodies interact with technology and the impact of technology on the body. This area includes the intersection of theological anthropology with biotechnology, artificial intelligence, and posthumanism. In all three of these areas, philosophical and theological questions center on the body and how the body is altered by the use and implementation of technology. Philip Hefner locates humanity's spiritual journey in technology. "Everything we think about religion, everything we think is *spiritual* is rearranged by technology" (*Technology and Human Becoming*, p. 12). Referring to Teilhard de Chardin, Hefner says, "For him the question can never be first of all 'what are we *doing* with our technology?' but it must be 'what are we *becoming* with our technology?'" For those working with artificial intelligence and robotics, the question focuses on "what makes a human being human?" How one answers the question of the quintessential attribute of humanity influences how one relates to robotics and artificial intelligence as well as how one opts to proceed in the posthumanist task of isolating and preserving the human mind while discarding the body.

At this point, we return to the question "what about the body?" "Body" in science and religion discourse can take on a plurality of meanings and uses depending on the intellectual context. Human beings do, in fact, "exist and live as a body in a world of bodies." The ways in which we consider what it means to be a body in the midst of other bodies, human and nonhuman, are vital areas of inquiry for science and religion.

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Body of Knowledge

- [Physics in Protestantism](#)

Brahmā

- [God and Devil in Buddhism](#)

Brain Anatomy

- [Anatomy of the Brain](#)

Brain and Behavior

► Neuropsychology

Brain Building

► Brains, Artificial and Computational

Brain Death

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Brain death describes a medical condition in which all brain functions have ceased while the other organs of the body continue to function normally. On neurological examination the patients are in coma and all reflexes mediated by their brain stem are lost. Ultimately, the patients do not breathe spontaneously and remain unresponsive (apnoeic) upon an oxygenated CO₂-challenge. The electroencephalogram reveals a complete absence of electric brain activity in all parts of the brain. On autopsy the entire brain is necrotic. This condition occurs in patients with severe brain damage (e.g., brain trauma, stroke, cerebral hypoxia due to cardiac arrest) who had undergone vital resuscitation and are treated with artificial ventilation on an intensive care unit. In the Western countries legal guidelines were developed how to identify this condition and to prove its irreversibility both in adults and children. These guidelines include the formal documentation of the presence of the diagnostic criteria of brain death by two independent physicians with an expertise of intensive care medicine at two predefined time points. These standards are object of continuous evidence-based evolution (Wijdicks et al. 2010). The fulfilment of their requirements is the prerequisite for organ donation in transplantation medicine.

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Brain Imaging

- Learning
 - Magnetoencephalography (MEG)
-

Brains, Artificial and Computational

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Related Terms

[Artificial minds](#); [Artilects \(artificial intellects\)](#); [Brain building](#); [Computer science](#)

Artificial Brains (ABs), as its name suggests, is a branch of artificial intelligence (AI) which attempts to build artificial brains, i.e., engineered brains. The most common approach is to use modern electronics and often robotics to give the artificial brains bodies to control. Typically, an artificial brain is hidden in the software of a computer, so one can only judge the quality of the artificial brain's control by the quality of the behaviors of the robot as seen by human observers.

Modern and near future (i.e., within 10 years) electronics is providing a gargantuan number of transistors on a chip. This number is doubling every year or two, a phenomenon called “Moore’s Law,” after Gordon Moore, one of the founders of the microchip company “Intel,” noticed the trend and wrote about it in 1965. Moore’s Law has been valid for over 40 years

and is thought that it will remain valid for at least another decade (by which time, transistors will be the size of atoms.)

Today's chips have over a billion transistors. By the year 2020 approximately, computer systems will contain trillions of trillions of components, because they will be of molecular scale (i.e., using "nanotechnology," or "molecular scale engineering"). This vast electronic capacity that is about to explode upon us is making the construction of artificial brains both realistic and practical.

At the same time, modern neuroscience is furnishing detailed knowledge of the micro-circuitry of the rat brain, providing data on how each neuron (brain cell) connects to roughly 10,000 other neurons in a single "cortical column" that consists of about 10,000 neurons. The rat brain has about 1,000 such columns. The human brain has about a million. The leader in this work is Henry Markram at EPFL in Switzerland [Markram]. He calculates, using Moore's Law, that within a decade, he will be able to obtain similarly detailed knowledge of the whole rat brain. It will thus be possible to *perform neuroscience experiments in a computer*, a revolutionary concept that is sometimes labeled "e-NS" (i.e., electronic neuroscience). Thus, Moore's Law and e-NS combined will have revolutionary consequences for humanity as detailed knowledge as to how the human brain works is incorporated into artificial brains, speeded up a million times, and with virtually unlimited memory and number of sensors.

As a concrete example of an artificial brain, the author uses modern electronics to evolve neural network modules, each with its own small task (de Garis 2002). Thousands of these evolved modules are downloaded into a supercomputer (or even an ordinary PC) and connected up according to the architectures of human "BAs" (brain architects) to build artificial brains that control hundreds of behaviors of two legged, two armed robots that can see, walk, grab, talk, listen, understand (to a moderate degree), remember, reason, etc.

The advent of such artifacts, even if only mildly intelligent, would probably become one

of the world's biggest industries, when useful home robots could be controlled by an artificial brain. As a result of this work, this field might play a major technological, economic, political, and even religious role later in the century.

Self-Identification

Science

There is little doubt that the field of Artificial Brains is a science. Brain builders are constantly testing their hypotheses as to how to build intelligence into a machine, in the form of artificial brains. These hypotheses are then embodied by implementing them in (usually) computer systems and robots, to see whether the implemented reality conforms to the original hypotheses. Building such an artificial brain would be a definitive test of humanity's understanding of how the human brain works.

Religion

The main idea of de Garis (2005) is that this century's global politics will be dominated by the question whether humanity should build "artilects" (i.e., artificial intellects, i.e., massively intelligent machines) or not. The author sees humanity dividing into two main ideological camps, labeled "Cosmists" (who are in favor of building artilects) and "Terrans" (who are opposed).

The Cosmists would be in favor of building artilects, because building artilects would be like "building gods." Artilects would be trillions of times more intelligent than human beings, they would be immortal, could change their form in milliseconds, have unlimited memory, go anywhere, do anything, understand hugely more. They would be gods.

Characteristics

Understanding the human brain is one of the greatest scientific challenges of the twenty-first century. The field of artificial brains is distinctive for three specific reasons of being (a) politically

consequential, (b) scientifically fascinating, and (c) economically important.

Many of the growing number of artificial brain researchers feel that they are in a field that is of great consequence, which is historically similar in prestige level to that enjoyed by the nuclear physicists in the 1940s and 1950s. Brain builders believe that in the longer term, the consequences of their work will end up dominating this century's global politics. This is not something to be sneezed at. It is terribly important.

The field is also fascinating. Two of science's greatest mysteries are the nature of intelligence, and the nature of consciousness. Artificial brain researchers are usually fascinated by such questions and feel they are probably in the field that one day will give definitive answers to such questions.

The field will have huge economic consequences. This author has asked many people how much money they would be prepared to spend on a genuinely useful and intelligent *home* robot. The general answer tends to be "less than for a house, more than for a car." Since billions of people would want to buy a useful intelligent home robot, we are talking about one of the world's biggest industries, worth trillions of euros a year.

Relevance to Science and Religion

The majority of artificial brain researchers are not traditionally religious. They view traditional religions as superstitions unworthy of their respect. Modern scientific knowledge has effectively debased traditional religions and made ideas such as a "prayer" and "life after death," "miracles," "angels," "resurrections," "virgin births" seem ignorant and stupid. On the other hand, researchers in this field are not averse to religion, provided that it is interpreted in terms of modern scientific knowledge and critical thinking. For example, many of the author's colleagues are open to "deism" (i.e., the belief in a creator of the universe (multiverse)), but sneer at theism (i.e., deism, plus belief that the creator takes a loving personal interest in the welfare of individual human beings).

The theist hypothesis is easily refuted by the brute fact that the twentieth century was the bloodiest in history, with some 200–300 million people being killed for political reasons, e.g., wars, holocausts, and purges. Presumably many millions of these people believed in a loving god who obviously did not love them.

The deist hypothesis however is far more substantial, on at least two counts. One is the "anthropic principle" which states that the values of the constants in the laws of physics are so fantastically improbably finely tuned (in one (cosmological) case, to one part in 10 to power 60) to allow the existence of matter and life, that the strong suspicion is that the universe was "engineered," implying a designer, i.e., a "deity". It is possible, however, that future theoretical physics may discover symmetry principles so severe in their constraints that only one possible universe and laws of physics is possible and our universe is it. The jury is still out on this question, but any scientifically curious person ought to be open to the idea that the universe is "rigged," "engineered," "designed".

The second count is more directly derived from artificial brains. The idea that an artefact could become trillions of times superior to humans in intellectual ability makes one wonder what they would do to pass their (immortal) time. Considering that human beings (e.g., Prof Guth at MIT) have already created physical theories on how to build baby universes, what could an artefact do? With its vastly superior intellectual abilities and knowledge of how the universe works, perhaps, it would be capable of actually *building* universes with all their constituents, including living beings similar to ourselves. By definition, such an artefact would be a "god," i.e., a creator. Admittedly, it would not be as "powerful" or omnipotent a "god" as the creator of the preexisting universe that the artefact was created in (either by inferior artefacts or human beings). The artefact creator of the new universe would take as a given, the circumstances in which it found itself at its birth. What then created those circumstances, given that they obey the anthropic principle?

So, if the artefacts made by human beings eventually become capable of building universes,

then it is plausible that our universe is the product of some earlier artefact in some earlier universe. Hence, and this is a major point that the field of artificial brains can contribute to the field of “science and religion,” *the prospect that humanity’s artefacts may become godlike, capable of building new universes, makes brain builders much more open to deism*, i.e., they lose their “a-deism” that traditionally was so common to most scientists. There are good solid scientific reasons to keep an open mind on the topic of deism.

Sources of Authority

The research field of Artificial Brains is as authoritative as any other substantial science. It is however very new, so there has not yet been enough time for the field to establish its own scientific journals and conferences. At the time of writing, research papers on artificial brains are scattered over various specialties (e.g., robotics, AI, electronics, cognitive science, etc., e.g., [Markram], [Artificial Development]).

Ethical Principles

The answer to this question depends on the time frame one is talking about. In the coming few decades, it is likely that the rise of the intelligent home robot will be considered a wonderful thing by humanity, as a liberating force, freeing human beings from the “3Ds,” i.e., those jobs that are “dull, dirty, dangerous.” Everyone will want one; thus, there will not be much in the way to obstruct progress in building artificial brains in the early twenty-first century. Ethical constraints against such progress will be light.

However, longer term is a very different matter. Already, thousands of scientists and engineers have formed themselves into internet interest groups, e.g., [Transhumanists], [Extropians], [Singularity Institute], to debate the longer-term consequences for humanity, if we decide to build artefacts. In 2006, major TV documentaries appeared devoted to the issue of

species dominance (i.e., whether humanity should build artefacts or not), [BBC], [ABC], [Technocalyps]. In 2011, a movie appeared in the USA discussing the issue [Transcendent Man].

The major ethical issue is that of “species dominance.” Should humanity build artefacts or not? As described earlier, the Terrans would be bitterly opposed to the creation of artefacts and, in the limit, would go to war to stop the Cosmists (and the Cyborgs, i.e., people who add artefactual components to their brains to become artefacts themselves). The fundamental ethical principle upheld by the Terrans is that of “survival of the human species.” To Terrans, this principle is absolutely nonnegotiable.

The Cosmists, on the other hand, would be driven by a sense of awe at the grandeur of what artefacts could become, vastly outpacing the pathetic little human lives we live, snuffed out in a mere 80 years in a universe that is billions of years old, living on a tiny planet of one star of a trillion trillion in our universe. The fundamental ethical principle driving the Cosmists will be the powerful impulse to build gods.

The Cosmists will anticipate the hatred and fear of the Terrans and will be prepared for the Terran “first strike” (which the Terrans must do, if they are not to be utterly outclassed over time by the rise of the artefacts and the cyborgs-cybernetic organisms, i.e., part machine, part human).

Hence the ethical dispute over whether humanity should build artefacts or not, later this century, may result in the deaths of billions of people. This author considers this scenario the most probable and, unfortunately, the most horrible.

Key Values

During the first decades of the twenty-first century, the values of the brain builders have been to build artificial brains as intelligent and as useful as they can be. Since the early artificial brains will not be intelligent enough to be a threat to humanity’s “species dominance,” there will be

plenty of incentive to increase the artificial intelligence level and usefulness of the home robots, controlled by artificial brains. As the decades pass however, the values of the Cosmists and the Terrans would diverge, and diverge dangerously, leading to the ethical dilemma mentioned above.

Conceptualization

Nature/World

The majority of brain builders are materialists, metaphysically speaking. Like most neuroscientists, they take a functionalist attitude to brain building. They accept the idea that artificial intelligence can be put into a machine provided that the machine obeys the needed “principles of intelligence theory,” which unfortunately today are only vaguely elaborated.

Human Being

Most brain builders feel that human beings are molecular machines, subject to the same laws of physics and chemistry as anything else.

Life and Death

To brain builders, life is an extremely complex molecular system that metabolizes, reproduces, mutates, and evolves. How life started is still unexplained. Did life come from outer space, or did it start spontaneously on the earth as soon as geological conditions were appropriate?

Death is not universal. Bacteria and cells in general are immortal if constantly fed. Reproductive cells are immortal because there are elaborate and energetically expensive molecular repair mechanisms that fix deleterious mutations in germ line (i.e., reproductive) cells. Once sex was invented and body (or somatic) cells separated from reproductive cells, organisms did not survive long enough (due to accidental death, e.g., starving to death, being eaten, burned to death, disease, injury, etc) to make constant upkeep of the somatic cells worthwhile.

Since both life and death are molecular mechanisms, with genetic programs, it is

probable that humanity will discover scientifically the mechanisms that cause death in humans and learn to counter them by reprogramming the DNA.

Reality

Brain builders are not on the whole physicists, so their conception of reality is probably not very different from the “man in the street’s,” i.e., the human eye and brain “sees” what is “out there” (what the philosophers call “naive realism”). To the minority of brain builders who are (mathematical) physicists, the concept of reality is far more subtle. The interpretation of quantum mechanics is riddled with philosophical and conceptual puzzles, on the nature of reality, the nature of measurement, of superposition, of entanglement, and so forth.

Knowledge

Artificial brains will need to store knowledge and use it. AI has long struggled with the problem of knowledge representation. How does the brain store knowledge? How does the brain decide what incoming stimuli are worthy of storage? There are many questions both philosophical and very practical regarding the nature and use of knowledge in artificial brains.

Truth

Philosophically speaking, the brain builders’ concept of truth as applied to an artificial brain controlled robot is how well the robot “survives” in its world. If the ideas and models in the artificial brain allow the robot to manipulate its world successfully, then those ideas are ‘true’ in some pragmatic, Darwinian sense.

Perception

Perception is a critical concept to brain builders. In the author’s artificial brain, a substantial proportion of the evolved neural net modules that make up the brain are perception modules. Each one recognizes a particular pattern or feature, e.g., something red, a straight line moving left, a shoe, a particular person’s face, etc. Choosing what is important for an artificial

brain to perceive is an important set of design or architectural decisions for that brain.

Time

To a philosopher, the nature of time is as deeply mysterious as the nature of consciousness is to a brain builder. To a brain builder, the nature of time is much more pragmatic. The time concept is used to determine the sequence of events, the concurrency of two events (so essential for Hebbian learning and synaptic reinforcement when two connected neurons fire simultaneously due to the two hitherto separated events). Previous events, if considered important by the artificial brain, are stored for future use. The concept of time for an artificial brain is as basic as it is for human beings.

Consciousness

One of the deepest mysteries in the whole of science, and especially neuroscience and artificial brains, is the nature of consciousness. The philosophers talk about the “hard problem,” i.e., how will third party objective (external) discoveries about the behavior of the human brain *ever* be able to explain a person’s subjective (internal) feeling of being conscious of something (qualia)? It is indeed a deeply puzzling problem. Whatever consciousness is, it gets built. Embryos grow into human babies that are conscious and intelligent.

Rationality/Reason

Artificial brains will obviously need to reason if they are to be useful. A machine that cannot reason from its past memories will not be very intelligent. Hence, the nature of logic and types of logical reasoning are important topics for study when building artificial brains.

Mystery

There are many mysteries remaining in the field of Artificial Brains. Here are some – (a) What is intelligence? (b) How is intelligence built? (c) What is consciousness? (d) How are memories stored in the brain? (e) Can humans with human intelligence build artefacts with superior intelligence? (f) How does the brain make a decision? (g) Will it ever be possible for one

human brain to have the same conscious experiences as another person? (h) Is the red person A sees, the same red as person B sees? (i) How does the brain learn? (j) How can answers to the above questions be put into an artificial brain? (k) Will human level artificial intelligence ever be achievable without a deep knowledge of how the human brain works?

Relevant Themes

As mentioned above, *the prospect that humanity’s artefacts may become godlike, capable of building new universes, makes brain builders much more open to deism.* Traditionally, most scientists were atheists (and still are in the strict sense, i.e., when distinguishing between atheism and a-deism). Acceptance of the possibility of a creator, a “deity” is much more plausible now, less “anti scientific.” In fact, it is science itself that has made formerly a-deistic researchers more open to the possibility that our universe has been built by a vastly superior being, commonly known as “god.” The “anthropic principle” coming from physicists only confirms the reasonableness of this openness.

In short, deism (as distinct from theism, which most scientists still dismiss with contempt) is making a comeback. Deism is consistent with (but not conclusive from) the current scientific evidence. One should be open to the possibility that a “deity” made our universe.

Cross-References

- [Artificial Intelligence, General](#)
- [Automation, Electronic](#)
- [Autonomic Nervous System](#)
- [Complex Systems](#)
- [Cyberethics](#)
- [Cyborgs](#)
- [Dualism](#)
- [Emergence, Theories of](#)
- [Software Engineering](#)
- [Space and Time](#)

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Broaden-and-Build

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A theory of positive emotion function developed by Barbara Fredrickson, the broaden-and-build theory maintains that positive emotions are evolutionarily evolved adaptations that enhance survival by expanding the repertoire of behavioral options for organisms. The theory posits that the expanded cognitive flexibility evident during

positive emotional states leads to the accrual of physical, social, intellectual, and psychological resources across time.

Buddha

- [Buddha \(Historical\)](#)
- [Modernity in Buddhism and in Islam](#)
- [Physics in Buddhism](#)

Buddha (Historical)

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Related Terms

[Buddha](#); [Gautama](#) [Buddha](#); [Shakyamuni](#); [Siddhartha Gautama](#)

Description

“Buddha” is a title meaning “the one who has awakened,” and in the Pali and Sanskrit texts that comprise the early Buddhist scriptures, “the Buddha” is a historical individual called Gautama. In later Buddhism, this individual is blended with a legendary figure, and eventually, he becomes an eternal, archetypal Buddha figure called Shakyamuni. The early scriptures are our only source of information about the historical Gautama, but they cannot be viewed as wholly reliable: The contents were reportedly memorized in the Buddha’s lifetime, then recited communally, and finally committed to writing in the first century BCE. Some historians argue that we therefore cannot know if the Buddha existed at all as an historical individual (Penner 2009); but most read the texts critically to distinguish the historical Gautama from the figure celebrated by Buddhist legend and piety.

These texts survive in two main collections. Those in the Pali language, often known as “the Pali Canon,” form the main corpus of Theravadin Buddhism, the dominant form of the religion in Sri Lanka, Thailand, and Burma. Alternative versions of the same texts, known as the Agamas, were set down in Sanskrit and survive in Chinese translation. Both recensions include three collections: the Discourses (suttas or sutras) which describe accounts of the Buddha’s teachings; the Monastic Code (Vinaya), which recounts both the rules and the occasions on which they were formulated; and analyses of the mind called the Abhidhamma/Abhidharma. All these texts (as well as the much later scriptures of Mahayana Buddhism) purport to record the Buddha’s words, but the Discourses – or at least their oldest stratum – have the strongest claim as reliable historical records.

Most historians tentatively place Gautama’s birth in c. 480 BCE, (Bechert 1991/1992/1997) around 100 years later than the traditional date used by Theravadin Buddhists: the uncertainty reflects the uncertainties of early Indian chronology in general. Gautama was a member of a clan called the Shakyans whose territory, called Shakya, was on the northern edge of the burgeoning civilization of the Central Ganges Valley. The major nations of the Ganges civilization were Magadha, on the southern shore of the river, and Kosala, ruled from Shravasti, which held suzerainty over Shakya. Gautama was born in Lumbini, which is now in southern Nepal, but his mother, Maya, died a week after his birth. He was brought up in Kapilavastu, by Suddhodana, his father, and Maya’s sister Prajapati, who was both his aunt and his stepmother.

Legendary accounts of the Buddha’s childhood make Suddhodana a king who secluded his son (who they call Siddhartha) in a sumptuous palace to shield him from knowledge of suffering. The account in the early sources is sparser and less romantic, and as Shakya was a dependent clan republic, Gautama cannot have been a prince. However, he had a comfortable, probably aristocratic upbringing. The tradition that he married is strong, though we do not know the name of his wife, and we also hear of a son called Rahula.

These later accounts of the Buddha’s life also show him growing up in a society dominated by Brahmins and their Vedic religious traditions. However, the Discourses represent the Brahmins as new arrivals from the West and show that the Ganges Valley had its own indigenous religions. Popular religion focused on spirit shrines, while the most prominent full-time religious practitioners were homeless wanderers called shramanas. Many shramana sects existed, including the Jains who survive to this day. Their beliefs and practices varied, but most believed in rebirth and karma (the ethical weighting that determines rebirth) and the need to escape repeated rebirth through some form of liberation or enlightenment. Shramana practices included self-mortification and probably meditative contemplation.

The Discourses tell us that aged 29 Gautama experienced profound disillusionment with ordinary life, left home, and became a shramana (though his actual age may well have been younger). Gautama’s aim was to understand and remove the cause of life’s sufferings thereby escaping the cycle of death and rebirth. To this end, he practiced meditation, perhaps following the traditions recorded in the Hindu Upanishads, and undertook self-mortification in the manner of the Jains (Mahasaccaka Sutta: *Majjhima Nikaya* 36 (I 246–7)). Finally, he adopted the novel method of examining his mind and learning to guide it. In time, his mastery was so complete that he could transform its deepest workings, and aged 35 (c.445 BCE), he sat down to meditate in the place that is now called Bodhi Gaya. He later said that he achieved the state of *Bodhi*, which literally means “awakening” but is usually translated as “enlightenment.” Henceforth, he referred to himself as “the Buddha,” which means “the one who has awakened.”

The Buddha crystallized his insights in the teaching that all experience arises in dependence on conditions (the teaching of “dependent arising”) (Pathamabodhi Sutta: *Udana* 1:1 (Ud 1)) and can be changed through ethical practice and mental development, especially meditation. This insight implied rejecting belief in a fixed, unchanging soul or essence to human

identity, which his contemporaries called *atman*, and in a divine power at the heart of the universe, which some of them called *brahman*. It also showed that everything in experience is impermanent and insubstantial and explained why it is unsatisfactory to ordinary human experience. The Buddhist practitioner confronts these truths and in realizing them finds a source of creativity and happiness.

As the Discourses are not arranged chronologically, we cannot reconstruct a narrative of the Buddha's life for the 45 years following his enlightenment. But they do show him traveling across the region and sharing his teaching (the "Dharma") with all who would listen. Many of those he addressed were fellow shramanas; indeed, his first teaching was addressed to former companions in Sarnath, near the Hindu holy city of Varanasi. These men quickly realized his teachings for themselves, but in other cases, his encounters involved engaging with the many philosophies and creeds the shramanas held. He also met and debated with Brahmins (the priests of the Vedic tradition) as well as speaking with ordinary people of all social strata and professions. Many of these people followed Gautama's example by leaving their household lives and adopting his version of the shramana lifestyle, while others continued in their previous lifestyles as householder disciples. It is also worth noting that the Discourses describe many encounters in which the Buddha fails to persuade or convince the people with whom he speaks.

The Kings of Kosala and Magadha, the regions' leading powers, reportedly became Gautama's disciples early in his ministry, and after several years, he made a base in Shravasti, Kosala's capital, where he met frequently with the Koslana King Prasanajit (Skt). Through teachings and debates, he developed his own soteriological system that included detailed descriptions of the mind, meditation practices, and a detailed path to enlightenment. These teachings and the encounters that prompted them are the subject matter of the Discourses.

The Discourses describe regular sessions in which the Buddha explained his understanding of reality and the practices that could enable

others to share it. He repeatedly emphasized that his teachings were not what we would call metaphysics, but guidance in how human experience works and how individuals can change in order to eradicate the sources of suffering and find liberation. The foundation of his path was ethics (*shila*), and for him, the ethical status of an action depended on the motivation behind it. Unethical or "unskillful" actions, as he called them, are those rooted in craving, hatred, and ignorance, while skillful actions are based in opposite mental states. Unskillful actions have harmful effects in the world and also upon the person who acts. These states condition or shape a person's future experience. In this way, the Buddha's ethical teaching was tied to a dynamic view of human experience (and hence psychology) as well as a system of practices for mental development.

Our knowledge of other Indian meditative traditions is too limited for us to be certain how much of the Buddha's teaching drew on preexisting practice and how much was his own. The Discourses include a few mentions of non-Buddhist shramana meditators, but they seem to have been relatively few. However, certain key features of his approach contrast with what we do know of others. For example, along with ethics, the foundation of the Buddha's path of mental development was the development of mindful awareness (*sati/smṛti*) of all aspects of experience. By paying careful attention, a practitioner learns to become aware of his or her body, feelings, and mental states as well as seeing their experience in terms illuminated by the Buddhist teachings.

Other distinctive features of the Buddha's approach to mental development relate to focused concentration. Firstly, he regarded meditative concentration as a natural function of the mind and did not associate it with metaphysical beliefs about *atman*, *brahman*, or the origins of the universe as we find in Brahmanical texts. He called these "speculative views" and argued that they preempted the meditator's capacity to see reality directly. Secondly, he emphasized the importance of states of progressively intense concentration called *jhana* (Pali) or *dhyana* (Skt.) and gave detailed instructions on how to enter and

progressing through these states. Some non-Buddhists seem to have practiced dhyana-based meditation, but the Buddha's teaching that they are impermanent and the meditator should not cling to them was his own. More broadly, Gautama encouraged his students to use a balanced effort, which was neither too forceful nor too lax, in developing their minds. Thirdly, the Buddha taught what he called "vipassana" practices in which the meditator reflects on an aspect of experience as he described it, such as its impermanence or insubstantiality, in order to gain direct insight into the truth of the description. This is the ultimate purpose of Gautama's meditative system, and the other aspects are means to achieving it.

The movement Gautama started was initially one shramana group among many, probably known as the Shakyaputras shramanas (Skt: "the sons of the Shakyan"). Like the Jain shramana community, it included both men and women, and the Buddha affirmed that women could gain insight just as men could. The traditional account relates that the Buddha was reluctant to ordain women, but most modern scholars conclude that this is not reliable. The early Shakyaputra community was probably relatively informal and unstructured, emphasizing a life of wandering and forest dwelling as well as periods of communal retreat. However, in time the Shakyaputras evolved into a distinctive community with its own rules, structures, and monastic centers. It is uncertain how far this process went in Gautama's own life, but the Discourses record tensions between those monks who favored life in the wilderness and those who favored settled monasticism. Novice monks and nuns learned to recite certain key Discourses meditated according to the Buddha's instructions and studied intensively with senior monks before setting off on their own.

Alongside the renunciates were householders who supported the monks and nuns, providing them with almsfood and robes. They also practiced the teachings for themselves to some extent, especially those relating to ethical conduct. The community of the Buddha's disciples seems to have grown considerably during his lifetime and

Buddhist tradition records that many of them became *arahants*, attaining a degree of awakening that meant they were assured of full enlightenment. Many of these individuals gathered followers of their own. The two chief disciples were Shariputra and Maudgalyayana (Skt.), and they are often depicted in Buddhist iconography flanking the Buddha himself. The Buddha's companion for the latter part of his life was his cousin, Ananda, who is said to have possessed a powerful memory with which he memorized Gautama's teaching.

The community of the Buddha's followers is called the Sangha (sometimes this term refers solely to the monks and nuns). Together, the Buddha, Dharma, and Sangha are called the Three Jewels of Buddhism, embodying its essential character, and the Discourses include many accounts of the Buddha's encounters with people who chose to become his followers by "going for refuge" to these Three Jewels and then living according to the values they express.

Both the Discourses and later tradition suggest that the latter years of Gautama's life were a time of difficulty. One tradition speaks of a split with a group within the Shakyaputra community led by a monk called Devadatta who was probably a strict forest renunciate. A second tradition describes the mass killing of members of the Buddha's Shakyan clan by the King of Kosala.

The Buddha's final year is described in great detail in the longest of the Discourses, called The Mahaparinibbana Sutta. It records his journey through Magadha, the leading Ganges Valley kingdom, as it prepared for a war against its northern neighbors. It then describes the Buddha's journey northward and depicts a life of meditation and teaching to groups of householders and Shakyaputra monks. Finally, he arrived in the provincial town of Kusinara and took ill after eating some infected food. There he died aged 80 in c. 400 BCE.

The Mahaparinibbana Sutta describes the elaborate ceremonies and devotional rituals that accompanied the Buddha's funeral followed by the division of his relics and the construction of ceremonial mounds (stupas) to house them. This suggests that even in his lifetime, the Buddha was

a figure of considerable religious significance for a much wider community than his immediate disciples and that his status as an Enlightened Buddha had a recognized place within Ganges culture.

The Vinaya records that the Buddha's arahant disciples gathered after his death in a cave outside the Magadhan city of Rajagriha for a meeting that became known as The First Council. There, Ananda recited the teachings he had memorized so that others could recite them in their turn, and a monk called Upali recited the Vinaya. While the traditional account cannot be accepted in all its details, it seems likely that a meeting of Gautama's senior disciples did occur shortly after his death and that this meeting established a system of recitation and aural transmission that passed the Discourses and the Vinaya on to subsequent generations.

By the end of the Buddha's life, the Shakyaputras were probably one of the leading shramana groups in the Ganges Valley, and they seem to have attracted followers from many other parts of Northern India as well. The Buddha himself seems to have been a respected and influential figure but perhaps no more than some other shramana gurus. However, in subsequent centuries his teachings were widely recognized as a powerful and original alternative to both Brahminism and Jainism, and they became a central part of religious life across India following the conversion to Buddhism of the Mauryan Emperor Ashoka (304–232 BCE).

Cross-References

- [Anatta](#)
- [Bodhisattva Ideal](#)
- [Buddhist Canonical Literature](#)
- [Buddhist Meditation Practices](#)
- [God and Devil in Buddhism](#)
- [Impermanence \(Buddhist\)](#)
- [Karma \(Buddhist\)](#)
- [Modernity in Buddhism and in Islam](#)
- [Psychology in Buddhism](#)
- [Reality in Buddhism](#)

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Buddhism

- [Abhidharma, Northern](#)
- [Buddhism in the West](#)

Buddhism in the West

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Related Terms

[Buddhism](#); [Modern Buddhism](#); [Orientalism](#); [Religious studies](#); [Science in Buddhism](#)

In a broad perspective, Buddhism in the West is just another phase in Buddhism's cultural migration, spanning more than 2,000 years. It also, however, constitutes a significant contribution within this history, sometimes referred to as a whole "New Buddhism," a "new Buddhist vehicle." Buddhism in the West comprises different types of groups, practices, and ideas related to the religion Buddhism, being geographically limited to Europe, North America, and in a broader sense countries outside of its Asian origin (South Africa, Australia, South America). This entry gives a historical overview of how Buddhism became part of the Western religious and cultural sphere, then discusses definitional and typological challenges, and finally explores the relations of science and Buddhism in the West.

Transplanting Buddhism from East to West: A Historical Overview

Alexander the Great's presence in Northern India was the context for the first meeting of Buddhism and the West. Westerners (Greeks) were mentioned in Buddhist sources (*Majjhima Nikaya* and *Milindapanha*), Buddhist Gandhara art was highly influenced by Greek art, and the first Western convert to and missionary of the religion (Dharmarakshita, third century BC) was probably a Greek descendant of the colonialists. Just like Alexander was never directly mentioned in the Indian classics, his Indian "counterpart," the first Buddhist king Ashoka, has not been mentioned by Greek historians, nor have the Indian stories of his missionaries being sent to the Mediterranean area.

Notwithstanding the possible Buddhist influences on early Christianity (especially Gnosticism), speculations of Buddhist monks having been to Greece to influence Greek philosophers and Christian mystics (and Jesus) going to India to learn from the spiritual depths of the East have, especially in esoteric and new age groups, had a certain fascination. Fascinated were also some of the medieval traders, adventurers, and Christian missionaries dealing with a mental landscape and a religion far beyond the politically and religiously troublesome Islamic region. Like the Far East, Buddhism was to most Europeans mainly an exotic other, if, to the majority, interesting at all.

Although having been discovered by intellectuals and missionaries already in the sixteenth century, it was not until the Enlightenment and later Romantic period that a true meeting between Buddhism and the West was realized. Rationality, religious criticism, and a search for human sources of truth claims were part of the Enlightenment project. Though Indian religions did not get the same recognition as the idealized Chinese Confucianism, the same ideals, however, were transferred also to Buddhism, when it was discovered in the first half of the nineteenth century. In the later Romantic period, rationalization was counterbalanced by an idealization of

feelings, experiences, mysticism, and origins, and romantics ascribed such ideals to be quintessential for Indian religions. Especially from the latter part of the nineteenth century, Buddhism became known as both a highly rational and spiritual path for literates, intellectuals, poets, scholars, and spiritual seekers. Such "rationalization" and "spiritualization" were due not only to the religion itself, in many ways being of a specific *kind* in the history of religion, but also to the history of its reception among scholars and practitioners and the cultural and political context of colonization.

Collecting the parts of hitherto heterogeneous sources to a whole more or less homogeneous religion was possible not the least due to philologists and scholars of religion, and when Eugène Burnouf (1801–1852) had his *Introduction à l'Histoire du Bouddhisme* published in 1844, a new religion was revealed for Western scholars. English, German, Scandinavian, French, Russian, and later American (and eventually from all over the world) scholars took up the task, and with the Pali Text Society, founded in 1881 by Rhys Davids (1843–1922), Buddhism as a textualized religion was established and later categorized as a world religion. The "historical Buddha" was identified, texts became canonized, and different lineages and schools were related in a genealogical framework in which social Darwinists could reflect evolutionary ideals and perennialists could claim Buddhism to express universal depths. Constructionist and postcolonial scholarship has noted the hegemonic contexts of Orientalism, in which such "Western" and Christian ideas were developed. Not only was the East conquered and its religions described, domesticated, and controlled, "Buddhism" was also "invented" under unequal power relations, and the Protestant bias of doctrinal and belief-oriented, anti-ritual, anti-lived religion representations has since been revealed as reductionist and particularist. Early focus on doctrinal ► [Theravada Buddhism](#) as being the true and original source of later degenerate ► [Mahāyāna Buddhism/Vajrayāna Buddhism](#), "Lamaism," and lived "folk Buddhism" until a

few decades ago was also the implicit template for Buddhist and religious studies.

Such Westernized projections were also part of *fin de siècle* representations of Eastern religions in popular literature. Edwin Arnold's poetic account of the Buddha, *The Light of Asia* from 1879, has been published in more than 100 editions, and later idealizations of Indian philosophy, Zen spirituality, and Buddhist magic and mystery from the Himalayan region have had enormous influence on popular images of Buddhism up to the present. Philosophers have used Buddhism to think with, and later generations of thinkers, artists, and authors have contributed to representing Buddhism as both an intellectual and highly spiritual tradition.

To a certain extent, such Westernized perspectives can be ascribed also to Buddhism in the West as a practice religion, both as underlying paradigms and expressed concretely through individuals and networks of influential persons. Madame Blavatsky and Colonel Olcott in 1875 created the Theosophical Society. Beginning as an American group, it soon became an international organization, proclaiming the parallels between science, evolution, spirituality, and esoteric religions, which they found best represented in Buddhism. Importing concepts such as karma and reincarnation into their esoteric (primarily literary) world view, they had a decisive influence on both spiritualist groups (continuing up to present day's new age and spiritualization) and conceptualizations in general of Buddhist and Eastern religions. The Theosophical Society was influential in the Ceylonese Buddhist revival, not least triggered by Blavatsky's and Olcott's arrival and taking of Buddhist refuge on the island in 1880 and Olcott's writing of the *Buddhist Catechism* (still used in Sri Lankan schools today). Anagarika Dharmapala (1864–1933) was their theosophical “pupil” and later himself became one of the most influential leaders in postcolonial Buddhist nationalism and modernity. Also some of the first Western converts were influenced by or members of theosophical societies, such as the British (and first Western) monk Ananda Metteyya, author Edwin Arnold, judge Christmas Humphreys, the German monk

Nyanatiloka, and several of the members of the late nineteenth-century symbol of nationalist and international Buddhism, The Indian Mahabodhi Society.

Modernity paved the way for international networks, and especially Dharmapala and the Japanese Zen “missionary” D. T. Suzuki (1870–1966) were tremendously influential in exporting to the West a “Protestant” form of spiritual and rational Buddhism. This protestant form of modern Buddhism is opposed to and yet inspired by Protestantism, such as focus on texts, degradation of rituals, and priesthood status. Not least the latter's relations to the American philosopher Paul Carus (1852–1919) inspired a modern interpretation of especially Zen Buddhism being scientific. Suzuki's teacher Shaku Sōen (1859–1919) with Dharmapala and the Indian Hindu reformer Vivekananda (1863–1902) had notable success at the Parliament of the World's Religions in Chicago 1893, a prestigious arrangement itself indicating a rising consciousness of Eastern religions. While the first European lay Buddhist groups of the early twentieth century were primarily of Theravadin origin (and especially in the British scene based on colonial relations), USA much earlier had relations to Eastern [Mahāyāna Buddhism/Vajrayāna Buddhism](#). Influential Buddhist teachers and missionaries and a long history of Chinese and Japanese immigrants made both elitist Zen Buddhism and East Asian folk Buddhism parts of the living American Buddhist reality. While Asians continued gathering in local temples, the first Euro-American groups and centers were formed around Japanese masters and missionaries like Nyogen Senzaki (1876–1958) and Shigetsu Sasaki (Sōkei an; 1882–1945).

The Beat Generation of the 1950s and 1960s not only continued the nineteenth century's literary tradition of “thinking with Buddhism,” it also itself helped spark renewed interests into Buddhism as a living religion in the West. Post-war existentialism and counter culture, hippie alternative lifestyle and flower power, easier and cheaper transportation to the Eastern regions further developed access to Buddhism, and from the 1970s onward, a plurality of Buddhist groups of

different schools and lineages were established in America, Europe, Australia, South Africa, and South America. Soka Gakkai, led by *sensei* Ikeda Daisaku (1928–), has had quite a success in its spread outside Japan, being the only truly global Japanese Buddhist school. As part of the increased interest in spirituality, mindfulness or *vipassana* meditation has been established not just as a doctrinal ideal or singular meditation practice but as part of a broader movement itself, promoted and practiced by individuals such as Sayagyi U Ba Khin (1899–1971) and Satya Narayan Goenka (1924–). Especially since the Chinese invasion of Tibet in 1959 and the subsequent diaspora of Tibetans, the perhaps most significant phase of contemporary Buddhism in the West has been established. Westerners went to the Himalayas meeting Tibetan Buddhism; lamas such as Tarthang Tulku (1934–), Chögyam Trungpa (1939–1987), Sogyal Rinpoche (1947–), Kalu Rinpoche (1905–1989), and the primary symbol of Tibetan and global Buddhism, Dalai Lama (Tensin Gyatso, 1935–), came to teach and establish traditions in the West.

The relevance of Buddhist teachers in all Buddhist history has been important. Tibetan lamas; Japanese (like Eidō Tai Shimano, Shunryu Suzuki, Taizan Maezumi, Harada Yasutani, Shodo Harada), Vietnamese (Thich Nhat Hanh), and Korean (Seung Sahn) Zen *rōshis*; and ► **Theravada Buddhism** monks (like Buddhadasa or Sivaraksa) in modern times have been influential agents of transferring the religion to the West (and sometimes, through spiritualization, rationalization, and popularization in the West, rebounding back to the East). Also Euro-American Buddhists like Sangharakshita, Philip Kapleau, Robert Aitken, Michael Roach, Jiyū Kennett, Surya Das, Pema Chodron, Ole Nydahl, Joseph Goldstein, Sharon Salzberg, and Jack Kornfield have taught and interpreted Buddhism for a Western audience. Their significance as symbols of spreading the dharma in a new tune is paradigmatic for the new “turning of the Buddhist wheel.”

Seen in retrospect, the history of Buddhism in the West has evolved from a primarily literary inspiration of an intellectual elite with a Protestant bias to a more widespread practice

of lived religion in a socially engaged, re-enchanted, and spiritualized world including meditation and (especially within Tibetan Buddhism) religious rituals. From a focus on primarily (textualized) ► **Theravada Buddhism**, through Zen to Tibetan Buddhism and contemporary “mindfulness boom,” singular traditions have kept developing their own identities while also being part of transnational, ecumenical, and global Buddhism. Apart from the practicing Buddhists in the West, Buddhism as an inspiration for therapy, psychology, philosophy, popular culture, consumerism, and management strategies has long lost its monastic attire in the West.

Monasticism is only for the few, but temple Buddhism is important for the majority of Buddhists in the West, namely, the immigrants coming from Asia. Their history goes further back in the USA, where Asians as the “old immigrants” already in the early nineteenth century came as working migrants. Like their later (also European, Australian, and South American) counterparts, initial expectations of eventually returning gradually changed into permanent residence and diasporic consciousness of being in a new cultural settlement in which also religion (and Buddhism) has importance. New immigration laws in the US and most European countries opened up for waves of migrants and refugees from Vietnam, Sri Lanka, Laos, and Cambodia, and with their descendants and family reunification possibilities, the amount of immigrant Buddhists has many doubled. While still being a minority religion in most Western countries, immigrant Buddhists in all Western countries constitute the absolute majority (up to 80 %) of Buddhists. While many threads combine elements of the “Euro-American” Buddhist history, the plural immigrant lines make up a tradition in many ways being so distinct that it has caused theoretical and conceptual discussion of “the two Buddhisms,” i.e., the spiritually and philosophically interested Euro-American “convert Buddhists” and the immigrant, “ethnic” Buddhists from Asia. Apart from focusing upon historical and cultural aspects, such reflections also point directly to (the difficulties of) understanding and defining Buddhism in the West.

“Two Buddhisms,” “Buddhism,” and “Western Buddhism”

As a dichotomous pair, “the two Buddhisms” has mainly been used in American and European contexts to distinguish the Buddhism of those with Asian origin as opposed to the “Euro-American” Buddhism, also termed variously “immigrant” or “ethnic” versus “convert” or “white” Buddhism. Immigrant or “ethnic” Buddhism is generally characterized by focusing on Buddhism as a religion related to the tradition and culture of the origin. Language, rituals, and social and cultural activities at the temples point to ethnicity as a major identity marker, with gatherings and services expressing typical “cultural religion” with temple engagement primarily related to rites of passage and major festivals. Merit accumulation, devotion, “folk religiosity” (use of amulets, ancestor worship, divination, etc.) and “other-worldly Buddhism” are as typical to ethnic Buddhism as a hierarchized gender and monk-lay relationship. Convert or Euro-American Buddhism is typically focused on meditation and philosophical readings of classical texts. It is typically individualized, psychologized, and spiritualized in focusing on a this-worldly, demythologized world. It is either de-ethnified in stressing the universal relevance of Buddhism or consciously “Westernizing” it by stressing the need for a more modern, democratic, egalitarian form of Buddhism (as, for instance, Sangharakshita, C. Trungpa, and Ole Nydahl have advocated for). That contemporary convert Buddhism to a large extent is a product of earlier Protestant Buddhism in a few cases is consciously acknowledged in Christianizing Buddhism (as, for instance, Jiyū Kennett and the Order of Buddhist Contemplatives).

That the dichotomous division, ethnic and convert, naturally can be criticized for its static nature is evident, and using two different classificatory taxonomies (ethnicity and religious conversion/engagement) as variables in a dichotomous pair does not make the logic of the typology more convincing. What about convert Buddhists not having ritually converted, some of whom might not even call themselves Buddhists?

What about the children raised as Buddhists, are they still converts, and how many generations does it take before immigrants are qualified not to belong to this category? Soka Gakkai started as a religion for ethnic Japanese but now almost exclusively is for converts, and most convert Zen Buddhists in Japan are actually the immigrants (from the West). Some convert Buddhists have taken interest in cultural aspects of Asian origin, often being more knowledgeable in Japanese martial arts or Tibetan culture than most Japanese and Tibetans. Some Vietnamese or Thais have been born into Buddhism but have actively taken interest in also elements of what typically constitutes “convert Buddhism.” Though also spiritualized and rationalized by some intellectuals, especially within Tibetan Buddhism in the West, offerings to heavenly beings, endless prostrations, belief in cosmic energies, miracles, or magical power transferred from lama to disciple through holy objects or bodily contact seem not that different from other kinds of traditional Buddhism in Asia. Is the main practice, chanting sacred words in front of an altar with a calligraphy scroll in order to acquire very concrete benefits of a very “modern” type of Buddhism, Soka Gakkai, in terms of belief and practice much different from many other traditional Japanese kinds of Buddhist belief and practice? Though democracy, gender equality, and egalitarianism are typical aspects of convert Buddhism, the strong commitment to the power, virtuosi, and charisma of Buddhist masters, lamas, *rōshis*, *senseis*, etc., in many ways seems to be identical not only to the worlds of new religious movements but also to the Asian context. The re-enchantment of the world might be a typical modern construct but often interestingly similar to enchantments of a traditional religious world.

Thus, empirical hybridity and terminological confusion have questioned the concepts, and other alternatives such as modern versus traditional or import versus export Buddhism have been suggested to capture the distinctions and relations between the kinds of Buddhism which, terminological confusion aside, still do seem in different degrees to exist in all Western countries.

Geographical origin and ethnicity as the dividing line is central, but not the only one in modern, Buddhism. Another is inter- and intrasectarian as well as the individual level, both pointing also to the question perhaps being more relevant for Buddhism than for most other religions: what *is* a Buddhist, what *is* Buddhism? Rather than using theological arguments in reaching an essentialist (but reductionist) delimitation, it might be more challenging to investigate the discourses and practices used within the diverse traditions, using a more pragmatic more or less family resemblance approach to capture (Western) Buddhism as a useful concept in the fluid and hybrid spectrum of contemporary individualized religiosity/spirituality.

Some are conscious of being Buddhist, are members of Buddhist groups, and might even have ritually taken the Buddhist refuges. Some hardcore Buddhists would claim a sharp distinction between being Buddhist or not and perhaps between being a true Buddhist (belonging to the right school, practicing or believing in an orthodox way) or not. Others use Buddhist ideas or practices (such as meditation), occasionally go to retreats or gatherings and might either do dharma (s)hopping, have a syncretistic mix of beliefs and practices, and might be reluctant (as Christian, Jew, spiritual seeker, atheist, or simply concept-detached individual) to call themselves Buddhists.

While believing, practicing, or being to the individual might be categories of determining authenticity, at an institutional, inter-, and intrasectarian level, legitimating tradition and authority is a matter of representation. Especially in convert Buddhist milieus, personal experience and legitimate transmission from former representatives of the religious institution are of utmost importance. Claiming the authority and authenticity of more or less charismatic “Western,” lamas, rōshis, and masters have often been a disputed topic, resulting in personal and institutional conflicts, as have disputes of which Buddhist groups might belong to “the Buddhist family.” Notwithstanding its fluid and hybrid character, *Western Buddhism* or *Buddhism in the West* is a useful umbrella category for the (just as hybrid and fluid) Asian Buddhism, having

been transplanted to another cultural and geographical hemisphere, including both convert and immigrants, and more or less Buddhists.

Science in Buddhism

Since its discovery in the West, Buddhism has often been related to discourses of science and the science of religion. Being described as “an atheist religion,” a “religion without God,” or simply as spirituality beyond the constraints of religion, Buddhism as an object became part of the enlightenment and modernity projects. Enlightenment thinkers and romantics could criticize religion and uphold versions of alternative truths by pointing to philosophical and textual versions of Eastern religious traditions (Confucianism, Vedanta, and later Buddhism) as evidence of their universal truths or placements on top of the religious evolutionary ladder. That modernist Buddhists such as Dharmapala, D. T. Suzuki, Chöphel, Taixu, Thich Nhat Hanh, and Dalai Lama have embraced science; that philosophers like Schopenhauer, Nietzsche, Heidegger, and Russell, scientists like Einstein, Bohr, and Bohm, and psychologists like Fromm, Jung, and Goleman were inspired by Buddhism; and that Western converts often have a general high level of education contribute to the image of Buddhism as a rational, intellectual, and even scientific religion, or “way of life.”

Whether there is actually a metonymical relation between Buddhism and science of course depends on the definitions of the concepts and the premises with which to operationally compare them. Do different contexts of origin, different methods and overall goals, and different semantic realms make them scientifically and Buddhistically incommensurable? Such theoretical discussions are beyond the scope of this article, but it should, additionally, be stressed that the “Buddhism” of “Buddhism and science” comprises only the very minority and elitist discourses and assumptions of primarily Western Buddhist modernists and that most Western scientists are reluctant to accept direct correspondence between science and Buddhism (or religion).

Most often, “science” in such contexts means the hard sciences and very seldom has a more “soft” scientific tradition such as sociology or interpretative methods within the humanities been related to or adopted by Buddhists as means of explaining its scientific value. This is due not only to the higher status of a presumably more “objective” science but also to the fact that critical approaches within the study of religion have a tradition of not only interpreting religious traditions “in their own languages” and at “face value.” Interpreting, explaining, and going beyond truth claims by also historicizing, culturalizing, and naturalizing them (including assertions of the scientific status of Buddhism) might not have the same appeal among Buddhists or Buddhist-inclined scientists, but is, however, a part of the history and study of Buddhism and science as well as Buddhism in the West. In this light, “scientific Buddhism” is also itself part of a theological and ideological discourse, legitimating and representing authority of (parts of) a religious tradition.

The following is a list of elements often used to explain the close relations between (or even identity of) Buddhism and science:

1. Buddhist approaches to epistemology and truth claims are based on a theoretical and philosophical basis of critical inquiry. Not accepting doctrines or absolutes for granted, there is a fundamental “hermeneutics of suspicion” in critically reflecting upon, exploring, investigating, and even deconstructing sources and representations of knowledge. Also classic world views (such as the idea of Mount Meru) have been either demythologized or simply discarded as nonscientific by modernist Buddhists. Buddhist classics, history, and contemporary rational arguments legitimate Buddhism as a “godless religion” and question whether it is a religion proper at all.
2. Buddhist ► **ontology** in its demythologized version is in accordance with modern physics. The underlying idea of the interrelatedness of all beings and things on the one hand relates to a holistic world view (combining person, nature, mind, body, subject, matter, concepts), while at the same time the idea of ► **impermanence** or emptiness of all things acknowledges a (postmodern) ontology of a fluid world being in concordance with both ecology and modern (quantum) physics.
3. ► **Evolution**, also in its Darwinian sense, is broadly accepted, since it does not interfere with a religion without creation – though it is also represented to be only a relative truth in a cyclic Buddhist cosmology with “many Big Bangs” and a karmic causality going beyond superficial meaningless and coincidental evolution.
4. Analyzing the person is of utmost importance to Buddhism, being the religion with the most developed and complex analysis of the self. Thus, Buddhist ► **psychology** has long ago acknowledged what Western psychologists (and postmodernists) have later incorporated into mainstream theory and templates for also therapeutic practice: the self as an impermanent, transient, fluid, and hybrid collection of interrelated parts. As a means of analyzing, controlling and transcending the “streams of consciousness” has ascribed to Buddhism the emblem “science of mind.”
5. Just as science, Buddhism is based on empirical investigations of causal relations and “reality as it is.” As opposed to other religions, truth claims may be transcended in order to get to “facts,” and as opposed to traditional science, Buddhists claim to go beyond (especially positivist) objectivist and interpretive/mediating methods by insisting on subjective experience as the profound epistemological approach to directly and fully realizing “how things are” and the causes and effects of all relations. Meditation (especially Vipassana, Dzogchen, and Zen) is often claimed to be such subjective means of scientific investigation, also being in accordance with (the findings of) newer forms of ► **cognitive science** and neurobiology.
6. ► **Postmodern** and post-essentialist notions of the dissolved self; of a fluid, relative, and decentered world; of relational and situational truth claims; of close interdependence between subject and object also in scientific investigations; of constructivist and relativist

world views; and of the breakdown of a grand narrative like the European Enlightenment can be legitimately argued from also a Buddhist frame of reference. With a typical dialectic of negation, even science and postmodernity – or Buddhism itself – can be transcended, thus both negating and affirming itself.

The relations between Buddhism and science have been institutionalized also academically in the West. Buddhism was an important tradition influencing the rise of the scientific study of religion, and both Asian area studies and Asian language studies in the West to a certain extent include also aspects of Buddhism in their curricula. Separate centers, institutes, research networks, or even universities focusing on Buddhist studies have emerged in the West, primarily in the USA. Also experimental studies within neuroscience and brain-scanning technology have involved experienced Buddhists in research projects measuring the impacts of meditation. The Mind and Life Institute with its dialogue between Buddhists and scientists is an example of such contemporary relations, involving also the Dalai Lama, who for many years has had interest in Western science. Such initiatives and his person itself have sparked further interest in the relations between Buddhism and science both among Tibetan (scholar) monks and Western scientists and converts, all contributing to a continuation of the image in the West of Buddhism as being a modern and contemporary robust religion.

Cross-References

- [Mindfulness \(Buddhist\)](#)
- [Modernity in Buddhism and in Islam](#)
- [Physics in Buddhism](#)
- [Psychology in Buddhism](#)
- [Science in Buddhism](#)

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Buddhist Canonical Literature

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Related Terms

[Tipiṭaka \(Pāli\)](#); [Tripiṭaka \(Sanskrit\)](#)

Description

The coming into being of Buddhist canonical literature has its beginning point in what tradition reckons to be the word of the Buddha. Already this notion of the Buddha word, *Buddhavacana*, has a certain degree of complexity to it, since from earliest times it has included some discourses spoken by others, such as by disciples of the Buddha. According to a famous dictum, whatever is well said can be reckoned the Buddha's word (Morris and Hardy 1885–1900, IV, 164).

Regarding the verification of the authenticity of a particular text, the canonical texts indicate

that the central criterion should not be from whom a text purporting to be the word of the Buddha has been received in oral transmission. Rather, whatever squares with the remainder of the texts can be considered authentic (Morris and Hardy 1885–1900, II, 167). Another famous canonical dictum is related to the adoption of various vernaculars for the transmission of the sacred texts (Oldenberg 1879–1882, II, 139). In sum, these indications convey an impression of pragmatism and flexibility.

During the early centuries that saw the gradual coming into being of Buddhist canons, orality was the central mode for the formation and transmission of texts. Unlike oral literature of an epic or entirely narrative type, which involves innovation and improvisation, Buddhist oral transmission appears to have oriented itself along lines similar to its Vedic predecessors, which seem to have achieved an impressive degree of precision in the verbatim preservation of texts by oral means. Nevertheless, the natural vicissitudes of orality have certainly left their impact on Buddhist canonical texts.

In the course of time, the transmission of Buddhist canonical texts took place across a range of different geographical regions and in a number of languages, proceeding from orally transmitted material via manuscripts, xylographs, and eventually print, to modern day digital editions. Among Buddhist traditions nowadays there is no generally agreed single canon. Three particularly well-known canons can be singled out – respectively preserved in Pāli, Chinese, and Tibetan – although this means leaving aside the equally important material preserved in Sanskrit, as well as in a number of other languages, such as, for example, Gāndhārī or Khotanese.

- The Pāli canon of the Theravāda tradition (Buddhist Schools and Traditions), preserved in a language closely similar to, but not identical with, the Middle Indic language(s) the Buddha and his disciples would have spoken, was according to tradition transmitted from India to Ceylon by oral means and then committed to writing during the first century BC.
- The Chinese canon comprises a vast collection of scriptures that is the final result of

translation efforts that started shortly after the beginning of the Common Era and continued for more than ten centuries. Unlike the Pāli canon, the Chinese canon preserves scriptures stemming from different Buddhist schools and even multiple translations of single works, undertaken at different times. The undertaking and maintenance of this immense translation enterprise appear to have stimulated the invention of printing technologies.

- The Tibetan canon, similar in its vastness to the Chinese canon, is the product of translation efforts that began in the eighth century of the present era, covering various texts of Indian provenance. It follows a basic twofold division into *bka'* 'gyur, what tradition reckons as the word of the Buddha, and *bstan* 'gyur, commentaries and treatises, and has in turn been the basis for a Mongolian canon.

A basic structure of the Buddhist canonical collections, which has its roots in the early attempts to assemble the textual material into collections for transmission purposes, divides the material into three parts. These three parts are referred to as “baskets,” hence the term *tipiṭaka* or *tripiṭaka*, the “three baskets.” They comprise:

- Vinaya
- Sūtra
- Abhidharma

The basket that from an historical perspective probably contains the greatest share of early material is the second of these, the basket of discourses, *sūtra* (Sanskrit) or *sutta* (Pāli). The Pāli canon has four collections of such discourses, referred to as *nikāyas*. These contain discourses that have been placed together on the principles that they respectively are long, of middle length, share a particular topic, or are arranged according to a numerical scheme that ranges from 1 to 11.

The Chinese canon has preserved translations of similar groups of discourses, referred to as *āgamas*, although stemming from different Buddhist schools. Besides complete *āgama* collections, the Chinese canon also has partial collections and discourses translated individually, that is, on their own. Complete collections

comparable to the Pāli *Nikāyas* or the Chinese *Āgamas* are not found in the Tibetan canon, which only has few translations of individual discourses.

Comparison of parallel versions of these discourses, as they have been transmitted by various schools and often in different languages, shows the impact of oral transmission on the texts. In relation to content, parallel versions exhibit a number of variations, although these are mostly of a minor type that does not affect the basic meaning. Considerable differences can be found in the placement of discourses within the *nikāya* or *āgama* collections, however, clearly reflecting the fact that the principles for organizing the texts into units for transmission were applied in different ways.

The first of the three baskets is the Vinaya, which takes its origin from the various rules and regulations the Buddha is held to have pronounced for the sake of his monastic disciples. The framework of the Vinaya as a basket appears to have its origin in an attempt to place these rules into a historical context, both by presenting an account of the Buddha's mission in general as well as by providing a narration that purports to record under what circumstances a particular rule came to be promulgated and what type of difficulties led to later amendments.

The Pāli canon has preserved the Vinaya of the Theravāda tradition and the Tibetan canon the Vinaya of the Mūlasarvāstivāda tradition (Buddhist Schools and Traditions). The Chinese canon contains not only a translation of the Dharmaguptaka Vinaya, nowadays still observed by Chinese monastics, but also translations of a range of Vinayas of other schools.

Comparison of the different Vinayas shows close agreement in regard to the formulation of the rules for monks, but considerable variation when it comes to the accompanying stories and explanations. This suggests the rules to be the ancient core around which various stories and commentaries accumulated during the prolonged period of transmission.

The third basket contains the teachings of the Abhidharma, clearly reflecting developments in Buddhist philosophy that took place at

a considerable temporal distance from the Buddha's lifetime, perhaps beginning about the second century BC. The Pāli canon contains the seven books of the Abhidhamma of the Theravāda tradition, while the Chinese canon has preserved the Abhidharma of the Sarvāstivāda and other traditions (► [Abhidharma](#)).

The development of Abhidharma thought is not the only philosophical innovation that had its impact on Buddhist literature. Another movement resulted in a vast literature reflecting various aspects of Mahāyāna thought. Although often presenting themselves as "discourses," *sūtras*, Mahāyāna works stem from a time substantially removed from the historical Buddha, as is the case for tantric works.

Nevertheless, tradition sees the respective canons as the sacred record of the Buddha's liberating message, whose preservation keeps open the path to deliverance for those who are willing to follow his teachings. The actual study of the respective canonical collections, however, has until recently mainly been the domain of a monastic elite, whereas later works, often in the vernacular, came to fulfill a canonical function for the majority of followers of any particular Buddhist tradition.

Cross-References

► [Bible as Literature](#)

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Buddhist Causality

► [Relations in Buddhism](#)

Buddhist Dialectics

► [Logic in Buddhism](#)

Buddhist Doctrine

► [Education in Buddhism](#)

Buddhist Meditation Practices

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Related Terms

[Contemplation](#); [Insight](#); [Mental culture](#); [Tranquility](#)

Description

The approach to the subject of meditation in Buddhist thought can be characterized as thoroughly methodical and thus constitutes one of the aspects that place Buddhism in fairly close vicinity to scientific thought. The practice of Buddhist meditation and its medical effects have been investigated and studied for several decades, and the practice of mindfulness (► [Mindfulness \(Buddhist\)](#)) in particular has become a prominent feature in modern health care.

The Buddhist traditions have developed a range of meditation techniques. A comprehensive survey of such methods goes beyond the aims of this entry, as the theme of Buddhist meditation is rather broad, and several aspects of it receive coverage through other contributions to this encyclopedia (Chan, Zen). This entry will therefore focus in particular on two key aspects of mental cultivation in early Buddhist thought: tranquility and insight.

According to Buddhist meditation theory, the precondition for the development of tranquility and insight is the removal of the five hindrances of sensual desire, ill will, sloth and torpor, restlessness and worry, and doubt (► [Hindrances \(Buddhist\)](#)). Overcoming these hindrances depends on having established a foundation in ethical conduct and developing a sense of inner contentment.

When the hindrances have been removed, the gaining of deeper levels of concentration and insight comes within reach. The distinction drawn here between concentration and insight is not necessarily one of meditation methods, but rather one of complementary qualities. In fact, a meditation practice that from ancient times up to modern days has enjoyed particular popularity – mindfulness of breathing – could in principle be used for both purposes.

Undertaking of mindfulness of breathing requires remaining aware of the presence and nature of the breath, without attempting to influence it – unlike the case of breath control in other Indic traditions. When just observing the breath in this way, attention during meditation can be given to various phenomena related to

the process of breathing. Such a practice would stay in the realm of variegated sensory experience and thus be more geared toward the development of insight. In contrast, giving attention to just mentally knowing the presence of the breath would lead to a unitary type of experience and thus be capable of issuing in deeper levels of mental tranquility.

Other methods for gaining tranquility of the mind include cultivating mental attitudes of loving kindness, compassion, sympathetic joy, and equanimity. Alternatively, certain reflections can be used as the starting point of practice, such as recollecting the qualities of the Buddha, his teaching, and his awakened disciples. Buddhist meditation theory also knows of the use of meditation objects such as the four elements earth, water, fire, and wind, or colors like blue, yellow, red, and white. Each of these is first observed externally until the mind is able to produce an inner mental image that can then be used to deepen concentration.

This brief survey already reflects a considerable breadth of meditative approaches, and throughout the history of the Buddhist traditions the visual component has received emphasis, just as the conceptual and the experiential modes of practice.

Whichever of the above methods a practitioner may decide to employ, progress in matters of concentration should eventually lead to experiencing four levels of absorption (Sanskrit *dhyāna*, Pāli *jhāna*). These four absorptions are states of refined concentration that are accompanied by intense inner tranquility and happiness, culminating in a mental condition of total imperturbability and equipoise with the attainment of the fourth absorption.

When the fourth of these levels of absorption has been gained, according to Buddhist meditation theory it becomes possible to develop various supernatural powers, such as levitation and telepathy. Alternatively, the same degree of concentrative proficiency can be employed to develop four types of mental experiences that transcend matter. These are the concentrative attainment of the notion of boundless space, boundless consciousness, nothingness, and neither perception nor non-perception.

While the development of mental tranquility (Sanskrit *śamatha*, Pāli *samatha*) is an important aspect of the Buddhist soteriological enterprise, tradition holds that on its own concentration will not issue in liberation. What is required in addition to mental tranquility is the development of liberating insight (Sanskrit *vipaśyanā*, Pāli *vipassanā*).

The early textual sources leave it up to the individual in which way the development of these two chief qualities of tranquility and insight is undertaken. One type of practitioner may first emphasize gaining mental tranquility and then turn to insight, while another may begin with insight and only subsequently turn to tranquility, or else someone may develop both in conjunction (Morris and Hardy 1885–1900, II 157).

Training in liberating insight requires the bringing into being of seven mental factors singled out for their particular potential for ripening the mind for the decisive breakthrough to awakening. These are the seven factors of awakening, which comprise mindfulness, investigation of phenomena, energy, joy, tranquility, concentration, and equanimity.

The first of these, mindfulness, serves as the foundation for the growth of the other factors (► [Mindfulness \(Buddhist\)](#)). With mindfulness in place, the practice of investigating phenomena as they present themselves to the observing practitioner gains momentum which leads to energy and then to joy, qualities which with maturing practice find their counterbalance in tranquility and then concentration, leading up to a balanced state of equanimity.

What is to be apprehended by the meditating practitioner is the true nature of existence, that is, its nature of being conditioned and having three characteristics. According to these three characteristics, any aspect of conditioned experience is impermanent (► [Impermanence \(Buddhist\)](#)), unsatisfactory (► [Dukkha](#)), and devoid of a permanent self (► [Anattā](#)).

Here, the conditioned nature of subjective experience is a correlate to its impermanence, in that, precisely because something is conditioned, it must be impermanent. Conversely, what is impermanent is certainly a product of conditions.

With this basic understanding in place, the dynamics of insight proceeds from a thorough reviewing of the impermanent nature of all aspects of experience to the realization that what is impermanent cannot yield lasting satisfaction. With this realization, a growing sense of disenchantment comes about, weaning the practicing meditator from the innate tendency to cling and crave. Based on a thorough appreciation of the unsatisfactory nature of all aspects of experience, the conclusion then dawns on the practitioner that what is impermanent and unsatisfactory does not deserve to be reckoned as one's self and is not fit to be identified with. Developed in this way, insight into not-self becomes a prominent feature of meditative realization, this being the crucial insight in the Buddhist soteriological scheme.

Such meditative development of insight is held to lead to four distinct levels of awakening (► [Awakening](#)): stream-entry, once-return, non-return, and arahantship. The defining feature of these four levels of awakening is the degree to which the mind has been purified from detrimental conditions referred to as fetters, which "fetter" living beings to continued migration in the cycle of rebirths (and re-deaths). A stream-enterer has eradicated three such fetters – belief in a permanent self, clinging to rules and observances, as well as doubt – and is assured of reaching final liberation within at most seven lives. In other words, he or she has "entered" the "stream" that invariably leads to final deliverance.

The once-returner has diminished, and the non-returner has fully eradicated the two fetters of sensual lust and ill will. The once-returner will thus return only once more to be reborn in the sensual realm – a designation that in Buddhist cosmology comprises the human world as well as lower celestial realms in which refined forms of sensual pleasure are still experienced – while the non-returner will not undergo such a rebirth, being instead destined to rebirth in a higher heaven beyond the sensual celestial realms.

The arahant has also eradicated the remaining five fetters of desire for fine-material experiences, desire for immaterial experiences, pride, restlessness, and ignorance, thereby having gone

beyond future rebirth in any form. Although with the attainment of arahantship, Buddhist meditation practice has reached its culmination point; arahants still continue to practice meditation, apparently because for them this constitutes the best way of spending their time.

Cross-References

- [Chan](#)
- [Meditation-Research](#)
- [Mindfulness \(Buddhist\)](#)
- [Psychology in Buddhism](#)

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Business Life

- [Economic Sociology](#)

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C

Cabala

► [Mysticism](#)

Cabalism

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Cabbalism

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Calculation

► [Arithmetic in Islam](#)

Caliphate

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The institution of the caliphate, the principle form of governance in medieval Islam, had its beginnings upon the death of Prophet Muhammad in 632. The Arabic word *khalifa* (“caliph”) simply

means a “successor” or “deputy.” The term has Koranic warrant, as when God says to David, “We have made thee a *khalifa* in the land” (2:30). In this spirit, the earliest caliphs held the modest title of “successor to the emissary of God.” Since Muhammad had been “the seal of the prophets” – the final prophet in a line extending back to Adam – his successors were precluded from announcing further revelations. Nevertheless, their role was not entirely administrative and political; they served also as spiritual leaders of the Umma, or community of believers. The first four caliphs, beginning with Abu Bakr, the father-in-law and close friend of the Prophet, and continuing through ‘Umar, who launched the first waves of conquest beyond Arabia, and ‘Uthman, traditionally credited with the codification of the Koran, down to the troubled caliphate of ‘Ali, the cousin and son-in-law of Muhammad – and hence, his only male blood relative – represent an idealized golden age for Sunni Muslims; this was the period of the “rightly guided caliphs.” Shia Muslims reject this rosy view; they consider the first three caliphs as little better than usurpers of Ali’s rightful claim to the office. It says much about this earliest formative phase of the caliphate and the inherent tensions of succession that all but Abu Bakr died at the hands of assassins. In 661, the murder of ‘Ali led to the rise of the Umayyad dynasty. During the ensuing century, the Umayyad caliphs saw themselves less as successors to Muhammad than as “God’s caliphs,” and the status and power of the office swelled considerably. After the Umayyads

were overthrown by the Abbasids in 749, the caliphate took on even more exalted trappings. The Abbasid caliphate endured for five hundred years (750–1258) before being extirpated by the Mongols. During its first two centuries, the caliphs wielded enormous power. Their functions ranged from the launching of expeditionary forces, not only against such rival empires as Byzantium but against various rebels and malcontents within their territories, to the administration of government appointments, the levying of taxes, and the supervision of the judiciary and even, in their role as defenders of the faith, to presiding over the Friday prayer, conducting the pilgrimage, and safeguarding, as well as occasionally formulating, articles of dogma. The office had spiritual prestige as well as political authority; the caliph was the “imam” as well as the “teacher” of his subjects, and that prestige endured even after the caliphs themselves had lost real governing power.

The Abbasid caliphs were assiduous patrons of science, art, and culture; such patronage became a fixture of caliphal rule, not only among the Abbasids but in rival courts, such as those of the Fatimids of Egypt and Syria (909–1171), an Ismaili-Shia dynasty, or of the Spanish Umayyads (756–1031) in the Iberian Peninsula. Beginning in 754 with the Caliph al-Mansur, the Abbasids sponsored an ambitious “translation movement” to bring Greek (and to a lesser extent, Indian and Persian) scientific and philosophical literature into Arabic. The establishment of the *Bayt al-Hikma*, or “house of wisdom” in Baghdad, a rich library formed on an earlier Sasanian Persian model, led to the creation of a vast corpus of learning which was continually revised and refined for the next two centuries; in this process, most of the works of Aristotle and Plato, as well as of Galen, Ptolemy, and dozens of other ancient thinkers, appeared in Arabic versions. This in turn inspired original philosophical, medical, and scientific treatises in Arabic by such outstanding Muslim thinkers as Kindi, Razi, Farabi, and Ibn Sina and such mathematicians as al-Khwarizmi, Ibn al-Haytham, and al-Biruni, among others.

The caliphate endured as an institution even as it fell, increasingly after the tenth century, under the sway of emergent dynasties such as the Shia Buyids (932–1062) and, more decisively, the Seljuq Turks (1040–1194), whose sultans – originally vassals of the caliphs – became de facto rulers of the Abbasid realm. The terms “caliph” and “caliphate” continued to be used on occasion by various rulers, such as the Mamluk Sultans of Egypt and Syria (1250–1517) or the Ottoman Sultans. The title conferred the legitimacy of succession in a line extending back to the Prophet himself. In 1922, the Ottoman sultanate was abolished, and in 1924, upon the establishment of the Turkish Republic, the caliphate itself came to its official end. An idealized concept of the caliphate continues to resonate for militant Muslims, and the call to restore the caliphate has become a frequent rallying cry among jihadists.

Cross-References

- [Islam: An Overview](#)
- [Muhammad, Prophet](#)
- [Philosophy in Islam](#)
- [Political Theology, Theological Politics](#)
- [Political Theory](#)
- [Science in Islam, Transmission](#)

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Caloric Tests

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A functional evaluation of the external semicircular canals that use water or air to change the temperature of the canal ampulla. These tests were perfected and standardized by C.S. Hallpike (Hallpike 1955). There are five variants: (1) the bithermal test which is standard performance; (2) the monothermal test in which a single large bolus of ice water is given instead of two irrigations with hot and cold; (3) the bilateral irrigation test in which both sides are irrigated simultaneously; (4) the balloon test where a water filled balloon is used rather than water and (5) the ice water caloric test which is used to confirm complete loss.

cAMP and Memory

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Cyclic adenosine monophosphate, cAMP, is a *second messenger* used in intracellular signal transduction of a neuron (cf. Question-5). Synthesis of cAMP depends on adenylate cyclase which is activated by a G_s -protein-coupled

receptor at the postsynaptic membrane in connection with a neurotransmitter (*first messenger*) that is released at a synapse to the axonal ending of this neuron. cAMP in turn activates protein kinase A (PKA).

As regards short-term memory, PKA leads to a facilitation of neurotransmitter release from the axonal ending of this neuron (sensitization).

As regards long-term memory, PKA in the nucleus of the same neuron activates CREB protein as transcription factor that binds to a certain DNA sequence and thus increases the transcription of certain *CRE* genes. Members of the CREB family contain enhancers (CREB1) and repressors (CREB2) of transcription. Each one is activated by a protein kinase, the enhancer by PKA and the repressor by MAPK (mitogen-activated protein kinase). The actions of both protein kinases depend on the cAMP level. The CREB1/CREB2 balance then determines long-term memory associated with synaptic growth by axonal sprouting at the synapse of that neuron. This allows facilitation of synaptic transmission to persist (long-term sensitization).

Canonical Neurons

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Canonical neurons are a specific class of neurons of the monkey ventral premotor cortex that discharge during motor act execution and in response to the presentation of 3-D objects. Typically they show congruence between the motor acts they code (e.g., precision grip) and the physical properties of the observed object (e.g.w, small object).

Cross-References

► [Action Control](#)

Cardiology

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Related Terms

[Circulatory system](#); [Heart](#)

Description

Cardiology is the medical discipline dealing with the heart, its functions, and its diseases.

During the course of the twentieth century, cardiovascular disease became more prevalent, especially in the industrialized nations, due to more sedentary lifestyles and altered diets (industrially refined, fat and sugar rich). In addition, the introduction of antibiotics toward the middle of the twentieth century curbed the death toll due to infection, hence extending life expectancy and increasing the likelihood and thus frequency of cardiovascular disease. These ongoing processes have led to an ever-increasing number of patients seeking the attention of cardiologists, a trend expected to carry on well throughout the next several decades.

With the first balloon angioplasty of a coronary artery performed by Andreas Gruentzig in Zurich in 1977 paving the way, Cardiology has been enriched by decidedly interventional treatment options. Especially the past two decades have seen the development of various interventional treatment approaches not limited to coronary artery disease but also encompassing structural and valvular heart disease as well as heart rhythm disorders with a major impact on the way Cardiology is practiced today (www.escardio.org).

Self-Identification

Science

Natural scientists and physiologists have been attracted to the heart and circulatory system for

centuries with W. Harvey first describing the essentials of the mammalian cardiac function and circulation in 1628. Arising from this, Cardiology is firmly grounded as a natural science, which sees itself as a scientific endeavor with the aim to enhance the knowledge about the organization and function of the human cardiovascular system as well as its disease-related abnormalities. This aim of enhancing knowledge in the fields of cardiovascular function as well as the fields of diagnosis and treatment of cardiovascular disease is strived for through rigorous basic research as well as by implementation of clinical trials. The best of the latter are designed to be randomized, blinded, placebo controlled, and externally monitored whenever possible.

Characteristics

Cardiology distinguishes itself from other disciplines in many ways.

It involves the treatment of cardiovascular disease which has been the most frequent cause of death in Europe and other industrial nations for several decades. Due to advancements in the therapeutic developments in Cardiology, this death rate is steadily decreasing.

The physiological and pathophysiological processes studied and treated in Cardiology are of a mechanistic nature compared to most other areas of medicine. For example, in valvular heart disease, a given heart valve can either be too tight (stenosed), allow a backward flow (regurgitant) or be characterized by a combination (to various degree) of the two phenomena. The mechanical obstruction or dysfunction can then be treated by catheter-based dilatation (valvuloplasty) in the case of stenosis or by catheter-based adaptation of valve leaflets in the case of regurgitation.

With the increasing possibilities of interventional cardiology the sister-disciplines of Cardiology, namely, Cardiothoracic Surgery and Cardiovascular Surgery, are merging together in providing optimal therapy for the individual patient in a fashion and extent unprecedented in medicine, thus clearing the vision for new therapeutic perspectives to the great benefit of patients

with cardiovascular disease (www.dgkardio.de; www.heart.org; www.acc.org).

Relevance to Science and Religion

While Cardiology and cardiovascular science are very productive fields of science, the interaction with religion has been minimal.

Nevertheless, the heart is important in the human collective psyche. Even before the time of Romeo and Juliet, the heart has been synonymous with love, a central aspect and theme of a large number of religions. Furthermore, in the English language, and other languages, the heart is frequently used to describe emotions (e.g., heartfelt, heavy heart, change of heart, “Herzschmerz”).

Sources of Authority

Today, the authorities in Cardiology are various departments and cardiologists whose origins date back to William Harvey, who in 1628 first described the circulatory system in mammals. One of the first prominent cardiologists in clinical medicine was Jean Nicolas Corvisart (1755–1821) who, after training in Vienna, practiced at the Hospice de la Charité in Paris. His important publication “Essais sur les maladies et les lesions organiques du coeur et des vaisseaux” (Essays on the disease and organic lesions of the heart and circulatory system), published in 1818 already covered pivotal aspects of Cardiology such as structural heart disease, valvular heart disease, and heart rhythm disorders with the interesting omission of coronary artery disease/ischemic heart disease. One of his successors in Paris, Rene Theophile Hyacinthe Laennec (1781–1826), took great interest in cardiac auscultation and is credited with inventing the first dedicated stethoscope (Lichtlen 2002).

Among the early authoritative texts in cardiology was that of Heinrich von Bamberg (1822–1888) published in Vienna 1857, “Lehrbuch der Krankheiten des Herzens” (Textbook of Diseases of the Heart). A further important textbook was “Traite Clinique de Malades du Coeur et de

l’Aorte, Tome II. Maladies des Coronaires et de l’Aorte” (Clinical Papers on Diseases of the Heart and Aorta) by Henri Huchard (1844–1910) published in Paris in 1899 (Lichtlen 2002).

Contemporary textbooks in cardiology have predominately originated in the USA with “Braunwald’s Heart Disease” and “Hurst’s The Heart” being the two most prominent examples.

Ethical Principles

Cardiology is, as is every discipline in medicine, ethically guided by the oath of Hippocrates, the Greek physician and “founding father” of medicine born 460 BC. More recently, this oath has been revised under the rules of the Declaration of Helsinki of 1971.

Key Values

The key value of Cardiology can be found in improving a patient’s cardiovascular health status. This is frequently achieved in acutely life-threatening medical conditions necessitating permanent (24 h/7 days/365 days a year) availability as well as rapid accessibility of cardiology services (optimally within minutes) for every individual of any given population.

The gratifying value of Cardiology to those practicing this discipline is the fact that the duration and the quality of life can be increased significantly for a large number of patients.

Conceptualization

Nature/World

Nature can refer to the physical world including the environment and life in general including the personality. Therefore, it could be said that nature is connected to the heart through the personality.

Human Being

The human being is a member of any of the races of *Homo sapiens*, living or extinct.

Life and Death

Life can be described as the property or quality that distinguishes living organisms from dead organisms and inanimate materials. It is considered to be the interval of time between birth and death.

The heart is one of the first organs to assume function within embryonic development with pulsatile activity discernable as early as day 22 of pregnancy.

On the other side of life's spectrum, death is frequently equated to the cessation of heart beat. While this definition of death is not correct medically, it is very widely spread across different cultures and populations and has been factually correct in nearly every case over several thousand years of humanity except for the last few decades.

Modern cardiologists often deal with patients who are resuscitated, thus blurring these seemingly in-permeable boundaries of life. Patients who have been resuscitated from circulatory/cardiac arrest often describe so-called near death experiences. These are frequently described to encompass multiple possible sensations including detachment from the body, total serenity, and the presence of a light.

Reality

Reality is classified as that which exists objectively and in fact.

Knowledge

Knowledge is the awareness, consciousness, or familiarity gained by experience or learning. Knowledge that can be produced by an individual from memory or intuition without consultation of external sources (other humans, books or any written form of information, audio or video files) is often referred to as "to know by heart."

Truth

Truth conforms to fact and actuality. It is a comprehensive term and in all of its nuances implies accuracy and honesty. "Veracity is the heart of morality" (Thomas H. Huxley).

Perception

Perception is the awareness and knowledge of any force, influence, or other sensation through the senses, especially sight and hearing.

Time

Time is an interval separating two points on a nonspatial continuum in which events occur in apparently irreversible succession from past through present to future. In Cardiology the measurement of heartbeats per minute is of extreme importance. Interestingly, the predominant heart rhythm observed in humans, so-called sinus rhythm has a normal range in adults at rest between 60 and 90 beats/min. This implies that in many situations (i.e., whenever the heart rate is 60 beats/min) the interval between two heartbeats equals 1 sec, the international unit of time.

Relevant Themes

With respect to "Science and Religion" a critical issue in Cardiology lies in organ transplantation. General ethical questions related to organ procurement and distribution have been addressed by several organizations such as the World Health Organization (www.who.int/ethics/en/EB113_14) and the European Commission. Most of the world's religions support organ as a charitable act with the respective community gaining great benefit. While Jehovah's Witnesses are frequently assumed to be strictly objecting to donation due to their belief against blood transfusion, the latter rather means that all blood must be removed from the organs and tissues before they could be transplanted.

Despite this benevolent position of the world's religions toward organ donors, the decision to donate the heart, be it by surviving relatives or by the donor himself, remains emotionally and spiritually charged compared to kidney or lung transplants. Likewise, the recipients frequently describe feeling a special connection toward the (in most cases) unknown donor.

Cross-References

- [Biology](#)
- [Body](#)

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Caregiving

- [Attachment: Theory and Patterns](#)

Cartesian Conception of the Mind

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This term refers to the conception of the mind that originated with René Descartes (1596–1650). More generally, it refers to a conception of the mind that gives primacy to the first-person perspective in discussing issues about the nature of mental states and mental concepts. For a Cartesian, mental state concepts are, for instance, defined in regard to experience to which each of us has access only introspectively. Cartesian dualism then refers to the distinction between the mind as an immaterial, nonphysical concept and the brain as a physical, measurable entity.

Cartography

- [Geography in Islam](#)

Categorical Imperative

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A general and foundational rule for ethical reasoning formulated by the Prussian philosopher Immanuel Kant that persons must act in such a way that their maxims, or principles of action, necessarily conform to a universal standard of respect for all other human beings and that they be consistently valid for all persons acting in the same situation.

Catholic Church

- [Physics in Catholicism](#)

Catholic Church and Science

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Related Terms

[Papal infallibility](#); [Science and catholicism](#)

The Science-Catholicism Relationship from Vatican I to Vatican II

All through its history, Roman Catholicism has managed to come out of serious crisis situations with considerable success. One of the secrets of this remarkable resilience can be traced to its tradition of convening ecumenical councils which are very special events wherein bishops and other top leaders of the Church from all

over the world, under the leadership of the Pope, come together to deliberate on critical issues and take appropriate steps to deal effectively with them. The Catholic Church recognizes 21 ecumenical councils starting from the first one in Nicaea in 325 AD to Vatican II in 1962–1965. Of these three are identified as the modern era councils: the Council of Trent (1545–1563), Vatican I (1869–1870), and Vatican II. In what follows, I offer a critical study of the documents of the last two councils from their historical, religious, scientific, and philosophical context. Special effort will be made to discuss critically the impact of sciences in necessitating these councils, shaping their different decrees and declarations, and even guiding many important aspects of their course. In fact, it is important to note that these two were the only councils that took place after the advent and development of modern science and hence had to face the full weight of its influence.

The First Vatican Council

Various developments in science and related fields played a crucial role in posing a serious challenge to the Catholic Church to which it had to respond. Not only individual theories, discoveries, and technological developments, but, even more, the worldview shaped by science and the wide impact it had on various fields of human thinking and living offered a serious challenge to traditional Catholicism. Space constraint compels me to confine discussion to only a few of these developments. This discussion is intended to shed light on the key themes related to Vatican I, particularly Pius IX's Syllabus of 1864 and the two principal documents of the Council, both of which had as their target a number of "errors" arising from developments in science.

Developments in Science, Philosophy, and Related Areas

Mechanical Philosophy of Nature. Mechanical Philosophy of Nature (MPN) resulted from the unprecedented success of science from the seventeenth to the end of the nineteenth century.

MPN looked upon this whole universe as a gigantic machine governed by the principles and laws of Newtonian mechanics. All living beings, including the human body, were also reduced to complex machines. In its extreme form, MPN claimed that all phenomena of our experience, including thinking, sensing, reproduction, etc., could be explained mechanistically. Science could give knowledge that was absolute, certain, exact, and objective. It projected science as the superpower that could accomplish everything, rendering God dispensable. Laplace's reply to Napoleon that the God hypothesis was unnecessary to explain the functioning of the universe was a clear demonstration of this attitude. Scholars like Michael Buckley have traced the roots of western materialism to this worldview. By making the empirically validated scientific knowledge the paradigm of valid knowledge, it began debunking knowledge that could not be subjected to empirical testing, particularly religious knowledge.

The Industrial Revolution. The Industrial Revolution was another consequence of scientific developments that transformed the mode of living and thinking of humankind mostly from 1750 to 1850. It brought about a mechanization of industry and mass production of commodities. Socially, it gave rise to a shift from an agrarian and rural to an industrial and urban society. Dependence on erratic nature, and hence on God and religion, decreased, and reliance on science and technology increased. Consequently, the Church and related activities began moving away from its traditional central place to the periphery. Material prosperity, better knowledge, and greater independence naturally led to liberal perspectives and ideologies along with a critical attitude toward traditional beliefs, values, and structures. These developments influenced considerably the official documents of Vatican I.

The Ghost of the Galileo Episode. Galileo failed to give convincing evidence for his support of heliocentrism at the time of his condemnation in 1633, even at the time of his death in 1642. However, it came in the middle of the nineteenth century, a few years before Vatican I. First, the Foucault pendulum, a simple device to

demonstrate the daily rotation of the Earth, was invented by Leon Foucault in 1851. Second, the ingenious observation of stellar parallax, the observed apparent motion of a star due to the real motion of the Earth, gave evidence for the revolution of the Earth around the Sun. This controversy had significant bearing on Vatican I because of the central importance it gave to Papal Infallibility. Although the Church's official condemnation of heliocentrism did not go directly against infallibility, for the critics, it considerably weakened the claim of the Church authorities that they had privileged divine illumination concerning truths.

Darwin's Theory of Evolution. Darwin's theory of 1859 that the different beings in the universe appeared gradually as a result of a long and complex evolutionary process questioned the traditional teaching of the Church on the origin of living beings, especially humans, and it challenged the reliability of scripture, particularly in its literal interpretation. It was also a very attractive illustration of naturalistic explanation which attempted to dispense with any divine role in the creation of life and intelligent beings.

The Enlightenment. The Enlightenment, an eighteenth century European philosophico-cultural movement, was characterized by an emphasis on reason, especially scientific reason, based on concrete data and logical method, and a strong dislike for tradition. While overvaluing empirically observable facts, it tended to devalue religious claims based on faith and authority. It was very clear that the overall effect of this movement was the gradual unseating of traditional religion with its emphasis on faith and the spiritual, replacing it with tangible reason and practical success.

Positivism. Positivism held that all true knowledge must be based on sense experience and accorded a preeminent place to science and scientific method. The development of positivism by Auguste Comte, undercutting the importance of the religious, in the middle of the nineteenth century, just a few years before Vatican I, contributed considerably to the devaluation of religious faith and dogmas.

Marxism. Karl Marx in mid-nineteenth century mounted a scathing criticism on Christianity, describing it as "the sigh of the oppressed creature, the heart of a heartless world, and the soul of soulless conditions. It is the opium of people." Far from being an answer to human problems, for him, religion was part of the oppressive system. These ideas also posed a formidable challenge to the Church at the time of Vatican I.

Rationalism and Naturalism. Rationalism and naturalism were highly influential views in the mid-nineteenth century. Rationalism assigned primacy to reason, reducing divine revelation or any other supernatural source to insignificance. For naturalism, the natural world of science was all that counted, thereby dispensing with any recourse to the supernatural. The spread of these two philosophical positions was also a major concern of Vatican I.

Developments in the World of the Catholic Church

Gallicanism and Febronianism. Gallicanism, a French ecclesiastical and political doctrine and practice, recognized the Papacy as a divine institution but stood for curtailing papal influence in the temporal field. Given the complexity and volatility prevalent in Europe for centuries, it is clear that this movement was a source of constant tension for the Pope as a person and the Papacy as an institution. Febronianism basically was the German counterpart of Gallicanism.

Ultramontanism. Ultramontanism was the opposite of Gallicanism and advocated papal supremacy and the centralization of the Roman Curia. The Jesuits, with their fourth vow of special loyalty to the Pope, were staunch supporters of this view.

The Papal States and the Challenges of Pius IX. The Papal States were the territories that were under the temporal sovereignty of the Papacy. They included parts of Italy and Avignon Venaissin in France from 756 to 1870. With the rise of strong nationalism in Europe, the Pope began losing these territories and finally was left with a small territory of the Vatican City and its vicinity. All these developments had a profound impact on Pius IX, who began his pontificate in

1846 as a sympathizer with the liberals. However, the bitter experiences of later years forced him to change his attitude. Particularly devastating were the Revolutions of 1848 and their aftermath. This period proved to be one of unprecedented disasters for the Pope. He was stripped of his political powers, forced to flee Rome in disguise, and became a “prisoner in the Vatican” when he managed to come back in 1850. Although Pope Pius IX’s person and reign were matters of serious controversy, even his critics admit that he placed the good of the Church before everything else. He was convinced that the new trends and developments like rationalism, naturalism, liberalism, etc., were utterly harmful to the Church and humanity. He was determined to fight back with all the powers he could muster. The firm, strong, and uncompromising steps he took in the ensuing years were to be seen in this complex context. He fought back first by promulgating the *Syllabus of Errors* in 1864 and then calling the First Vatican Council in 1869.

The Syllabus of Errors. The *Syllabus of Errors*, which was 12 years in preparation with 80 items, could be considered the preface to Vatican I since it provided most of the ideas discussed at the Council. Scholars like T. Tackett think that Pius IX convened Vatican I to obtain conciliar confirmation for the *Syllabus of Errors*. The whole thrust of this document can be summarized into two tendencies both of which were strongly condemned: the downgrading of God and the divine and the upgrading of nature and the natural. Pope Pius IX considered Vatican I as a decisive step to counter firmly this powerful threatening current.

Chronology of the Events of Vatican I. According to some scholars, already in 1849, Luigi Cardinal Lambruschini, a member of the Roman Curia, suggested convening a council to Pius IX. The Pope himself mentioned its possibility in 1864, but the initial work started only in 1865. The formal announcement was made in 1867, and the apostolic letter of convocation was given on 29 June 1868. The first session started on 8 December 1869. The first voting on infallibility was on 13 July 1870, and Pius IX

suspended the council indefinitely on 20 October 1870.

The Documents of the First Vatican Council. This council approved two dogmatic constitutions: *Dei Filius*, “On the Catholic Faith,” and *Pastor aeternus*, “On the Church of Christ.” The first talks about the precarious and alarming situation caused by the rise of rationalism and naturalism. These false doctrines have led people to “the abyss of pantheism, materialism, and atheism,” resulting in the destruction of rational nature, denial of any genuine criterion of what is right and just. They question the supernatural origin and destiny of the Church, the Magisterium, and the Teaching Authority of the Church and the importance of Holy Scripture and sacred tradition, and reduce religious questions to a matter of individual judgment. With regard to the source and interpretation of Holy Scripture, it affirms the traditional view of direct divine origin and the official Church as its only authentic interpreter. Reason and faith, it sees as a twofold order of knowledge, which, though distinct, do not conflict since both have God as their source. Matters of faith cannot go against reason because they are confirmed by miracles and prophecies. It affirms the Catholic Church as the sole custodian of Christian faith, the divinely ordained arbiter of what is right and wrong. Hence, Christians are “forbidden to defend as legitimate conclusions of science those opinions which are known to be contrary to the doctrine of faith.” Coming to dogmas, it asserts that they are part of the immutable divine deposit, and hence, their meaning must be maintained intact.

Pastor aeternus, “On the Church of Christ,” had its focus on the jurisdictional primacy and infallibility of the Pope. The major part of this document dwells on the Primacy of Peter and of the Pope as his successor. It may be noted that although Vatican I is known for its definition of Papal Infallibility, this point came up strongly only toward the end of the Council; but once it came up, it became the epicenter of heated debates. Just before the final vote, more than 60 members left Rome, and when the final vote was taken, 533 voted for and 2 against.

Since the impact of science on this document seems to be very limited, we will limit ourselves to giving the final statement of the dogma of Papal Infallibility, which says: When the Pope speaks *ex cathedra*, in his office as shepherd and teacher of all Christians, on doctrines concerning faith or morals to be held by the whole Church, “such definitions of the Roman Pontiff are of themselves, and not by the consent of the Church, irreformable.”

Some Remarks

The Language of the Texts. The language of the texts is clear, direct, and absolute, leaving no room for doubt or misunderstanding, dialogue, or compromise. All major assertions are followed by “*anathema sit*,” “let him be anathema.” Today’s democratic and dialogical world may find such an approach jarring, particularly in a religion that considers love and forgiveness its characteristics marks. However, when we consider the nature and purpose of the text, the circumstances in which the whole developments took place, as given in our detailed background study, this style and tone becomes understandable.

Science and Vatican I. The impact of developments in science and related fields on Vatican I is very evident in the documents. Many of the decrees and affirmations of the council are targeting scientific ideas and certain ideologies that emerged from them. Vatican I for the most part took a negative, narrow attitude to these developments, perceiving them as harmful to the Church and humanity. It seems to me that this situation led scholars like Andrew White and John Draper at the end of the nineteenth century to the conflict model for the science-Catholicism relationship. Although this may, in some ways, be true during this period, when we consider the wider period from the beginning of modern science to the present day, the relationship is far more complex. For instance, when modern science was in its infancy, the Church encouraged and supported it. As we shall see, Vatican II took a positive and collaborative approach toward modern science.

The Second Vatican Council

Features of the Council

Vatican II was, in many ways, a landmark in the history of the Catholic Church. According to the Apostolic Brief, *In Spiritu Sancto*, “The Second Vatican Council. . . must be remembered without doubt among the greatest events of the Church.” Not only did many new ideas emerge from it, but also a new approach and a new attitude arose as a consequence of this largest ever ecumenical council. As Oscar Cullmann observes, the impulses of this council are as effective as its documents. Many of its novel and revolutionary ideas and path-breaking approaches are yet to become an integral part of the Church’s official policy and practice.

Vatican I and Vatican II. Since Vatican II follows serially Vatican I, one is understandably tempted to consider it as a follow-up on Vatican I. But a serious reflection on these two councils reveals that they were significantly different. For instance, Vatican I was very much institution-centered, whereas Vatican II was conspicuously people-centered. The primary move of Vatican I was principally to conserve and confirm, while that of Vatican II was mainly to preserve and progress. Vatican I focused on defining certain dogmas to bring clarity and conformity, whereas Vatican II focused on updating Catholic teaching and heritage to make it more relevant to the times. With regard to science and technology, Vatican I made very few references, mostly to show their negative impact, while Vatican II addressed the subject of science and technology quite frequently, mostly in a positive tone. As Giles Routhier points out, many Council Fathers, particularly E.A. Blanchet, Rector of the Institut Catholique of Paris, and P. Veuillot, Coadjutor Archbishop of Paris, wanted to give “positive praise to its great dignity.” Vatican I was conspicuous in its use of the language of condemnation and “*anathema sit*,” whereas Vatican II wanted to use the “*medicine of mercy* rather than of severity.”

Although the exact causes of this striking turnaround is difficult to pinpoint, it can be shown

that certain developments in science during the period between Vatican I and Vatican II, particularly relativity and quantum theory, and similar developments in Catholicism, particularly in scriptural scholarship and interpretation, missionary expansion, and wider interaction with other world religions and cultures, the fruitful involvement of many loyal Catholics like Georges Lemaitre in science, played a crucial role in this happy transformation.

The Chronology of the Different Events. On 25 January 1959, Pope John XXIII announced the convening of the Council. On 17 May 1959, the "Antepreparatory Commission" was appointed by the Pope. Ten preparatory commissions and 2 secretariats were established on 5 June 1960. The council commenced on 11 October 1962 under Pope John with 2450 members out of the possible 2908 and closed on 8 December 1965 under Pope Paul VI. The council had 4 principal sessions and produced 4 Constitutions, 9 Decrees, and 3 Declarations. In addition to these, there were also a number of "closing messages" to special target groups, introduced by the Pope and read out by cardinals appointed by the Council.

Special Features of the Council (1): Emphasis on the Pastoral Rather than Doctrinal Dimension. As the Apostolic Brief, given at the end of the council declaring its conclusion, pointed out, the council always bore in mind "the necessities of the present day, above all it sought to meet the pastoral needs." According to the "opening speech" of Pope John XXIII, the primary purpose of the council was not the discussion of any particular doctrine but to bring "the modern world into contact with the vivifying and perennial energies of the gospel, a world which exalts itself with its conquest in the technical and scientific fields, but which brings also the consequences of a temporal order which some have wished to recognize excluding God. This is why society is earmarked by a great material progress to which there is not a corresponding advance in the moral field." Thus, the council was intended to remedy the serious mismatch between the advances in the world of science and technology and in that of religion and morality.

Special Features of the Council (2): Greater Sensitivity to the Human Dimension. This council was particularly noted for its people-friendly vision and approach. It is remarkable that it began with a nontraditional opening "Message to Humanity," "to all men." Walter Abbott points out that this is the first time that a council addresses itself to all men, not just Catholics. In a personal note the Council Fathers assured all that they were in solidarity with the people, carrying in their hearts their "hardships, the bodily and mental distress, the sorrows, longings, and hopes." *Lumen gentium*, "Dogmatic Constitution of the Church," often considered "the most imposing achievement of Vatican II," described the same predicament of contemporary humans: Today, humans are "buffeted between hope and anxiety and pressing one another with questions about the present course of events, they are burdened down with uneasiness."

Special Features of the Council (3): The Spirit of "Aggiornamento." "Aggiornamento," making up-to-date, the catchword for the Council, expressed the goal that the Church must be brought up-to-date, must adapt itself to meet the challenges of modern times, particularly due to the astounding developments in science and technology. Pope John wanted the Church not to be intimidated by science but be daring to make use of modern ideas, means, and methods, well proven for their efficaciousness and accuracy, to expound and explicate the Christian teaching and heritage. Thus, the council would be "a step forward toward a doctrinal penetration and a formation of consciousness in faithful and perfect conformity."

Aggiornamento in the theological context should not be reduced to an exercise of rephrasing conventional theological teaching in contemporary terminology. The council clearly stated that such "old wine in new skins" simply defeated the purpose because scientific findings had posed new questions demanding new theological investigations.

Special Features of the Council (4): A Balanced Approach. At the same time, it must be emphasized that this aggiornamento in no way meant any break with the fundamental teachings

of the Church. To dispel any doubt on this matter, Pope John clarified: “The substance of the ancient doctrine of the deposit of faith is one thing, and the way in which it is presented is another. And it is the latter that must be taken into great consideration with patience if necessary, everything being measured in the forms and proportions of a Magisterium which is predominantly pastoral in character.” In fact, he most sincerely hoped that “illuminated by the light of this Council, the Church . . . will become greater in spiritual riches and . . . make men, families and peoples really turn their minds to heavenly things.” Clearly, one of the goals of this council was to help contemporary humans living in a world dominated by science and technology to achieve a delicate balance between the scientific and the religious, the material and the spiritual.

Special Features of the Council (5): A Positive and Non-Defensive Attitude. It could be said that Vatican II ushered in a new age in the life and attitude of the Catholic Church. In place of the spirit of “anathema sit” and condemnation prevailed that of understanding and compassion, meeting “the needs of the present day by demonstrating the validity of her teaching rather than by condemnation.” The request of many Council Fathers to reconsider the Galileo case and Pope John Paul II’s follow-up on the matter were an unmistakable testimony of this spirit. Another instance of this new spirit was the public expression of regret by Pope Paul VI and Athenagoras I, the Patriarch of Constantinople, on 7 December 1965 for the mutual excommunications pronounced by their respective predecessors Pope Leo IX and Patriarch Cerularius in 1054.

Special Features of the Council (6): The Spirit of Openness and Optimism. A spirit of optimism and positiveness that readily appreciated the good in other religions and systems and a spirit of openness to new possibilities, even when they looked challenging and demanding, was another hallmark of the Council. As Pope John said: “We feel we must disagree with those prophets of gloom, who are always forecasting disaster, as though the end of the world were at hand. . . . Everything, even human differences, leads to the greater good of the Church.” A similar

sentiment was expressed by Pope Paul VI: “From the start the Council has propagated a wave of serenity and of optimism . . . free of medieval rigorous and pessimistic understanding of man and his customs.” This openness and optimism was very conspicuous in the welcoming attitude the council took toward developments in science and technology, without losing its rootedness in tradition.

Special Features of the Council (7): The Spirit of Partnership and Collaboration. It is remarkable to note that the council expressed a very close and intimate relationship with the scientific community, as was articulated in the “closing message” of the Council. According to it, since scientists and the Council Fathers were fellow-seekers of truth, their paths “could not fail to cross. Your paths are never foreign to ours.” In fact, the relationship between the two groups was one of intimate partnership and close collaboration, as expressed in the following words: “We are friends of your vocation as searchers, companions in your fatigues, admirers of your successes and, if necessary, consolers in your discouragement and your failures.” The Council ardently encouraged them to continue the search “without tiring and without ever despairing of the truth.”

The Main Ideas of the Council

Importance of Science in Contemporary Society. The council correctly emphasized the fact that in the contemporary world science was fast becoming the foundation of intellectual formation. *Lumen gentium* says: “Intellectual formation is ever increasingly based on the mathematical and natural sciences and on those dealing with man himself, while in the practical order the technology which stems from these sciences takes on mounting precedence.” Furthermore, “Technology is transforming the face of the earth, and is already trying to master outer space.” The advances in the biological and social sciences too are equally powerful and effective: “Advances in biology, psychology, and the social sciences not only bring men hope of improved self-knowledge. In conjunction with technical methods, they are also helping men to exert direct

influence on the life of social groups.” In short, in our contemporary world, intellectual formation is very much colored and controlled by science and technology. The council was in praise of the methodology of science also. “If methodical investigation within every branch of learning is carried out in a genuinely scientific manner and in accordance with moral norms, it never truly conflicts with faith. For earthly matters and the concerns of faith derive from the same God.” It also affirmed “the legitimate autonomy of human culture and especially of the sciences.”

Genuine Appreciation of the Achievements of Science. According to Vatican II, far from being the devious devices of the devil, science and technology are a boon to humanity, ordained by divine dispensation. “By divine favour, especially in modern times, human genius has produced from natural material astonishing inventions in the field of technology.” The Church gladly welcomes them: “As a Mother, the Church welcomes and watches such inventions with special concern.... Mother Church, to be sure, recognizes that if these instruments are rightly used they bring solid nourishment to the human race.”

Science as an Affirmation of Human Dignity – Human Partnership in Creation. In a way, science is a powerful affirmation of human dignity and greatness and provides humans with a most effective means to collaborate with the Creator in the ongoing plan of creation. “When with the aid of technology man develops the earth ... he simultaneously obeys the great Christian commandment that he place himself at the service of his brother men.” A prudential, judicious engagement in science can elevate humans to a higher and more sublime level of moral and intellectual life. “Furthermore, when a man applies himself to the various disciplines ... of mathematical and natural science, he can do very much to elevate the human family to a more sublime understanding of truth, goodness, and beauty, and to the formation of judgments which embody universal values.”

Science Education for Priests and Other Leaders. The council emphasizes the need for

science education both for Church leaders like priests and the laity. This point is emphasized in the “Decree on Priestly Formation” and in the “Declaration on Christian Education.” In institutions of higher learning, the Church wants “in a systematic way to have individual branches of knowledge studied according to their own proper principles and methods, and with due freedom of scientific investigation.” According to it, “Catholic colleges and universities and their faculties should give the maximum support to institutes which primarily serve the progress of scientific research.”

The Impact of Science on Theology. According to the Council, theology is an important beneficiary of these scientific developments because they can “stimulate the mind to a more accurate and penetrating grasp of the faith. For recent studies and findings of science, history, and philosophy raise new questions which influence life and demand new theological investigations.” Hence, the council urges theology to be in constant touch with developments in the sciences, “through a sharing of resources and points of view,” collaborating “with men well versed in the other sciences,” and seeking “a profound understanding of revealed truth without neglecting close contact with its own times.”

Science at the Service of the Church’s Pastoral Mission. The council readily acknowledges and appreciates the positive values accruing from the scientific spirit such as fidelity to truth, team spirit, etc., Science and its findings can be equally beneficial in the area of pastoral care. The council reminds pastors and other ministers to make use “in pastoral care ... the findings of the secular sciences, especially of psychology and sociology.” In fact, it wants the faithful to “blend modern science and its theories with Christian morality and doctrine. Thus their religious practice and morality can keep pace with their scientific knowledge and with an ever-advancing technology.”

Openness to the Dynamic Worldview of Science. Vatican II in some ways shows an openness to the scientific dynamic worldview in which change is an essential part, particularly in

Gaudium et spes, “Pastoral Constitution on the Church in the Modern World of Today,” where it says: “The human race has passed from a rather static concept of reality to a more dynamic, evolutionary one.” The consequences of this paradigm shift are enormous, and the Council, well aware of this fact, observes: “In consequence, there has arisen a new series of problems, a series as important as can be, calling for new efforts of analysis and synthesis.” This sensitivity to the dynamic worldview of modern science and this openness to its consequences played a crucial role in defining the Council’s attitude to science and technology. They can play a pivotal role in fostering a constructive and creative dialogue between Christianity and modern science.

Holistic Approach Toward the Divine and the Human. Vatican II encourages a holistic approach to the divine and the human, the supernatural and the natural. It looks for “a spiritual renewal from which will also flow a happy impulse on behalf of human values such as scientific discoveries, technological advances, and a wider diffusion of knowledge,” indicating a close link between spiritual renewal and scientific activities, an idea reminiscent of the thought of Teilhard de Chardin. A very positive attitude toward the world that was created by God who “found it good” can never be alien to the Church of God.

No Excessive Importance of Science. As Pope John made very clear, the Church has been a vigilant and alert observer of scientific developments, following “step by step the evolution of peoples, scientific progress, and social evolution.” At the same time, it “does not neglect to admonish men so that, over and above sense – perceived things – they may raise their eyes to God.” It has taken pains to distinguish between “excesses associated with a spirit of scientism and the permanently valid achievements of the positive sciences over the past few centuries.” While recognizing the legitimate independence of the world of science, it always rejects the false sense of independence, which is taken to mean that “created things do not depend on God, and that man can use them without any reference to their God.”

Conclusion

Our brief survey reveals considerable difference between Vatican I and Vatican II in many respects. Perhaps one of the main reasons for this marked difference was the attitude each had toward science. For Vatican I, science was a contender to be tackled firmly and decisively. For Vatican II, science is a partner with whom the Church needs to collaborate in an ongoing search for truth. It seems clear that this spirit will continue as Pope John Paul wrote to Fr. George Coyne, SJ, in 1988, the then Director of Vatican Observatory: “The truth of the matter is that the Church and the scientific community will inevitably interact; their options do not include isolation.”

Cross-References

- [Christian Cosmology](#)
- [Christianity](#)
- [Determinism and Indeterminism](#)
- [Evolution](#)
- [Mechanics](#)
- [Philosophy of Science](#)
- [Physics in Christianity](#)
- [Quantum Theory](#)
- [Rationality \(Philosophical\)](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Catholic Perspectives in Sociology

► Catholic Sociology

Catholic Social Science

► Catholic Sociology

Catholic Sociology

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Related Terms

[Catholic perspectives in sociology](#); [Catholic social science](#); [Faith and reason](#); [Religious sociology](#)

Description

A Catholic sociology is a subdiscipline within the broader discipline of sociology. It builds on generally agreed upon insights about the role of basic sociological considerations in an analysis of social life (e.g., culture, socialization, groups, social stratification, etc.). It also follows the generally accepted canons of social science research in terms of issues, such as method, evidence, and reasoning. Catholic sociology is sociology that takes the sociological enterprise seriously, is consciously upfront and explicit about its fundamental assumptions, and aims to contribute to its positive development by enriching the internal intellectual exchanges within the general discipline.

At the same time, a Catholic sociology attempts selectively to incorporate elements of

Catholic theological and philosophical analysis into both the “front” and “back” ends of its overall analysis, that is, respectively, into its theoretical framework and into a range of possible social policy suggestions that are consistent with its cognitive analysis of social life. A Catholic sociology argues both the inevitability and desirability vis-à-vis, respectively, theory and public policy, of incorporating elements of, and concepts from, normative analysis, especially as derived from the Catholic social doctrine, Catholic social thought, and “natural law” analysis. It does so without compromising its cognitive function and mission of arriving at a truthful and objective depiction of social reality. Examples of such incorporated elements and concepts would be the fundamental dignity of the human being made in the image of God; the individual viewed ultimately as a spiritual being with a soul and eternal destiny; the individual characterized as possessing free will and viewed as a responsible social agent with both duties and rights; a concern for the common good; subsidiarity; solidarity; the family as the basic cell of civilization; and the compatibility and complementary nature of faith and reason. Such an interdependent, three-tiered conception of a Catholic sociology has developed slowly, in fits and spurts, over the past century and a half. This is the result of two processes. The first is an increasing awareness that there are limits to the useful employment of specialization in research. The second is an increasing awareness of intellectual freedom to socially construct and modify intellectual perspectives encouraged in the current “post-modern” culture.

A Catholic sociology is consistent with the argument of the Protestant scholar, George Marsden (*The Outrageous Idea of Christian Scholarship*), that Christian ideas can and should be incorporated into academia in a way that does not violate reasonable, tradition-tested, and widely accepted philosophical and methodological conventions. For Marsden, whether religious or secular in nature, worldviews “help shape not only our overt ways of valuing things, but also our priorities. What do we see as important to study? What is it about that subject which makes it interesting? What are the questions we ask that

will organize our interpretations of this topic? What theories do we entertain as relevant to our interpretations? What theories do we rule out?" (1997: 63). The Catholic sociologist Joseph A. Varacalli similarly offers a fivefold classificatory scheme of the impact of values on the social scientific enterprise involving (1) *motivation*, or in some cases, *ideological agenda*; (2) *choice of research project or social problem*; (3) *selection of data as relevant* or, conversely, aspects of social reality ignored; (4) *interpretation of data, involving analytical concepts, definitions, and theoretical frameworks employed*; and (5) *possible social policy recommendations* (Varacalli 2000: 7–8).

Both the formulations of Marsden and Varacalli are consistent with the claim that, while any investigation takes place within a given frame, there is a responsibility to dialogue with other frames as well as search out and document whatever is perennial in social life. The sentiments of Marsden and Varacalli are consistent with that of Ralph Gallagher, the first president of the American Catholic Sociological Society (founded in 1938), who declared that "there *is* such a thing as a Catholic sociology, for sociology is not, in the full sense of the word, an exact science. The method of investigation, the assembling of data, the conclusions drawn depend frequently upon the thought and philosophy of the investigator." Gallagher quickly added, however, that "...certainly we can learn much from those whose approach is different from ours. They have much to contribute in the field of method and research. We have no intention of becoming advocates of intellectual isolation" (quoted in Varacalli 1990: 249). Following the general direction of the Catholic sociologist of knowledge, Werner Stark (*The Sociology of Knowledge*), a premise of a Catholic sociology is that the pursuit of truth must work its way *through* culture and society, accepting and emphasizing those conceptual elements and visions of humanity that can justifiably lay claim to a perennial status, thus separating itself from the contingent and utopian. Stark argues that, through a careful analysis of sociohistorical reality, "the absolute is

recognizable...in, through, and under the relative... 'to the absolute through the relative is our device'" (1958: 196).

One characteristic of a Catholic sociology is a "moderate integration" between the metaphysical, empirical, and social reform realms of analysis. This characteristic generally separates a Catholic sociology from more conventional understandings of the discipline, the latter which tend not to address its own metaphysical presuppositions. A Catholic sociology, as such, rejects the argument of Max Weber about the possibility of "value-free" sociology.

A Catholic sociology would respond to those who advocate Weber's view that, to the contrary, the mutually agreed upon goal of objectivity in social research requires two procedures. The first is the introduction of a theoretical/conceptual framework derived from, or consistent with, the natural law and Catholic social doctrine and thought. The second, methodologically, is the conscious juxtaposition of competing frameworks, pace Karl Mannheim (*Ideology and Utopia*), as an aid in reaching a truthful and comprehensive analysis of issues of major ethical import.

In his *Ideology and Utopia*, Mannheim proposed that a "socially unattached intelligentsia" could approximate objectivity in analysis by comparing competing existentially based social and historical perspectives in the attempt to weed out ideological distortion and structurally based biases. Many scholars, including non-Catholics, have concluded that Mannheim's methodology, while broadening academic discourse, has not provided, in and by itself, an escape route from error and a path toward truth. For the Catholic sociologist, any path toward truth additionally must acknowledge some metaphysically based natural law-like analysis or a phenomenological analysis connecting an absolute realm of eternal values with the relativities involved in empirical analysis (Varacalli 2012: 103).

Following the logic of Jacques Maritain in *The Peasant of the Garonne*, the metaphysical, empirical, and social reform levels of analysis in Catholic sociological research are interdependent and mutually shaping. For Maritain, "between

faith and reason, as between grace and nature, there is essential distinction and one sometimes tends to lose sight of it. . . But between faith and reason, as between grace and nature, there is no separation. One tends to overlook that too. . . Things are that way, and so is life; there is distinction without separation" (1968: 166–167).

That there can and should be a moderate integration between the metaphysical, empirical, and social policy levels of analysis points to the assertion of a Catholic sociology that the general discipline of sociology is itself not fully self-contained but only semi-autonomous and interdependent. Just *why* the broader discipline of sociology has posited a rigid segregation between fields of knowledge is an important question that involves many partial answers. Among others, these involve an overreliance on the positivistic scholarly tradition; the perceived need to defend the integrity of sociology vis-à-vis religion, philosophy, and the humanities; and the desire of sociologists to capitalize on the status and material benefits that accompany the "scientific" label.

There is no doubt that, with few exceptions, there is vigorous opposition on the part of the mainstream sociological establishment to any sociological connection with a metaphysical realm. As one of the most accomplished and respected sociologists in the history of the discipline, Robert Merton, puts it in his critique of the work of Max Scheler, any discussion of "absolutes" is "wholly foreign to empirical inquiry" (1957: 472). The response of a Catholic sociologist to this claim is that *all* sociologies are tied to what the sociologist Alvin Gouldner (*Enter Plato*) termed basic, foundational, or "domain" assumptions about the nature of reality, society, and human beings. These domain assumptions can be found (to whatever degree, either explicitly or implicitly) in the Calvinism in the work of Talcott Parsons and Robert N. Bellah, the Marxism in the work of C. Wright Mills, the Lutheran heritage in the work of Peter L. Berger, the portrayal of the radically "protean" or "plastic" nature of the human being in the work of the symbolic interactionist Herbert Blumer or the dramaturgical approach of Erving Goffman, in

the atheistic existentialism in Stanford Lyman's and Marvin Scott's "sociology of the absurd," in the behaviorist assumptions underlying a rigorist mathematical sociology, and so forth.

The Catholic sociological call for a "moderate integration" does not deny, conversely, the necessity, inevitability, and desirability of some significant degree of disentanglement of social science from, first, theology; second, philosophy; and, third, social policy. What the former *does* argue is that specialization has proceeded too far, producing sub-universes of meaning that are compartmentalized and mask inevitable interdependencies, thus doing an injustice to the intellectual requirement to produce comprehensive and holistic analyses of life that nonetheless are capable of making and acknowledging subtle and necessary distinctions between faith and reason and metaphysics and empirical reality. Max Scheler's critique, in his *Problems of a Sociology of Knowledge*, of Auguste Comte's zero-sum evolutionary movement from *myth* to *philosophy* to *science* (or a positivistic social science) is quite consistent with the Catholic position regarding the relationship, over time, of those social constructions based on the absolute to those that more reflect a relative cultural ethos. For Scheler (1980), the absolute is ever present throughout time and space in the form of an eternally valid hierarchy of values although any specific cultural ethos may distort the true ordering of these values. When this happens, for Scheler (1980: 13–23), various "disorders of the heart" are produced, that is, pathologies at the level of both society and the individual.

The Catholic appropriation of sociology sets itself up in sharp relief from either of the two current and major alternatives in the field, that is, the *ideological* and *positivistic* models as discussed by the sociologist Peter L. Berger (2011). The ideological perspective, which gained political dominance in the mid-1960s in the contemporary academy, assumes two things. The first is that the political cause of choice is more important than the integrity of the scholarly process. The second is that the reality that the philosophy and personal values of the researcher affects the nature of the research process makes

the goal of objectivity an impossible one, representing nothing more than a clever rationalization and intellectual tool used by the guardians of the political *status quo*. The positivistic model, while arguing for objectivity, tends to view the individual and the individual scholar as devoid of free will, creativity, and responsibility. Generally, it has fallen into the trap of a methodological fetishism encouraged by a hyper-specialization focusing on topics of little or no importance to those concerned with the construction of a “good society.” The goal of a “Catholic sociology,” in contrast, is to analyze and reconstruct the social order on the basis of sound/right reason and empirical evidence. What makes it a “Catholic” sociology is the application, when appropriate, of insights and sensibilities developed within the corpus of Catholic social theory to the existing body of sound social scientific theory, concepts, and methods, and through a thorough public exchange (Varacalli 2000: 6–11).

There are multiple (empirically existing and theoretically possible) versions of a “Catholic sociology.” This complexity results from considerations involving intellectual pluralism and prudential application. Regarding intellectual pluralism, the individual Catholic sociologist can make recourse to a variety of theological and philosophical schools of thought, assuming that the latter can be plausibly judged as existing within the broad parameters of a Catholic worldview. Another consideration is that the discipline of sociology itself contains many – and in certain cases, seemingly disparate – theories and schools of thought. While none of the major options within the broader sociological tradition are, in and by themselves, consistent with a Catholic logic, some can claim a closer affinity to Catholic thought than others. For instance, and although differing from each other in significant ways, the “structural-functionalism” of Talcott Parsons with its organic understanding of social institutional arrangements and its discussion of a “telic” system, and the “integral” sociology of the Russian Orthodox sociologist, Pitirim A. Sorokin, with its linking of the empirical, rational, and other-worldly transcendent realms of analysis,

bears certain affinities with the thought of St. Thomas Aquinas. Likewise, the “debunking” sociology of the liberal Lutheran sociologist, Peter L. Berger, shares some affinity with the thought of St. Augustine. Other sociologies are harder to reconcile, if the Catholic sociologist affirms the parameters of acceptability as outlined by the magisterium (or teaching authority) of the Catholic Church. Regarding the issue of prudential application, there can be a broad array (albeit not of an indiscriminate nature) of possible social policy recommendations that flow from the cognitive analysis of a Catholic sociology. In other words, there are various licit and legitimately debatable means toward instituting the common good.

This brings up the reality that there are both “official” and “unofficial” versions of a Catholic sociology. The former accepts the parameters of the Church’s teaching authority (or *magisterium*) as the field from which its intellectual and normative formulations are chosen. The latter refuses to do so, arguing, pace the logic of “Christ of culture” thinkers like Harvey Cox (*The Secular City*), that any social construction can be consistent with a Catholicism undergoing constant, even radical, and officially unsupervised change. In his *A Theology of Liberation*, for instance, Gustavo Gutierrez, offered a “Marxist-Catholic” synthesis widely viewed by orthodox Catholic scholars as reducing the Catholic faith to Marxist categories of thought along the lines of the general methodological critique offered in two statements issued by the Congregation for the Propagation of the Faith whose prefect was the then Cardinal Joseph Ratzinger. These statements are the 1984 *Instruction on Certain Aspects of the ‘Theology of Liberation’* and the 1986 *Instruction on Christian Freedom and Liberation*. Also relevant is the document published by the Congregation for Catholic Education in 1989, that is, *Guidelines for the Study and Teaching of the Church’s Social Doctrine in the Formation of Priests*. There are currently a plethora of unofficial (and mostly implicit) Catholic sociologies accepting concepts and theories (e.g., “androgyny” for radical feminists and “queer theory” for homosexual activists) which

advocate positions fundamentally at odds with an official Catholic understanding of human nature and the overall magisterial worldview. Many, although not all, of these nonmagisterial understandings derive from a radical, “post-modern” interpretation of “social constructionism” for both the discipline of sociology and for the broader civilization; others derive from the acceptance of various visions of life based on “modern” philosophies whose root assumptions are incompatible with a Catholic vision (e.g., Communism, Freudianism, *laissez faire* Capitalism).

It should be stated immediately that the role of the Magisterium vis-à-vis a Catholic sociology is subtle. Positively viewed, it is a source of inspiration regarding insights about human and social existence. It does not enter, as a matter of everyday routine, into specific sociological debates. Periodically, it produces statements when schools of thought or individual scholars explicitly negate fundamental assumptions about the existence of God, the nature of society, the individual, and their relationships.

The origins of the idea of a Catholic sociology arose concomitant with the development of the general discipline. It developed “negatively,” that is, in reaction to the non-Catholic elements influencing the emergence of the discipline (whether inspired by Auguste Comte, Herbert Spencer, Karl Marx, Emile Durkheim, or liberal Protestant thinkers). The idea also developed “positively,” that is, originally in “proto”-Catholic sociological form, in response to the developing tradition of social Catholicism (Williams 1950). The social apostolates promoted by, for instance, Bishop William Emmanuel von Ketteler (1811–1877) in Germany and Edward Henry Cardinal Manning (1808–1892) in England both influenced the content of the social encyclical, *Rerum Novarum*, in 1891 and contained implicit sociological analyses of civilization.

In Europe, sociology as a general intellectual perspective developed as a response to the forces of exaggerated social change that tended to undermine what the social philosopher, Alfred Schutz, termed the “taken-for-granted”

assumptions of social life, especially from the nineteenth century forward. These social forces included ideas derived from the eighteenth century Age of the Enlightenment and the rise of science, structural developments like industrialization and urbanization, and historical events like the American and French Revolutions and *Il Risorgimento* in Italy. The resulting volcanic changes produced a general divide between those ascendant sectors strongly progressive and secular and those defending tradition, the *status quo*, and tied to the aristocracy and a defense of its rigid system of social stratification. For most of the European founders, the various sociological formulations were viewed as enlightened substitutes for religion, whose function was not merely cognitive but served as functional replacements and equivalents for religion. This cultural, religious, social, and academic divide placed those advocating a reconciliation between Catholicism and the newly emerging and “modern” discipline of sociology in a “no man’s land.” Relevant here are the stages of history as discussed by the Catholic historian/sociologist, Christopher Dawson. As Edward King notes, “Dawson characterized his sixth and final historical era as that of ‘secularized Christendom and the Age of Revolution’ which spanned from the eighteenth century to the present... (This)... is Christendom with a profound spiritual vacuum at its core, and its history over three centuries shows the rise of a series of secular prophets who sought to fill this vacuum” (2007: 280).

Nonetheless, there were individual attempts to make such a negotiation between Catholicism and sociology. Increasingly more articulate Catholic sociological formulations were created by such figures as Christopher Dawson (1889–1970) in England (and later the United States), Frederic LePlay (1806–1882) in France, Cardinal Joseph Hoffner (1906–1987) in Germany, and Don Luigi Sturzo (1871–1959) in Italy. These individual scholarly attempts were part of the same social matrix which saw the emergence of Catholic social doctrine in the form of such encyclicals as *Rerum Novarum* (1891) and *Quadragesimo Anno* (1931). These attempts tried to address the needs of the “social

question” for the majority mired at the societal periphery and to provide a Catholic critique and alternative to such secular ideologies as capitalism, socialism, and Communism.

In the American context, the proto-Catholic sociologists fought their own two-front war. The first front opposed the liberal Protestant Social Gospel movement dominant at the turn into the twentieth century which focused on establishing “God’s Kingdom here on earth.” After the carnage of World War I, the second front opposed the newly emerging heirs to Auguste Comte, in the form of such positivistic sociologists like William Ogburn (1886–1959) and George Lundberg (1895–1966). Some key early founders of a Catholic sociology/social science in the United States were William J. Kirby (1870–1936), Monsignor Paul Hanly Furfey (1896–1992), and Eva J. Ross (1903–1969).

The attempt from 1938 to 1970 to institutionalize Catholic sociology in the United States through the American Catholic Sociological Society failed primarily because of several inter-related reasons. One was a lack of institutional support from an institutional Church where the majority of its scholars felt secure that truth could be approached almost exclusively through the deductive disciplines of theology and philosophy. Another was the still working-class backgrounds of most Catholics, a reality not amenable to a wide-scale acceptance of the utility of social science perspectives. Another was the desire of young Catholic sociologists and social scientists trained in secular universities to conform to the standards of the mainstream and secular profession.

Regarding the latter reason, the secularization that overtook the A.C.S.S. and many other Catholic scholarly organizations in the post-Vatican II period involved an interpretation of the significance of the theology of Vatican II (1962–1966) for Catholic scholarship that argued, basically, that the state of existing Catholic scholarship was inferior to the secular scholarship of the time. An important argument laying the groundwork for this line of thinking was the essay of the influential, progressive American Catholic historian, Monsignor John

Tracy Ellis, *American Catholics and the Intellectual Life* published in 1956.

Advocates of a Catholic sociology made the contrary claim that the Council actually affirmed the need for Catholics to engage in public dialogue about what their religion – with its intellectual heritage – had to offer to both the world and sociology. In their view, the Council was incorrectly interpreted as signaling the obsolescence of the ideal of distinctive Catholic intellectual approaches (Varacalli 1990: 250–251). As such, the transformation of the American Catholic Sociological Society into the Sociology of Religion in 1970 was viewed an indicator of the power of assimilation into the mainstream conventions of the secular discipline of sociology, with more than a few of these conventions subject to legitimate criticism from a Catholic intellectual perspective.

However, that same secularization was also an indicator of the weak tradition of, general lack of competency in, and lack of enthusiasm for, the social science enterprise on the part of the Catholic Church and Catholics in general vis-à-vis the more completely secularized and progressive camps within the overall discipline of sociology. For decades after the conclusion of the Second Vatican Council, either an overt secularization or a more subtle “secularization from within,” continued to erode any effective interface between Catholicism and sociology, thus attenuating, to the point of utter dormancy, the reality of an official Catholic sociology. This secularizing movement was carried, variously, by the general processes of assimilation into an increasingly less religious society and specifically fomented by Catholic progressive elites.

This trend has now started to be reversed, in part, a consequence of Pope John Paul II’s “new evangelization.” Also, the importance of social science research has increasingly been accepted, in a “taken-for-granted” fashion, by most of the increasing percentage of formally educated Catholics in the contemporary world. As but one indicator of this, the Society of Catholic Social Scientists was formed in 1992, convening annual national conferences; publishing a journal, the *Catholic Social Science Review*;

and instituting a book series on the themes of Catholic social thought and the connection between Catholicism and the social science disciplines. Most relevant to the discussion of a Catholic sociology is the substantial volume put together and edited by Stephen R. Sharkey, *Sociology and Catholic Social Teaching: Contemporary Theory and Research* (2012). Sharkey provides a range of contemporary social scientists from both the S.C.S.S. and the Pontifical Academy of Social Sciences who use their theoretical and empirical work to serve both the Church and the broader civilization. In his discussion, he also notes other contemporary schools of thought that can serve to foster a vivifying exchange between religion and sociology (e.g., “personalist critical realism” and “integral sociology,” the latter based on the work of Pitirim Sorokin).

While the S.C.S.S. has made substantial internal progress over its first 20 years, its ultimate fate is tied to such issues as the general reception of the idea of specifically Catholic perspectives in scholarship among its membership, the state of Catholicism within the broader American and world civilization, as well as the direction of the internal currents of the sociological profession. Regarding the latter, Sharkey suggests that the prospects of a Catholic sociology are superior in the present post-modern society for two interrelated and overlapping reasons. The first is that post-modern society is characterized by a greater self-reflexivity vis-à-vis the immediately preceding post-traditional, “modern” era. The second is the growing rejection both of positivistic notions of a “value-free” sociology and overt ideological scholarship.

Self-Identification

Science

A “Catholic sociology” is a subdiscipline of sociology which itself is an example of a social science. Social science perspectives can lean in either the scientific or humanistic direction. Without violating the scholarly canons for

empirical research, a Catholic sociology definitely leans in the humanistic direction emerging, in part, because of its rejection of the inadequacies of the pseudo-scientism of positivism.

Religion

An “official” Catholic sociology is *not* defined as a “religion.” A semi-autonomous Catholic sociology is viewed by its advocates as a licit *means* to actualizing one’s primary religious, intellectual, and moral commitments to a Catholic worldview. However, an “unofficial” Catholic sociology could be defined as a religion, following what sociologists refer to as a “functional definition” of religion. So defined, an unofficial Catholic sociology combines a scholarly analysis of Catholicism and religion with either an ultimate interest in promoting autonomy in intellectual, religious, and moral affairs or in some other essentially secular philosophy/worldview.

Characteristics

A Catholic sociology draws on the distinctive insights of human personhood and sociability inhering in the Catholic intellectual tradition. Catholic sociology as a subdiscipline is distinctive in at least several ways. One is the Catholic conviction that faith and reason are compatible and mutually supportive. Another is in the attempt to systematically relate and demonstrate interdependencies between normative and cognitive analyses, between, more specifically, the realms of metaphysics, empirical research, and social policy. Yet another is its attempt to reintegrate knowledge and produce holistic knowledge in order to provide analyses of social existence that are comprehensive, subtle, and complex.

Relevance to Science and Religion

A Catholic sociology is certainly interested in and can contribute to the scholarly area called “Science and Religion.” A Catholic sociology accepts the idea that the discipline of sociology

has inclusive tendencies, that is, that it can and should incorporate the insights of interdisciplinary research. A Catholic sociology also views the scientific enterprise as not fully autonomous, that is, that scientific activity, while maintaining a legitimate semi-autonomous status that resists any facile reduction to nonscientific considerations, is both affected by cultural and social factors and has tremendous consequences for the civilization in which it operates. The actual and potential implications of current biotechnological revolution for civilization highlight the latter claim.

Sources of Authority

There are dual sources of authority for the idea of a Catholic sociology. The first source comes from the secular mainstream tradition of the discipline of sociology in the form of what has been termed “basic sociology,” (James M. Henslin, *Essentials of Sociology: A Down to Earth Approach*, Ninth Edition). This tradition stresses certain fundamental postulates. One would be an emphasis, relative to most philosophical and theological thought, on empirical reality. Another would be the goal of objectivity. Another involves the requirement that all aspects of the research process be open for review and accountability and be conducted under ethical guidelines.

The second source of authority for the subdiscipline is found within the corpus of Catholic social thought. Given the present influence of both positivistic and ideological thinking, Catholic sources of authority for this subdiscipline are not widely recognized outside the sphere of “official” Catholic thinking or that relatively small segment of religious thinkers who utilize the sociological discipline in their various religious, intellectual, and policy “apostolates” and “ministries.”

The establishment of a “Catholic social science” was first called for in official Catholic circles by Pope Pius XI in his important encyclical, *Quadragesimo Anno*, #20, (1931). This important social encyclical was produced

40 years after the publication of what is generally acknowledged as the first great social encyclical, *Rerum Novarum*, issued by Pope Leo XIII in 1891 as a response to the conditions of the working classes as the dysfunctions of the industrial revolution in Europe became manifest. Building on more than 100 years of development within the corpus of Catholic social thought since the publication of *Rerum Novarum*, Pope John Paul II established the Pontifical Academy of Social Sciences in Rome in 1994. According to the Vatican web site, the Pontifical Academy of Social Sciences was founded “with the aim of promoting the study and progress of the social sciences, primarily economics, sociology, law, and political science, thus offering the Church those elements which she can use in the development of her social doctrine, and... (in)... reflecting on the application of that doctrine in contemporary society.” While the Pontifical Academy has not addressed yet the specific issue of to what degree and in what ways the social sciences can be “Catholicized,” the idea that objective social science can contribute to Catholic social thought and the broader civilization represents some initial positive movement in the direction of a fruitful exchange between Catholic social thought and the mainstream tradition of the discipline.

As of now, however, a deliberate Catholic sociology exists in more or less restricted circles. Mention should also be made regarding the debatable issue of the degree to which the principles of a Catholic sociology (e.g., a positive role for values in the research process, a concern for human dignity and social justice – as understood in official Catholic sources – have started to become institutionalized in Catholic colleges and universities).

The widespread “plausibility” of a “Catholic sociology” depends on two related issues. The first is the possibility of a revitalization of Catholicism/Christianity in world civilization and within the secular academy. The second, conversely, involves the issue of whether the concurrent debunking of the monopolistic status and claims of both positivism and of ideological

thinking within secular academic circles will continue into the future. There are two questions here. The first is whether the Catholic intellectual community has the will and ability to develop more fully a Catholic sociology. The second is whether there might be a change in attitude in social science circles regarding the idea that the cognitive and normative claims of traditional religion can contribute in a positive manner to intellectual discourse.

Ethical Principles

There are several distinctive overriding ethical principles which inform Catholic sociology as reflected in the Catholic intellectual tradition and especially within the social encyclicals. The first is to pursue truth, wherever that truth may lead. A second and third is that the subdiscipline serves the interests of the common good and the fundamental dignity of the individual, in terms of the latter's integral human needs, both spiritual and material.

Key Values

There are several key values for the subdiscipline of a "Catholic sociology." One is that human beings are constitutively "cultural and spiritual creatures," however modified by an awareness that cultural and spiritual realities are mediated and affected by (but not reduced to) material states of being, historical and personal realities and exigencies, and by a human nature that, while variegated in its manifold expressions, is essentially common and unchanging. Another is that human beings are not merely products of their "social location." The power of the human mind to reflect on the nature, causes, and impact of socialization create the grounds for the assignment of responsibility for human thinking and action, however mitigated by such factors as the nature of one's inherited and present social environment, stage of human development, and state of mental health. Another key value is the

positing of the inevitable interaction of a metaphysical realm with both society and sociology in the form of the natural law or its equivalent that helps provide a yardstick in social analysis allowing one to partially transcend the empirical reality of relativism. Another value is the positing of the existence of a supernatural realm which rejects the idea that all phenomena in social life can be completely and neatly explained. Both the nature of the individual – marked by an essential freedom and some degree of unpredictability – and his/her orientation to the transcendent realm presuppose that some of social life remains "mysterious." From a Catholic sociological perspective, put another way, no finite human agency has the ability to understand all of reality in its fullness and complexity. Finally, one of the constitutive goals of a Catholic sociology, given its positing of the ultimate other-worldly destiny of human beings, is as an aid to the individual in reaching the beatific vision.

Conceptualization

In addressing the following issues, it is important to preface the respective discussions by noting that a Catholic sociology affirms the religious/transcendent realm, especially as it conceptualized within the Catholic tradition.

Nature/World

The essence or substance of the created universe, including both the supernatural and the social universe, knowledge of which can be studied objectively through the use of the natural, social, and theological intellectual disciplines. From a Catholic sociological perspective, any understanding of earthly life, with its promotion of the essential dignity of the human being, must be integrated into a larger transcendent vision which understands that the ultimate origins of life come from God and that the ultimate destiny of the human being is the beatific vision. It is the social universe as it intersects with the natural and transcendent realms that is the special purview of a Catholic sociology as discussed by,

among others, the early Catholic sociologist, Don Luigi Sturzo.

Human Being

The individual, possessing both a body and soul, and capable of rational thought, voluntary action, and reaching truth, whose rights and duties derive from God through the natural law. Constitutive components of the human being as depicted by a Catholic sociology include a foundational spiritual and cultural dimension as well as the operation of the “natural law” written into the heart.

Life and Death

Viewed in terms of the earthly existence of the human being, activity which begins at the moment of conception and terminates with earthly death. Theologically, the soul continues in the next life within the spheres of Heaven, Hell, or temporarily, Purgatory. A Catholic sociology, in its social policy aspects, is committed to protecting and promoting the fundamental dignity all human life from the moment of conception through natural death.

Reality

All that exists objectively in the natural and social universe, that is, outside the mind of the individual. Regarding social existence, the dictum of the classical sociologist, Emile Durkheim, is relevant, that is, that “social facts are things.” One focus of a Catholic sociology is the determination of which social constructions are consistent with the natural law.

Knowledge

The cognitive understanding of God, the historical and social universe, the individual, and their relationships. Knowledge is acquired through reason and the senses but is aided and strengthened by revealed truth and the invisible operations of grace. A Catholic sociology takes from the sociology of knowledge the distinction between the “plausibility” and “truthfulness” of knowledge claims. Regarding the former, it accepts the dictum of the early “Chicago school” sociologist, W.I. Thomas, that “if something is

defined as real, it is real in its consequences.” However, following such scholars as Werner Stark and Max Scheler, it also considers one of its goals the pursuit of truth through a scholarly and discerning analysis of society, the human being, and the dialectical relationship between the two.

Truth

Objective factual/cognitive reality in the natural universe and objective factual/cognitive and moral/normative reality in the social universe, reached through the two complimentary wings of faith and reason. The desire to know the truth is intrinsic to the human being. A distinguishing characteristic of a Catholic sociology is the goal to identify truth and morality in society and social relations.

Perception

A way of understanding or interpreting. A Catholic sociology accepts, but only as a partial truth, that varying cognitive and normative understandings of reality inevitably are generated by the sociological reality of a differential socialization along a host of variables (e.g., cultural context, socioeconomic class, age, cohort, education, region, occupation, lifestyle, etc.). These cognitive and normative definitions are amenable, to a certain degree, to being documented through conventional sociological research. However, Catholic sociologists also affirm a deeper form of knowledge that comes not from purely empirical data gathering techniques but from the exercise of what the early Catholic sociologist, Monsignor Paul Hanly Furfey, referred to as “noesis” or the ability of the mind to immediately perceive certain truths or fundamental essences in the tradition of Plato and, derivatively, in the Catholic sociological work of scholars like Max Scheler and Werner Stark.

Time

The sum total of past, present, and future periods of existence. A Catholic sociology simultaneously takes into account different secular and religious conceptions of the temporal without violating the overall Catholic narrative on the

purpose of meaning of human existence. These include a straightforward understanding of chronological time; time understood as divided into cultural, political, and historical categories (e.g., the “Age of the Enlightenment”); time viewed from contrasting traditional and modern perspectives (e.g., the past as eternally present vs. a future open to human calculation and planning); and time viewed from a perspective centering on the creation of the universe by God, the historical reality and salvific mission of Jesus Christ, and the future anticipation of God’s plans for civilization and humanity.

Consciousness

A subjective and immediate awareness either of the external world and transcendent realm or of some intra-subjective mental state. Relatedly, individual consciousness/conscience may or may not be more or less in line with objective reality/truth/morality depending on a combination of circumstance, choice, and grace. One tenet of a Catholic sociology is that consciousness/conscience is in a dialectical relationship with the state of the surrounding civilization and one’s primary group attachments. One important Catholic sociological concern involves an analysis of modern consciousness and the question of its openness to the transcendent realm.

Rationality/Reason

A faculty of the human being to reach or at least approximate truth, despite the reality of original Sin and the inevitability of human error. Reason is meant to be assisted by Faith. Faith without reason produces a fideism which ignores/underplays the reasoning capability of the individual typical of formulations generated by advocates of the Protestant Reformation. Reason without faith produces a rationalism which overextends itself and lends itself to a destructive utopianism typical of advocates of revolutionary thought and action (e.g., French Revolution, Communist revolutions in Russia and, later, China, etc.). One important Catholic sociological concern involves an analysis of the dysfunctions associated with the increased growth of bureaucracies and

the bureaucratic mentality, supposedly based on rationality/reason, in the modern world.

Mystery

The theological, anthropological, and sociological reality that no purely human, finite agency can explain the fullness of the natural, social, and religious universe. The Catholic sociological acceptance of a significant role for mystery in social affairs lends itself strongly to the humanistic and “actionist” perspectives within the overall sociological tradition.

Relevant Themes

The utility and logic of the idea of a “Catholic sociology” depends on more than the exercise of reason and an examination of historical reality. Accepted here is the premise of the sociology of knowledge that ideas do not rise or fall (at least in the short run) on the issue of truth. Rather, all ideas, whether true/logical/useful (or not), depend on what sociologist Peter L. Berger has termed a “social base” or “plausibility structure” (*The Sacred Canopy*). The plausibility of an idea depends significantly on unpredictable future historical developments. It is scholarly paradigm (Thomas S. Kuhn, *The Structure of Scientific Revolutions*; Robert W. Friedrich, *A Sociology of Sociology*) awaiting its moment.

Cross-References

- ▶ [Cognitive Science of Religion](#)
- ▶ [Critical Realism in Theology and Science](#)
- ▶ [Ethics/Moral Theology, Roman-Catholic, Europe](#)
- ▶ [Faith and Belief](#)
- ▶ [History of Ideas \(Intellectual History\)](#)
- ▶ [Interreligious Dialogue](#)
- ▶ [Knowledge, Sociology of](#)
- ▶ [Religion, Sociology of](#)
- ▶ [Science and Religion Dialogue and the Interreligious Dialogue](#)
- ▶ [Science and Scientific Knowledge, Sociology of](#)

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Catoptrics

- [Optics in Islam](#)

Causal Inference

- [Attribution/Attribution Theory](#)

Causality

- [Attribution/Attribution Theory](#)

Causality in Physics

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Related Terms

[Causation](#); [Determinism](#); [Fatalism](#); [Predestination](#); [Predictability](#)

Religious Aspects of Causality

Ancient Judaism covers so many centuries that it is not surprising that it does not present a unified picture. The earliest of the literary prophets, such as Amos and Hosea (eighth century BCE), clearly believed that humans have free will, that their future is not predestined, but it is conditional depending on the behavior of the people. Predictions of doom and destruction are meant to instill ethical practices specifically to avert the dire predictions.

Deuteronomy (seventh century BCE) speaks clearly of a choice between following Torah (law) and disobeying it. A certain element of causality (but not predestination) is maintained. The correct choice leads to prosperity and happiness, but the wrong choice leads to ruin (Deuteronomy 30:15–20).

Although Jeremiah (early sixth century BCE) often sounds as though people have choice, he is much more predestinarian than his predecessors. Even his birth is seen as predestined by God, as is his calling as a prophet. Times were much worse; the political, military, and economic welfare of Judah had come close to destruction, and predestination seemed the only explanation: We do not

like it, but God's plan has something good as an outcome.

Prophets of the exile such as Ezekiel and Second Isaiah (Deutero-Isaiah, chs. 40–55 of canonical Isaiah) were preaching to a powerless people. They considered that only God's will and strength could restore the Jews to a measure of freedom and ability to practice their inherited religion. Predestination offered hope.

During the Persian, Greek, and Roman periods, a religious fragmentation of Jewish thought was in place. Pharisees, for example, believed in predestination; Sadducees opposed it. Early Christianity presented a mixture of ideas on the subject. Paul, a former Pharisee, taught predestination. The Gospels are not nearly so clear about it.

Ancient Greek philosophy was concerned with causality. From the religious point of view, the most important figure was Aristotle because his ideas were adopted by Christians and Muslims in the Middle Ages, and his categories are still a part of some schools of Christian philosophy. Aristotle identifies four types of cause:

1. Material (*causa materialis*)
2. Efficient (*causa efficiens*)
3. Formal (*causa formalis*)
4. Final (*causa finalis*)

To illustrate these, consider a house, according to Aristotelian notions of causality.

1. Material: the bricks, mortar, wood, glass, etc.
2. Efficient: the action of the workers who built the house.
3. Formal: the blueprint, the design by which the construction was guided.
4. Final: The owner wished to have a pleasant place to live.

Of these four, only the efficient cause survives in science today. The study of final causes was considered important in the Middle Ages, but it was attacked savagely during the Enlightenment, even though vestiges survive today, often well disguised.

Disagreement about predestination came to a focus in the dispute between Augustine (for predestination) and Pelagius (against it). The former was the clear winner, since he became Saint Augustine, while one speaks of the Pelagian heresy.

In the thirteenth century, Thomas Aquinas took full advantage of manuscripts previously unknown in the West to understand Aristotle and to incorporate his ideas – including those on causality – into his systematic theology. He used causality as one category of proof for the existence of God: For every effect, there is a cause; but a cause is also an effect; by induction there is a chain of causality; either it is an infinite regress (absurd), or there is an uncaused cause, a First Cause, called God.

In the Reformation period, Martin Luther, John Calvin, and Huldreich Zwingli were all strongly in favor of causality and predestination. Luther engaged with Erasmus of Rotterdam (opposed to predestination) in an exchange of treatises on predestination; neither one convinced the other. Confessional documents of the Reformation era appeared among the religious groups of Western Europe. In 1530, the Augsburg Confession (Lutheran) was written and presented publicly by Philip Melancthon. It was very diplomatic about predestination, too much so for Luther. In 1547, the Roman Catholic Church in the Council of Trent adopted similar statements. In 1562, the Church of England adopted the 39 Articles of Religion, of which several deal with predestination; there too an inclusive spirit prevailed, trying to contain a broad spectrum of opinions in the Church. The Lutherans continued to argue over predestination until 1575, when they adopted a Formula of Concord, which was conciliatory toward both sides of the issue. Calvinists met in 1620 at Dordrecht in the Netherlands (Synod of Dort) and adopted a strongly predestinarian statement.

By this time, the state churches of Western Europe had taken a stand, and it was in general forbidden that theologians should debate any more about predestination. Such strictures have been largely ignored in America.

Causality During the Enlightenment

The seventeenth and eighteenth centuries saw a great emphasis on rationality and a rejection of Aristotelian causal categories except the

efficient cause. God was seen as possibly the First Cause, but beyond that no divine action was considered as more than superstition. This is essentially Deism. The action of objects in the world was considered as if they were mechanisms driven by rather impersonal forces, much like cogs in a machine. Political and economic freedoms were mostly not valued, and determinism in nature was accepted, with mechanics as the foremost branch of science.

Descartes, Galileo, and Spinoza were intellectual leaders, pointing the way toward mechanism and determinism. Newton and Huygens formulated mathematical systems for this cause. Newton's laws became the model of enlightenment because they contained the essence of a causal and deterministic outlook.

Newton's second law, $F = ma$, force equals mass times acceleration, takes causal form because acceleration is the second derivative of the spatial position of an object. In other words, velocity is the rate of change of a coordinate, and acceleration is the rate of change of the velocity. If the position and velocity of an object are known at a particular time, and if the forces are known, it becomes possible to calculate the position and the velocity for all subsequent times, and also to calculate backward in time to learn the past history of the object. This condition of the knowledge is mathematical determinism. By the end of the eighteenth century, it was widely accepted as the way the world works.

David Hume wrote on causality and did not repudiate Newton. His writings had a great influence on Immanuel Kant, who examined every aspect of causality that was accessible at that time (Torretti, ch. 3). Hume added further causal conditions, most notably the requirements of sequence and contiguity. Both of these appear to be plain common sense: The cause must precede the effect, and effects such as telekinesis and levitation are excluded. Although it is attractive to insist on contiguity (objects must touch to cause anything), there is a problem when a force such as gravity acts across a distance. The sun's gravitational attraction keeps the earth in orbit, yet the earth and the sun are not contiguous. Newton was aware of this problem, and he did

not know how to explain it. Newton and Hume had little choice but to ignore it.

Alternative Formulation: Fields

The problem of action at a distance is also present for magnets and for electrical charges. The best description of the situation was developed by Michael Faraday, who described magnetic forces by using a force field. Magnet A sets up a magnetic field in its surrounding space. Magnet B interacts locally with A's field, and we say that B experiences a force from A. But Magnet B also sets up a field that locally causes a force on A. These two forces are equal in magnitude and opposite in direction, just as Newton's third law requires.

The field concept works just as well for electrostatic forces and gravitational forces. James Maxwell showed how the electric and magnetic fields fit into a set of four interlocking equations. Attempts to integrate gravity into the system have failed so far. However, the forces described by these fields continue to describe a causal and deterministic motion.

Alternative Formulation: Global Theories

The idea that it is important to maximize or minimize some value goes back to Newton and to Wilhelm Gottfried Leibniz, both of whom invented calculus to do this. One of Leibniz's disciples, Moreau de Maupertuis, tried to formulate a quantity that he called "action," calculated by adding contributions from all of the space; minimizing the action would then give you the answer to how the system behaves. For both personal and professional reasons, Maupertuis made enemies, one of whom was Voltaire, whose novel *Candide* was a biting satire of Leibniz, Maupertuis, and their ideas. Voltaire believed that their attempts to maximize or minimize asserted that we live in the best of all possible worlds, an idea he found easy to ridicule.

Although the formulation by Maupertuis was a bit confusing, his scientific endeavors had considerable merit, as was shown by Leonhard Euler and Joseph-Louis Lagrange. By more carefully defining the action, Lagrange was able to set up a well-posed problem of minimization, and by using Euler's calculus of variations, he was able to find the minimum. In doing so, he found, Newton's second law appears. Thus, a global principle of least action – which is not manifestly causal – leads to the same causal equations of motion that arise from the local theory of Newton, valid point by point.

Subsequent developments have shown that the global approach can be quite powerful provided that the action is properly defined. The global approach not only can reproduce the results of the local one, but it sometimes provides additional insight and information that theories based on a single point cannot produce.

Pierre Simon de Laplace

In the period of the French Revolution and the Napoleonic Wars, an important scholar of causality was Pierre Simon de Laplace (Gillespie 1997). His treatise on celestial mechanism carried Newton's mechanics to an impressive level of understanding of the motions in the solar system. In particular, he proved the stability of the solar system against small perturbations, and demonstrated that Newton's laws were more impressive than Newton himself had realized. He articulated the idea of Laplacian determinism, which states that given the initial conditions, you can use Newton's laws to predict the subsequent motion.

It is interesting that Laplace, famous in his own time for the causality of mechanics, should have achieved more lasting fame for his work on the theory of probability. He was not the first to attack the subject. The Bernoulli family placed probability on a good mathematical basis. The motivation for studying the systematics of multiple events, supposedly random and noncausal, was initially aimed at dice and card games. Laplacean probability does not really examine whether the randomness is ontological or simply

based on the impossibility of predicting outcome for a sufficiently complicated system. Dice are a Newtonian mechanical system, and therefore ought to be predictable, except that (1) the initial conditions are not properly known, and (2) the calculations are too difficult. So it is better to assume an aleatory system and analyze it as such.

With the rise of statistics as a mathematical tool to study aleatory systems, there arose a problem that needs to be noticed. Sometimes two types of events seem to be associated, and statistical tests show that they are correlated. But correlation does not prove causality. It could be that both events are caused by the same prior cause, and that neither one is the cause of the other. The Latin adage is actually false: *post hoc ergo propter hoc* (after this therefore because of this). It is a fallacy to be avoided.

Statistical Mechanisms

Physicists such as James Maxwell, Ludwig Boltzmann, and Josiah Willard Gibbs invented statistical mechanics to describe a system of many particles, each of which moves according to the laws of classical mechanics. The motion is causal at root, but by treating the motion as if it were random, one can use statistics to describe the entire system on the average. The results frequently agree well with observations, especially for many commonly encountered gases at room temperature and one atmosphere of pressure.

By the early twentieth century, the satisfaction with statistical mechanics was badly undermined by annoying discoveries of which we list three outstanding examples: (1) Classical statistics fails dismally to predict the shape of the electromagnetic spectrum. Max Planck in 1900 finally succeeded in getting agreement with experiment by introducing packets of energy, which he called *quanta*, to replace the classical idea that energy can come in whatever size you like. (2) The specific heat of a solid at very low temperature does not follow any rational classical form. Albert Einstein used Planck's distribution to improve the situation, but there was still measurable

discrepancy. Pieter Debye's theory went further in the direction of quantization to fix things up. (3) The behavior of electrons in a metal is quite far from the predictions of classical statistics. Enrico Fermi in the 1920s used quantum ideas to gain the needed understanding.

Quantum Mechanics

The need for a better theory than classical mechanics was evident by the 1920s, and for reasons beyond the examples listed above from statistics. The atomic theory of Niels Bohr, based on classical mechanics but with the ad hoc addition of quantized angular momentum, was not a satisfactory answer. There was need for something new.

In 1925, Werner Heisenberg pointed toward a new theory (quantum mechanics, or QM) by positing that one should use only quantities that are observable. This start (somewhat misguided) was good in that it removed the classical Bohr orbits from the center of attention. It motivated Paul Dirac to invent a particular type of noncommuting algebra that led to better insights. In 1926, Erwin Schrödinger constructed his wave equation to accomplish the same things that Dirac and Heisenberg were doing. Multiple papers appeared that year showing that the three approaches were equivalent.

In the summer of 1927, Heisenberg showed that the formalism of quantum mechanics implies the famous principle of uncertainty: The position and the momentum of an object cannot be known simultaneously to arbitrary accuracy. Hence, the requirement for classical determinism cannot be satisfied, and the motion can never be fully determined. At the Solvay Conference in Brussels in October of 1927, there was a titanic struggle between Einstein (determinist) and Bohr (indeterminist). Neither was able to shake the other's firm beliefs (Moore 1966, 163 *et seq.*). The debate went on for another 8 years before it finally subsided, mainly because Bohr's interests had changed toward the phenomenology of nuclear physics. With a few exceptions, physicists active today agree that Bohr was right and Einstein was wrong.

People still argue about the detailed interpretation of quantum mechanics, but there is broad agreement about the outlines, including indeterminacy.

How firm is the uncertainty principle? It is very robust. It follows by airtight logic from the basic assumptions of quantum mechanics. If we wish to deny the uncertainty principle, we have to abandon quantum mechanics, and we will be left with no working theory of molecules, atoms, nuclei, and subatomic particles. That price would be too high.

As a way to save both quantum mechanics and determinism, it has been suggested that there are *hidden variables* that are deterministic in their nature, but which can mimic the result predicted by the Schrödinger equation. A definitive test was performed experimentally by Alain Aspect and his coworkers; they found strong evidence against hidden variables in favor of conventional quantum mechanics.

Quantum Mechanics: Evidence Against Causality

The argument against causality begins with the uncertainty principle. For a single particle constrained to move in one dimension, the uncertainty principle states that $\Delta x \Delta p \geq h/4\pi$ where x is the position, p is the momentum, and h is Planck's constant; the symbol Δ means "standard deviation" or uncertainty.

It is permissible in quantum mechanics to narrow down and refine your knowledge of the position coordinate. In doing so, you will thereby lose information about the momentum. Similarly, you can know the momentum to great precision, but you will not know much about where the particle is.

In classical mechanics, one can construct a two-dimensional space with coordinates x and p . The particle's initial state is represented by a point in this space (phase space); its motion, governed by Newton's laws, is a curve in phase space. (Phase space: for a system of N particles, the $3N$ -dimensional space of the coordinates is called configuration space. If the $3N$ components of the momenta of these particles are added, the

resulting 6N-dimensional space is called phase space.) In quantum mechanics, the idea of a single point in phase space is without meaning. The initial state of the particle appears as a cloud of points in phase space in an area at least as big as $h/4\pi$. The density of the cloud is nonuniform; its local density is given by the square of the wave function at that point.

If the problem is generalized to allow motion in three dimensions, then the three components x , y , z of the particle's position will have uncertainty relations with their respective components of momentum p_x , p_y , p_z . There is no uncertainty relation between, say, x and p_y .

The energy E of the particle has a conjugate relation with the time t , and so there is the relation $\Delta E \Delta t \geq h/4\pi$. This relation comes into play when physicists try to study very short-lived particles. If a particle's lifetime is so short that the time of its decay is known rather accurately, then the measurement of the energy will be correspondingly inaccurate.

One extreme case is given by resonances in the scattering of pi mesons from protons. The cross section (a measure of the probability) of the scattering increases rapidly from low energy and peaks when the energy (in the center-of-momentum system) is about 1,240 MeV (million electron volts). The peak is quite broad, $\Delta E = 120$ MeV, corresponding to a time interval of 10^{-23} s (seconds). The usual interpretation of such resonances is that they are really particles with very short lifetimes, and therefore, there is considerable uncertainty in their mass (energy).

An example of the opposite sort is provided by a continuous-wave laser, where the photons have a long time interval for their production and extremely well-defined frequency.

Another important example of noncausal phenomena in QM is the case of an electron in an excited state of an atom. If the excitation energy is high enough, there may be several states, including the ground state, of lower energy. For one such electron, QM cannot tell you into which state it will make its downward transition, nor can it tell exactly when the transition will occur. What it can do is to calculate the respective probabilities of the various transitions and also

the mean life of the excited state. When such calculations are performed for atoms, the results agree with experiment. For example, of two transitions, if one is twice as probable as the other, the more probable one will appear as a spectral line twice as bright as the other.

Quantum Mechanics: Evidence for Causality

Although the spirit of quantum mechanics is probabilistic or aleatory, there are some ways in which it describes behavior with certainty.

A particle whose wave function is known at a specific time for all points in space will propagate in space in a very predictable way, as long as external forces are absent. This statement is a direct result of the time-dependent Schrödinger equation; it is in a sense the quantum version of Newton's first law of motion.

Occasionally, one encounters a quantum system that is unstable and that has only one decay option. In that case, it is perfectly predictable which option will occur, but it is still not possible to predict the precise time when the decay will occur.

For many systems that obey quantum statistical mechanics, the average behavior will be based on enough particles so that the uncertainty in the motion will be quite small, and the system will be deterministic. It is effectively at the classical limit, and the predictive power of Newton's laws will appear.

Monte Carlo Calculations

An interesting and useful technique for computation is called Monte Carlo (for the famous gambling center) because it is based on randomness. One uses random numbers in quantity to simulate something which could perhaps be modeled by an analytic calculation, but where the accuracy achieved in a given amount of computer operation is greater for the Monte Carlo method.

A simple example would be to calculate the value of π by using random numbers. Consider a circle of radius equal to unity, centered at

the origin of coordinates. A square is circumscribed about the circle with $-1 < x < +1$ as the mathematical definition. Generate random numbers in pairs, uniformly distributed between -1 and $+1$; call them x and y . Then calculate $x^2 + y^2$; if the result is greater than 1, discard it; if less than 1, keep it, and keep track of the total number of pairs generated. The fraction of keepers will be $\pi/4$. The more trials you make, the more accurately will your answer resemble the correct one.

The simple example of a circle converges to the correct answer slowly enough that one should really do the calculation some other way. That is because the example is in essence two dimensional; Monte Carlo converges more slowly than other methods until you encounter a problem with five or more dimensions, and after that, it is faster than most other methods.

Monte Carlo is in essence a method of integration, i.e., finding areas, volumes, or hypervolumes.

A serious question arises in computer calculations using Monte Carlo. Where does the computer get a large supply of random numbers in a short time? The customary answer is to use a multiplicative congruential method. A suitable chosen number is caused to multiply another suitably chosen number many times, and each successive result is the next random number. These numbers are of course not truly random: They are perfectly causal, but the casual observer cannot see the connection. The numbers are called “pseudo-random.”

It happens that there are potentially harmful correlations in pseudo-random numbers from multiplicative congruential generators. This fact was discovered by George Marsaglia, who also discovered the cure: Use a different multiplicative congruential generator to do a pseudo-random shuffle of the numbers from the original one.

Causality and Chaos

It seems illogical that a causal, deterministic device such as a properly operating digital

computer could ever produce random numbers. The pseudo-random sequence that comes from a computer is in fact totally deterministic, but it passes certain statistical tests for randomness.

Chaotic systems are quite analogous. They are governed by the laws of classical mechanics and should thereby be deterministic. Yet they exhibit behavior that appears wildly unpredictable.

A simple example is a pendulum with a magnet at its end, allowed to swing freely in what is basically two dimensions, the two angles that it takes to specify the instantaneous location of the pendulum. Two (or more) additional magnets, placed just below spots where the pendulum can go, complete the arrangement. If the pendulum is released and allowed to swing freely, the motion is surprisingly unpredictable.

Many other examples of chaotic behavior could be listed: (a) Population dynamics in biological systems provides many specific types. (b) The earth's atmosphere is a chaotic system that renders impossible accurate predictions of weather more than a few days in advance. (c) If 15 billiard balls are placed in an equilateral triangular array and then struck with a sixteenth ball (the cue ball), the resulting motion is quite unpredictable. The list could be continued.

All these chaotic systems share a few important properties: (a) Their motion is inordinately sensitive to initial conditions. (b) Their equations of motion contain nonlinearity. (c) They mostly move in a phase space of three or more dimensions. (Population dynamics is an exception, since it is governed by a nonlinear difference equation rather than a differential equation). (d) Their time evolution ought to be causal and deterministic, but in practice, it is not.

In these nonlinear systems, there is typically some parameter (or set of parameters) that can be adjusted, along with the initial conditions. It very often happens that there are regions in phase space that correspond to stable and predictable motion, and likewise, there are regions of phase space that are characterized by unstable, chaotic behavior. There is a boundary between these two regions, and it is here that some of the most interesting phenomena occur (Kauffman 1995, Ch. 6). It appears that life itself is

a phenomenon associated with the boundary between order and disorder.

Cross-References

- [Christian Cosmology](#)
- [Classical and Quantum Realism](#)
- [Creator – Co-creator](#)
- [Deism](#)
- [Determinism and Indeterminism](#)
- [Divine Action](#)
- [Energy in Physics](#)
- [Free Will](#)
- [Mechanics](#)
- [Physics](#)
- [Quantum Theory](#)
- [Statistics and Probability](#)

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Causation

- [Causality in Physics](#)

Celebration

- [Ritual](#)

Celibacy

- [Biology of Religion](#)

Cells

- [Histology, Cytology](#)

Cerebrovascular Diseases

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Diseases of the nervous system covered by neurology mainly affect the brain, spinal cord, peripheral nerves, and muscles. Different mechanisms contribute to focal or global brain lesions which today can be diagnosed based on clinical signs and symptoms, the history of onset, follow-up with progression or recovery and rehabilitation, modern brain imaging, and neurophysiological as well as laboratory investigations. Management and emergency or intensive care treatment are based on neurobiology, neurophysiology, pathophysiology, and clinical study evidence.

Stroke is one of the most frequent diseases treated by neurologists in industrialized countries of North America, Europe, Asia, and Australasia. This disease has been known since the times of Hippocrates (about 400 B.C.) who already observed that many blood vessels connected the brain – he believed they were filled with air providing the spirit of mankind: He considered interruptions of this air flow to be responsible for hemiplegia and convulsions with paralysis of the right arm and the loss of speech (probably the first written account of aphasia) as already described in his *Epidemics*. This was confirmed later by Galen who attributed *apoplexia* to an accumulation of phlegm in the arteries once this obstructed the passage of animal spirits within the ventricles. However, it took more than 1,500 years until the discovery of the anatomy of the brain from dissections by Andreas Vesalius (1514–1564) and his outstanding artist Jan Stephan Kalkar



Cerebrovascular Diseases, Fig. 1 Thomas Willis (Wikimedia Italia)

who in their book *Fabrica* presented outstanding neuroanatomical diagrams in copper plates and woodcuts. Thomas Willis (1621–1675) (Fig. 1) indeed coined the term *neurology* taking its root *neuro* from the Greek in his *Cerebri Anatome*, although the structure for which he is still remembered was actually described earlier by several others, such as Gabriel Fallopius (1523–1562), Johann Vesling (1595–1649), professor of anatomy and surgery at Padua, and Johann Jacob Wepfer (1620–1695), a Swiss physician from Schaffhausen, who was affiliated to a convent where he was able to follow his patients from disease to autopsy. Actually Wepfer's vascular anatomy of the brain in his *Historiae apoplecticum* described the polygon of arteries at the bottom of the brain already years before Willis. In addition, he identified the carotids penetrating from the extra- to the intracranial space forming a segment now known as carotid siphon. His insight into clinical correlations was also advanced over his time since he reported on the sudden clinical manifestations secondary to carotid artery blocking as well as bleeding into the brain as causes for apoplexy and was the first to emphasize the association of speech disorders with right hemiplegia

based on his anatomical observations. His name continues to be associated with stroke in our days: Since 2005, the European Stroke Conference annually honors outstanding contributors to clinical and/or experimental stroke research with the most prestigious stroke award available, named Johann Jacob Wepfer Award (www.eurostroke.eu) (Fig. 2).

Despite increasing efforts during subsequent centuries, it took another 500 years to understand and acknowledge the importance of cerebrovascular diseases in neurology and medicine: Stroke is the third leading cause of mortality and the second one of economic burden worldwide due to its frequent lack of full recovery and impact on dependency of its victims.

Only since more than a few decades ago, the management and prevention of cerebrovascular diseases became the most challenging task for neurologists because of an estimated prevalence in Europe of nearly 10 million people. Worldwide stroke kills an estimated 5.7 million people annually, it is a major public health issue and among the leading causes of immobility and long-term disability. There are two main types of stroke, the most common is ischemic stroke caused by thromboembolic clots narrowing or blocking blood vessels (about 80%), followed by hemorrhagic stroke caused by bleeds from blood vessels in the brain or in the subarachnoid space (about 20%). With increasing age, hemorrhagic stroke becomes more frequent and is estimated to grow within the next decade up to 30%. The onset of stroke is often sudden; however, about one third of the patients present with warning signs followed by immediate full recovery within minutes or a few hours (so-called TIAs – transient ischemic attacks). Although TIAs have gained increasing public awareness, they are often misinterpreted as benign events although the immediate risk of permanent stroke after a TIA can be as high as eight- to tenfold within a few weeks after the qualifying event in the presence of active carotid or cardiogenic sources of embolism. It is, therefore, important to seek emergency advice in a specialized stroke center, whether or not full recovery of symptoms occurs. This new management of stroke has decreased

a THE
JOHANN JACOB
WEPFER AWARD



b THE JOHANN JACOB WEPFER AWARD
OF THE
EUROPEAN STROKE CONFERENCE
2010
IS DEDICATED TO

PROF. JAN VAN GIJN, MD
UTRECHT, THE NETHERLANDS

FOR OUTSTANDING WORK IN
THE FIELD OF CLINICAL RESEARCH
FOR ISCHEMIC AND HEMORRHAGIC
STROKE TREATMENT AND
PREVENTION

BARCELONA, MAY 26TH, 2010

J. M. FERRO
CHAIR SCIENTIFIC COMMITTEE

M. G. HENNERICI
CHAIR PROGRAMME COMMITTEE



Cerebrovascular Diseases, Fig. 2 Johann Jacob Wepfer award (European Stroke Conference ESC)

mortality significantly. Furthermore, acute treatment of patients early after onset in stroke units and comprehensive stroke centers has improved the chances for full recovery and independence strikingly, mainly because of early thrombolysis of acute ischemic stroke. Increase in public awareness has advanced general knowledge about risk factors, early signs of symptoms, and potential treatment facilities: *Time is brain and stroke is an emergency* has been coined for health care strategies and information in the newspapers, television, and advertisements. Consequently appropriate diagnosis and treatment has been disseminated around the world by multiple professional medical specialties including paramedics, emergency and general physicians,

neurologists, internists, clinicians, physiotherapists, speech therapists, etc.

However, with increasing age, cardiogenic causes of ischemic stroke have also increased and along with small vessel diseases today contribute to more than 50% of stroke etiologies potentially leading to vascular dementia. Risk factors of atherosclerosis such as hypertension, hyperlipidemia, smoking, diabetes mellitus, and anticoagulation disorders increase with aging but are already present in younger stroke victims. People with risk factors for stroke need careful control and regular advice with regard to medication and recommended lifestyle changes. The value of physical activity as well as continuous mental and cognitive activity has only recently

been addressed scientifically both in experimental and clinical studies. There is no doubt about their effectiveness in stroke prevention and strategic capacity of best aging. Lifestyle changes should be added to modification of risk factors and urgent action should be taken both for primary and secondary prevention (of recurrent stroke after a qualifying event). High blood pressure should be lowered ($<130/80$ – 85 mmHg), and diabetes mellitus be controlled to maintain HbA1c values below 6.5% levels. People with cholesterol levels >190 mg/dl and cardiovascular disease, including TIAs/stroke, are likely to benefit from cholesterol-lowering regimens as do patients with multiple risk factors, requesting statins in many conditions. Smokers can reduce their overall risk of cardiovascular mortality and morbidity considerably by cessation of smoking, and alcohol intake should be limited to reasonable doses. By the age of 55, healthy people should regularly be controlled for silent cardiovascular disease; in particular, they should undergo regular noninvasive diagnostic testing in order not to oversee developing diseases such as atrial fibrillation and atherosclerosis.

Mechanisms of recovery and rehabilitation are by far better understood than 10 or 20 years ago and offer a spectacular potential for patients with focal disturbances of sensori-motor and neuropsychological deficits. This is of utmost importance because neurodegeneration and vascular diseases of the brain coincide in the elderly and cause multiple cognitive problems and changes in personality: Emotional disturbances, depression, psychomotor retardation slowing of executive cognitive function as well as decline of intellectual power may all limit people's independency and are among the most feared and disastrous complications in otherwise healthy aging populations.

Diagnostic instruments have improved and contributed to much better strategies in stroke prevention and treatment. Based on clinical signs and symptoms, they are prepared to identify sources and degree of brain lesions quickly and noninvasively without producing harm to the patient in the acute condition. In addition, identification of subjects at risk for recurrences is of the

utmost importance as is the correct interpretation of signs of stroke: Complete infarction in the largest territory of the middle cerebral artery (MCA) is a life-threatening event and can cause deviation of the head and eyes from the hemiplegic side involving face, arm, and leg, sometimes along with hemisensory loss and homonymous hemianopia. Dominant hemisphere lesions produce various sorts of speech disturbances (aphasia) while nondominant hemisphere lesions produce contralateral neglect with dysarthria, sometimes dysphagia and impairment in spatial orientation. It has to be mentioned, however, that occlusions of branches of the MCA can cause quite strange, sometimes misdiagnosed or even silent deficits, i.e., non-fluent speech, impaired repetition ability, calculation failures, body texture abnormalities, position sense disturbances, etc. Emotional apathy and constructional impairment, mutism, abulia, muteness, and reduced spontaneity may result from branch occlusions of the anterior cerebral arteries, and memory disturbances, illusions, cortical blindness, and agitation are characteristic signs resulting from occluded branches of the posterior cerebral artery, all sometimes difficult to identify.

Spontaneous intracerebral hemorrhage (ICH) accounts for 10–15% of all strokes and has a higher mortality rate than ischemic stroke or subarachnoid hemorrhage (SAH). Most frequent causes are hypertension, cerebral amyloid angiopathy, coagulopathy, vascular anomalies, tumors, and drugs; however, hypertension is the greatest modifiable risk factor for ICH.

Bleedings into the vessel walls (so-called dissections) and blockage of draining veins and sinuses are common causes of hemorrhagic stroke in younger men and women and may be overlooked both by patients and nonexpert healthcare people. Once severe ICH has occurred, treatment is still limited, unfortunately. This is to some extent also true for SAH, mainly caused by aneurysmal bleedings (80%) from ruptured formations. In the older literature, saccular aneurysms are sometimes called “congenital” which is misleading; although a hereditary defect of the vessel wall is likely to contribute foremost, aneurysms develop during the course of life, enlarge over

years to decades until they become symptomatic in young and middle aged patients. Today they can be identified in advance by noninvasive vascular/brain imaging (CTA/MRA). However, it is largely unknown why some patients develop aneurysms and others do not. Surgery may be indicated in patients with a high risk for bleeding complication and after SAH in the presence of multiple aneurysms.

In summary, the history of stroke and cerebrovascular diseases covers more than 2000 years of well-known but misunderstood clinical signs and symptoms. Emergency management, prevention of first ever and recurrent events has only very recently been achieved. Today we are faced with challenging questions about recovery and rehabilitation as important mechanisms of brain reorganization and plasticity anticipating healthy aging as well as repair mechanisms after detrimental lesions. With increasing age of modern populations, neuro- and vascular degeneration of the brain will become a major issue for translational research (= basic experimental and clinical research) to prevent people from dementing illnesses causing disastrous cognitive decline and loss of intact personality.

Cross-References

- [Dementia](#)
- [History](#)

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Ceremony

- [Ritual](#)

Chan

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Description

The term “Chan” contracts *channa*, the Chinese transliteration of Sanskrit *dhyāna* or meditation/contemplation. Chan denotes a school of Chinese Buddhism that, generally speaking, values meditative insight over scholastic knowledge. Chan denies to be based on scriptural exegesis (as is the case with all the other schools of Buddhism) and therefore sees itself as a unique – and superior – tradition within Buddhism in general. Its key concepts are those of transmission and immediacy.

This entry will present Chan in terms of its intradenominational characterization, its hagiography, its religious practice, and its relevance as an object of scholarly analysis.

Characteristics

Central to Chan’s self-representation is the claim that the Buddha transmitted not only teachings as pointers toward and mediations of truth but also awakening itself as immediate realization of truth. The transmission of awakening is based on direct communication between the heart of the Buddha (and/or his successors, the so-called Chan patriarchs, *chanzu*) and the heart of the disciple. This process is commonly called “using the heart to transmit the heart” (*yixin zhuanxin*) and crystallized in a lineage of Chan teachers who took custody of awakening, passing it on unaltered through the ages. Thus, every Chan practitioner, if a part of this enlightened tradition, has access to the same awakening that the Buddha himself had experienced.

Chan is, in general, critical of what is taken to be the scholastic profanization of language and hesitant to employ discursive and argumentative

prose. This is because in light of the importance of heart-to-heart transmission, the communication between master and disciple holds soteriological significance that supersedes linguistic interpretation or textual analysis. The disciple is urged, not to intellectually understand a certain dogma but to transform her existence precisely by abandoning the intellect's restrictions. Specific communicative models include nonverbal elements (blows, gestures, silence, shouts, etc.) as well as sophisticated verbal strategies (anecdotal and poetic quotations, seemingly random interjections, pithy remarks, spite, etc.). These are used to weaken the student's rational attachment to self and world. Having deconstructed rationality as the main impediment to immediacy, the student is referred to the ancient patriarchs and her present master as objects of mimesis. Awakening is, in a manner of speaking, rehearsed mimetically, and at some point, the student achieves the same immediate realization of truth as the Buddha. She is then acknowledged by her master as a follower of the Chan tradition and thus a direct successor of the Buddha himself.

In summary, by traditional account, Chan:

- Establishes neither words nor letters
- Is a separate tradition beyond the teachings
- Points directly to the human heart
- Reveals awakening in every practitioner's nature and perfects the Buddha

Hagiography

In keeping with the pivotal role accorded to authentic transmission, Chan relies heavily on anecdotes that present the ancient masters as blueprints of impersonated enlightenment. This tendency resulted in a vast corpus of anecdotal literature that typically belongs to the "recorded sayings" (*yulu*) genre. These texts form an integral part of Chan's self-understanding and concisely outline its hagiography. Some examples shall be given below.

In the traditional account, the Buddha, having awakened to the ultimate truth by way of silent meditation, began his teaching career. But as his awakening surpassed the limitations of

verbalization, his teachings could not but remain at the level of mere approximation, relative in nature, and as such incongruent with the absoluteness of reality. Out of this incongruity, Chan derives its founding myth: On one occasion, instead of delivering the expected sermon, the Buddha simply presented a flower to his congregation. This met with incomprehension in every but one case: Kāśyapa, a long-standing disciple of the Buddha, smiled in understanding. Thereupon, the Buddha declared that a transverbal transmission had taken place and that Kāśyapa was to be revered as his successor and the future custodian of awakening (Wumenguan 2005, case 6).

Through Kāśyapa, a lineage of transmission had formed that in its 28th (sometimes also 29th) generation reached China in the person of the Indian monk Bodhidharma around the turn of the sixth century. When Bodhidharma had spent 9 years in unbroken and motionless meditation inside a cave, he accepted his first disciple (though only after the latter had cut off his own arm below the elbow to prove his determination; Wumenguan 2005, case 41). Thus, Bodhidharma came to be regarded as the founding father and first Chinese patriarch of Chan. His exchange with emperor Wu of Liang (r. 502–549) is among the most famous of Chan anecdotes. Upon their first meeting, the emperor, being an ardent supporter of Buddhism, inquired as to how many merits his considerable endowments had earned him. Bodhidharma cut him short: "No merits at all." When the emperor then asked about the nature of truth, Bodhidharma again gave a short-spoken answer: "Everything lies in plain view, and nothing sacred is in sight" (Biyanlu 2003, case 1), thereby thoroughly negating the possibility to earn merits, rationally explain truth, or speculate on the underlying nature of reality.

By the Tang dynasty (618–907), a Chan community had begun to grow on Chinese soil that over the years drew more and more followers. The fifth Chinese patriarch, Hongren, supervised a congregation of considerable size but was unable to decide on a suitable successor. Having called on his advanced students to give expression to the profundity of their insight in rhyme, he praised his disciple Shenxiu's work above all

others: “The body is the *bodhi* tree under which the Buddha had his awakening, and the heart is like a bright mirror’s pedestal. Take pains to always wipe it clean! Let no speck of dust settle upon it!” However, Huineng, an illiterate kitchen helper, heard about these verses and in reply had his own version inscribed on the monastery’s walls: “Actually, there is no tree in awakening, and a pedestal has nothing to do with the bright mirror. Originally, there is not a single thing. So how could there be any place for dust to settle upon?” (Liuzu tanjing 2008) Officially, master Hongren scolded Huineng for his temerity but in secret revealed him to be the actual inheritor of the Buddha’s awakening.

Subsequently, a dispute over the patriarchal succession arose, and Chan was divided into the Northern school of Shenxiu and the Southern school of Huineng. As the quotation above indicates, matters came to a head over the ideological issue of whether enlightenment was a gradual process (the Northern position) or a sudden breakthrough (the Southern position). Within only a few decades, the gradualist position had relegated into other, more speculative and scholastic traditions. Subitism became the only ideological and rhetorical standard for Chan. Even today, every existing lineage traces itself back to Huineng as sixth patriarch and adheres to the sudden enlightenment approach he advocated.

A series of great masters furthered Chan’s development in the eighth and ninth centuries and produced parallel lineages: the so-called Five Houses (*wujia*) with distinct “family styles” (*jiafeng*). These ranged from metaphysical speculation (Caodong faction) to eclectic considerations about the fundamental unity of Buddhist diversity (Fayan/Yunmen factions) and to radical antinomianism (Linji/Guiyang factions). These diverse readings of what constitutes the Chan tradition dominated the general Buddhist discourse in China well into the Song dynasty period (960–1279). Under the guidance of the Five Houses, Chan reached its apex. Later Chinese developments are traditionally regarded as mere repetitions at best, deteriorations at worst. In this mature form Chan was transmitted to Japan (where it is called Zen) in the late twelfth and

early thirteenth century and was made known internationally in modern times.

Nowadays, Chan remains a dynamic, even vibrant tradition in Taiwan and continues to draw followers also on the Chinese mainland. It has had major influence on the development of Korean Son, Japanese Zen, and meditative forms of East Asian Buddhism as received in the Americas and Europe.

Practice

In terms of practice, Chan relies heavily on seated meditation (*zuochan*; hence its name). Roughly speaking, two different meditative techniques may be distinguished:

- Insight into an Anecdote (*kanhua*): The master presents her disciple with an anecdote or a rationally irresolvable dilemmatic question (a so-called *gong’an*, literally “public notice”) which forms the basis of meditative practice.
- Silent Illumination (*mozhao*): Practice is reduced to silent, objectless sitting meditation; prolonged practice produces spontaneous enlightenment.

Beyond these, however, in Chan monasteries – while entertaining close ties to a considerable community of lay followers, Chan has developed forms of monasticism that have had major impetus on the general development of Buddhist institutions in East Asia – there is also an array of rituals that may be employed in varying degrees. These include work around the buildings and gardens (*zuomu*), one-on-one encounters with the master (*canchan*), question-and-answer sessions (*wendang*) during which a student’s doubts are addressed or her enlightenment put to the test, recitation of scriptures (*kanjing*), teachings and interpretative readings by advanced monks (*fayu*), and observations on memorial days, prayer, social work, etc. If based on the proper Chan-like attitude, all these are seen as spiritual practices of equal value.

Criticism

While the traditional narrative outlined above remains unbroken in denominational circles,

Chan's self-characterization in terms of authenticity and immediacy has increasingly been challenged from philological and historical perspectives and in academic circles is counted as a hagiographical and ideological construct. This antitraditional reading of Chan became possible, above all else, by the discovery of a large corpus of Chinese manuscripts dating from the fifth to the eleventh centuries in a sealed cave near the Silk Road oasis of Dunhuang (Gansu prefecture, western China) in the year 1900. This corpus included several hitherto unknown Buddhist texts that shed new light on the historical development of Chan and resulted in the acknowledgement that Chan had to be seen not as a transhistorical absolute but as a phenomenon in historical context (cf. especially the groundbreaking studies by Yanagida Seizan (1922–2006)). In scientific terms, Chan is, far from being a manifestation of unchanging reality beyond the contingencies of time, a relatively late development in the history of Buddhism that draws on a plurality of sources for inspiration and legitimation.

While this viewpoint has met with considerable resistance from the believers' side (cf. the dispute between Hu Shi (1891–1962) and Suzuki Daisetsu (1870–1966) in *Philosophy East and West* 3/1 (1953)), the “Golden Age” of Chan iconoclasts during the Tang era has been proved to be a mythological construct. For the sake of securing religious prestige – and actual political power as well – Song dynasty adherents of Chan developed a narrative that allowed them to present their own tradition as the superior form of Buddhism. In consequence, Song Chan has come to command scholarly attention (cf. Gregory and Getz 2002; Schlütter 2008). At the same time, efforts continue to contextualize Tang Chan, resulting in the deconstruction of traditional hagiography (cf. McRae 1986; Faure 1991; Welter 2008). To give a few examples:

- Bodhidharma has been disclosed as a pan-denominational figure that is not only an anti-nomian Chan master but also incorporates ritual aspects as well as scholastic modes of argumentation.
- The schism between the Northern and the Southern school has turned out to be rather

a product of subitist rhetoric that attempted to marginalize gradualism and deny its influence.

- An analysis of the tenth-century texts has yielded data that the traditional focus on meditative experience and authoritative lineage had been challenged by scripture-focused approaches within Chan itself.
- Ritual has been emphasized as a main, if not the major concept in an analysis of Chan practice, casting doubts over the claim to radical iconoclasm and meditational authenticity (cf. Heine & Wright, 2008).
- Chan's self-representation has convincingly been shown to be a Song era and even later product that owes much of its present-day popularity to the missionary efforts of Suzuki and his epigones.

Thus, in recent years Chan has come to be understood less as a monolith of religious truth but as a historically conditioned, highly complex sociopolitical phenomenon. Its critical analysis continues to produce relevant insights into, among others, the historical relation between state and religion or society and tradition, respectively; the role of meditation vis-à-vis ritual in religious practice; strategic issues centering on the authoritative nature of scripture versus tradition; and problems in the transcultural reception of religions and ideas.

Cross-References

- ▶ [Awakening](#)
- ▶ [Buddha \(Historical\)](#)
- ▶ [Buddhist Canonical Literature](#)
- ▶ [Buddhist Meditation Practices](#)
- ▶ [Ritual](#)

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Character

► Personality Psychology

Chemical Thermodynamics

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Related Terms

Energy; Entropy; Gibbs energy; Helmholtz energy; Rate of entropy production; Self-organization; Thermodynamics

Description

Thermodynamics originated from study of heat engines, engines that convert heat to mechanical motion. Prior to the invention and the use of steam engines (James Watt obtained a patent for his version of the steam engine in 1769), the machines of the eighteenth century were driven by wind, water, and animals: They transformed one type of motion to another. In contrast, the steam engine converted heat to motion: an entirely new way of generating motion, which heralded the industrial revolution. Only in the following century, when the steam engine's role in transforming society was plainly visible, was a systematic study of its fundamentals undertaken. The most significant contribution to this field came from Nicolas Léonard Sadi Carnot, who discovered the fundamental limits to the efficiency of heat engines that convert heat to mechanical energy. This line of work eventually led, in the hands of Rudolph Clausius, Lord Kelvin, and others, to the formulation of the Second Law of Thermodynamics. This law established the fundamental irreversibility of natural processes, or the arrow of time as an objective reality (http://en.wikipedia.org/wiki/Entropy_2999).

During the nineteenth century, with the new instruments that were constructed, heat, electricity, and chemical reactions were investigated and many new laws governing these phenomena were formulated. It also became evident, that all these phenomena were interrelated: Chemical reactions could produce heat (exothermic reactions), and heat could drive chemical reactions (endothermic reactions); so it was with electricity which could drive “electrochemical” reactions and vice versa; heat could generate motion and motion could generate electricity. While these interconnected processes were being investigated, the idea that there was one quantity, the energy, that was conserved in all these transformations was born. Many contributed to this concept, most notably, James Prescott Joule, Germain Henry Hess, Julius Robert von Mayer, and Herman von Helmholtz. This development and understanding of the concept of energy and

its conservation led to the formulation of the First Law of Thermodynamics, which states that in every transformation, total energy of all systems involved must be conserved; transformations in which the energy is not conserved do not take place in nature – though we can easily conceive of them.

The two laws of thermodynamics are the foundation of the subject. In the nineteenth century, Clausius, Kelvin, Gibbs brought all the contributions to the subject into coherent whole and formulated what is currently called *classical thermodynamics*. As will be shown below, this formalism made thermodynamics a theory of states and has no direct connections to the processes that transformed the states. Later, two other laws were added to the formalism, called the Zeroth Law and the Third Law. The Zeroth Law states that if system A is in thermal equilibrium with system B, and B is in thermal equilibrium with C, then A must be in thermal equilibrium with C. The Third Law gives us the means to assign an absolute value to entropy; it states that as the temperature approaches zero, the entropy of a system also approaches zero. Though these two laws are essential for the completeness of the formalism of thermodynamics, their physical consequences are not as far reaching as those of the First and Second Laws.

During the twentieth century, contributions to thermodynamics made by Lars Onsager and Ilya Prigogine made thermodynamics a theory of irreversible processes (Ji 2012; Kondepudi 2008). It related the production of entropy directly to natural processes and essentially restated the Second Law in terms of processes and gave us a way to relate the rates of production of entropy to the rates of processes such as heat flow. The contributions of Ilya Prigogine and his colleagues also gave us insight into the dual role of irreversible processes: as both *creators* and *destroyers* of order (<http://en.wikipedia.org/wiki/Entropy> 2009; Prigogine 1947). Thermodynamics has given us two fundamental quantities, *energy* and *entropy*, and two universal laws that govern them. The universality and practicality of these laws make thermodynamics one of the most important branches of human knowledge. And it

has raised profound questions about our universe, the arrow of time and the theory of evolution. In the twenty-first century, thermodynamics will find new areas, such as sustainable energy use and economies, to which it will contribute.

Heat and Energy. The concept of *kinetic* and *potential energy* and the conditions under which their sum, the total *mechanical energy*, is conserved was well known in the nineteenth century. This formalism also included the concept of mechanical work, which is defined as the product of force and the displacement of the body upon which the force acted. The unit for measuring mechanical energy was the erg. But the nature of heat was still under debate in the nineteenth century. The *caloric theory* of heat, which posited that heat was some sort of fluid, and the amount of heat was measured by its effect in raising the temperature of a substance; the unit for the measuring the amount of heat was called the calorie, a term still in use along with the term “calorimetry,” the science of measuring heat. On the other hand, the *mechanical theory* argued that heat was a measure of mechanical motion of molecules. The experiments of James Prescott Joule established the equivalence between mechanical energy and heat energy. With his carefully designed experiments, and state of the art calorimetry, Joule proved that when mechanical energy is converted to heat, there was an equivalence: The amount of heat generated was proportional to the mechanical energy or work in the conversion process, regardless of the means or method through which the conversion took place. This implied that the two quantities, mechanical energy and calories, are two measures of the same quantity, and that the calorie and the erg were measuring the same quantity – just as Celsius and Fahrenheit measure the same quantity, viz. temperature. Similarly, the measurement of energy in other processes, such as electromagnetic and chemical energies, can be proven to be equivalent. This has led us to the current SI (Système International) energy unit, which is the Joule. In the currently used of units (Système international units), Joule’s experiments established that $1 \text{ cal} = 4.18 \text{ J}$.

The First Law of Thermodynamics. The formulation of the First Law of Thermodynamics is based on the contributions of many scientists. One of the early contributions came from Germain Hess, who established the fact that heat released or absorbed during a chemical reaction, called the heat of reaction, depended only on the initial and final states of the system, and not on the manner in which the transformation was accomplished. This led Hess to the formulation of the law of additivity of heats of reaction: The total heat released or absorbed in an overall chemical reaction is equal to the sum of the heat released or absorbed in the chemical steps that constitute the overall reaction. This law enabled the chemists to assign energy to each chemical compounds and measure the changes in their energy in a chemical transformation. The law of Hess implies that the total amount of energy, chemical plus heat released or absorbed plus mechanical work (due to changes in the system's volume), remains the same during the chemical reaction. This is the law of conservation of energy in the field of chemistry.

Following the work of Joule, Hess, and others, Julius Robert von Mayer and Herman von Helmholtz suggested a universal conservation of energy, a quantity conserved in all natural processes. This is the First Law of Thermodynamics. Thus, every system could be said to have certain amount of energy, U . This energy is a state function, i.e., it depends only on the current state of the system, not on the manner in which that state was reached.

While it is true that our current understanding of the atomic structure of matter reveals that all energy is, in its essence, kinetic and potential, in practice, the measurement of energy is not based on this understanding. Indeed, the First Law of Thermodynamics can be formulated and could be stated entirely in macroscopic terms, regardless of the structure of matter. It is important to note that the laws of thermodynamics can be stated and verified entirely in macroscopic terms. The First Law of Thermodynamics or the law of conservation of energy is the cornerstone of science. It has withstood countless experimental tests. Even the existence of an elementary particle,

now called the neutrino, was predicted on the basis of this law and experiments confirmed the prediction. Any theory of natural processes that violates the law of conservation of energy is rejected as impossible.

The Second Law of Thermodynamics. The origin of this law can be traced back to 1824, when Nicolas Léonard Sadi Carnot, a brilliant military engineer, published a remarkable book, "Réflexions sur la Puissance Motrice du Feu, et sur les Machines Propres a Développer cette Puissance" ("Reflections on the Motive Force of Fire and on the Machines Fitted to Develop that Power"). In it he came to a far-reaching conclusion that eventually led to the formulation of the Second Law of Thermodynamics. Carnot analysis showed that while the energy of mechanical motion can all (100 %) be converted to heat, the inverse process, the conversion of heat energy to mechanical energy, has limitations. Carnot's work showed that maximum efficiency of conversion of heat energy to mechanical energy by a heat engine depends not on the mechanism of conversion but only on the temperatures between which it is operating. In contemporary formulation of thermodynamics, this upper limit of efficiency is expressed as $(1 - T_{\text{cold}}/T_{\text{hot}})$, in which T_{cold} and T_{hot} are the temperatures in Kelvin. T_{cold} and T_{hot} are the temperatures between which the heat engine operates, i.e., the temperatures between which heat flow takes place. Carnot's observation brought to light the fundamental irreversibility in the conversion of mechanical energy to heat. Carnot's work led Rudolph Clausius to formulate the concept of entropy and Second Law of Thermodynamics, which established the fundamental irreversibility of all natural processes.

Entropy. The irreversibility that Carnot discovered in his study of heat engines led to the formulation of the concept of entropy by Rudolph Clausius. The formalism he developed showed that entropy is a state function, i.e., an objectively measurable entropy, S , could be associated with every system in equilibrium. The entropy of system depends on its current state and not on the manner in which the state was reached. The entropy of a system is independent of its history. Like energy, entropy is expressed as a function of

the variables, such as temperature, volume, and chemical composition that specify the state of a system. However, in the classical formalism of Clausius, when a system's state changes from one equilibrium state to another, the changes in the entropy of a system can only be computed for an idealized reversible process. A reversible process takes place at an infinitesimal rate, such that entire evolution can be reversed returning the system and the rest of the universe exactly to their original state. For such a process, the change in entropy is:

$$dS = dQ/T \quad (1)$$

in which dQ is the heat exchanged by the system and T is its temperature. Natural processes, however, are not reversible and they occur at a finite rate, not at an infinitesimal rate. For such processes, Clausius gave the inequality:

$$dS \geq dQ/T \quad (2)$$

This inequality implies that the entropy can only increase or, in the case of idealized reversible process, remain unchanged, but never decrease. Thus, the statement of the Second Law: *Natural processes increase the entropy of the universe*. The formalism gains its power and applicability because changes in entropy between two equilibrium states depend only on the initial and final states, and not on the manner in which the change from the initial to the final state took place. Thus, the changes in entropy due to irreversible processes can be computed using idealized reversible processes for which we have the equality (Eq. 1). It is tacitly assumed that any irreversible transformation of state from one equilibrium state to another can also be achieved through a reversible process for which $dS = dQ/T$.

Thermodynamic Systems. To understand the implications of the laws of thermodynamics, it is convenient to classify systems into *isolated*, *closed*, and *open* systems. *Isolated systems* do not exchange any matter or energy with their environment. In such systems, the entropy reaches its maximum possible value. The rate at which entropy will reach its maximum value in

an isolated system is not predicted by the second law, but that the processes within the system will monotonously increase the entropy until it reaches its maximum value is its prediction. When the system reaches its maximum entropy, it is in a state of equilibrium. *Closed systems* exchange energy with their environment in the form of heat and mechanical work, but they do not exchange matter. Systems whose temperature and volume are maintained constant also reach the state of equilibrium. In doing so, they minimize a quantity called Helmholtz free energy or simply Helmholtz energy, denoted by F . If U is the total energy of the system, Helmholtz energy $F = U - TS$, in which T is the system's temperature and S is its entropy. Similarly, if the pressure and temperature of a system are maintained constant, the system's evolution minimizes a quantity termed Gibbs free energy or simply Gibbs energy, denoted by G . The Gibbs energy $G = U - TS + PV$, in which P is the system's pressure and V its volume. The minimization of Helmholtz and Gibbs energies are a direct consequence of the second law. Gibbs energy is much used in chemical thermodynamics and biology. Similarly, depending on the constraints on the system, other quantities reach their minimum value. Such quantities are sometime referred to as *thermodynamic potentials*. Closed systems may or may not reach equilibrium. For example, if one part of a system is heated while another is cooled, there will be a continuous flow of heat through the system which keeps it from reaching a state of equilibrium. The state of equilibrium is characterized by uniformity of temperature throughout the system in which there is no flow of heat. *Open systems* are those that exchange both energy and matter with its exterior. Such systems are generally maintained in a nonequilibrium state through the flow of energy and matter. As will be described below, under appropriate conditions, such systems spontaneously make transitions to states that are "organized" with more structure than equilibrium systems. Living systems are examples of systems that maintain their structure through continuous exchange of matter and energy with their environment.

Twentieth Century Thermodynamics Formalism. Though the wide range of applications and usefulness of classical thermodynamics are beyond any question, its limitations are quite clear in its formalism. As expressed in equation (Eq. 1) the change in entropy, $dS = dQ/T$, can be calculated only for reversible processes. For irreversible processes, we only have an inequality: $dS \geq dQ/T$. The formalism does not have a way to calculate the changes in entropy for an irreversible process. So it confines itself to calculating changes in entropy between the “initial” and “final” states of a transformation by constructing a reversible process that connects the same states. Consequently, in this formalism, entropy has no direct link to irreversible processes that produce the entropy that is computed. Classical thermodynamics is thus a *theory of thermodynamic states*; irreversible processes are not a part of the theory. The processes for which entropy changes can be computed are idealized, infinitely slow reversible processes. As a result, the theory does not consider rates of changes of thermodynamic quantities. In short, there is no time in the theory. To relate entropy to irreversible processes and convert inequality (Eq. 2) to an equality, we need to know how entropy is related to irreversible processes that we observe in nature. During the twentieth century, contributions made by Onsager, Prigogine, (both received the Nobel Prize for their contributions to thermodynamics) and others, thermodynamics became a theory that is capable of describing irreversible processes. The twentieth century formalism, which we will refer to as *modern thermodynamics*, expresses the changes in entropy of a system, dS , as a sum of two parts (<http://en.wikipedia.org/wiki/Entropy> 2999; Ji 2012; Kondepudi 2008; Kondepudi and Prigogine 1998):

$$dS = d_e S + d_i S \quad (3)$$

in which $d_e S$ is the change in the entropy of the system due to the exchange of energy and matter with its exterior while $d_i S$ is the change in entropy of the system due to irreversible processes that take place within the system. $d_e S$ can be positive

or negative. For instance, in a closed system which exchanges heat, $d_e S = dQ/T$, depending on whether the system is receiving heat or releasing heat, $d_e S$ is positive or negative, respectively. The second term, $d_i S$, relates entropy to irreversible processes. It might be thought as a term that *converts the inequality (Eq. 2) to an equality*. It is expressed in terms of *thermodynamic forces*, F_k and *thermodynamic flows* J_k (the subscripts identify different forces and corresponding flows). Each irreversible process is associated with a thermodynamic force and a thermodynamic flow. Thermodynamic forces drive thermodynamic flows. For example, a gradient of temperature is the thermodynamic force that drives the flow of heat. The change in entropy due to irreversible processes, in a time interval dt , is expressed as:

$$d_i S = (F_k J_k) dt \geq 0, \text{ or } d_i S/dt = F_k J_k \geq 0 \quad (4)$$

That is, the product of a force and flow is the rate at which entropy is produced by that processes. When several forces and flows are at work, $d_i S/dt$, the rate of entropy production, is the sum of all the force-flow products. In chemical systems, the thermodynamic force that drives chemical reactions is called Affinity, a quantity introduced by De Donder (Kondepudi and Prigogine 1998). In this formalism, the second law is stated as:

$$d_i S \geq 0. \quad (5)$$

That is, all irreversible processes increase entropy. All processes in nature are irreversible and take place at a nonzero, finite rate. *Thus, the second law states that every natural process increases entropy.* However, the entropy of a given system need not increase. In isolated systems, $d_e S = 0$; the changes in entropy are entirely due to processes within the system, $d_i S$, and they are always positive, i.e., the entropy of an isolated system can only increase. When the system reaches equilibrium, $d_i S = 0$; there are no processes taking place in the system. Everything in the system is static and the temperature is

uniform. In closed and open systems, $d_e S$ could be positive or negative (sometimes called “negentropy” if it is negative) but the entropy produced by the processes within the system $d_i S \geq 0$, in accordance with the second law. The change in entropy of a system, $dS = d_e S + d_i S$, can be negative if $d_e S$ is negative and sufficiently large in magnitude to overcome the positive contribution of $d_i S$. This is what happens in living cells whose entropy can decrease. Such a decrease in entropy of a system is not in any way in contradiction with the second law which mandates $d_i S \geq 0$.

The Dual Role of Irreversible Processes. Twentieth century thermodynamics brought to light an important aspect of nature: *self-organization*. The inexorable evolution to equilibrium has often been talked about as evolution toward “disorder.” The association of the concept of entropy to “disorder” is unfortunate and has led to much confusion. It had misled people to think that the second law implied that a system could not spontaneously evolve to an ordered state in which its entropy decreases. All this changed, however, when it was discovered in the early part of twentieth century that when a system is far from equilibrium, it can spontaneously become ordered. One of the first and much studied system is the Belousov-Zhabotinsky (BZ) reaction in which the concentrations of the reactants oscillate periodically like a clock. Under other conditions, the same system generates propagating chemical concentration waves (Nicolis and Prigogine 1977). These and other systems that were discovered and studied subsequently revealed an important aspect of irreversible processes (Nicolis and Prigogine 1977): their *dual role* as both *creators* and *destroyers* of order. When a system is close to thermodynamic equilibrium and evolving toward it, irreversible processes tend to reduce order. For example, when the BZ system is close to thermodynamic equilibrium, the concentrations change monotonically toward their equilibrium value at which the entire system becomes homogenous and static. This monotonic behavior has been associated with the inexorable increase in entropy, hence the second law. But the correct

interpretation of the second law is that when chemical reactions take place, the entropy increases. When the BZ system is sufficiently far from equilibrium, however, the concentrations begin to oscillate spontaneously, like an organized clock. The non-monotonic oscillatory change in concentrations is perfectly consistent with the second law because it is the consequence of irreversible chemical reactions which increase the entropy. The same irreversible chemical processes lead to both monotonic concentration changes toward static equilibrium state and the dynamic, “organized” oscillatory changes in concentration. *They destroy order when close to an equilibrium state but create order when a system is far from equilibrium.* The realization of the role of irreversible processes (that dissipate free energy) while creating ordered states has given rise to the term *Dissipative Structures*, structures we see in nature that are generated and maintained by entropy producing dissipative processes. This term was coined by Ilya Prigogine and represents an important concept in understanding *order* and *disorder* in nature (Nicolis and Prigogine 1977). *Dissipative structures* are often used synonymously with “self-organizing chemical reaction diffusion systems” (Nicolis and Prigogine 1977). The Belousov-Zhabotinsky reaction is a widely recognized example of self-organization; the Bernard convection cells provide another type of example (Ji 2012, p. 17).

Thermodynamic Entropy versus Information-Theoretic Entropy. The term “entropy” was coined by Rudolf Clausius in 1865 as a *thermodynamic state function*. In 1948, upon the recommendation of von Neumann, Shannon employed the same term to refer to H , a mathematical function (later known as the Shannon entropy) that he invented to quantify the average amount in bits of the *information* transmitted by a message. It had no connection to the physical entropy that originated in Carnot-Clausius formulation of the concept. Furthermore, Shannon’s formalism uses the term “information” in a very narrow sense. The main success of Shannon’s concept is in coding theory. Shannon’s H is a measure of how much a message

coded in bits can be compressed by appropriately coding it. The association of Shannon's H with "entropy" is due to similar mathematical expression used to define the entropy of thermodynamic system in terms of the micro-states of the system. To overcome terminological confusions and facilitate logical analysis of the theoretical relation between the *thermodynamic entropy* and *information-theoretic entropy*, it was suggested in (Ji 2012, pp. 97–101) that the former be referred to as the *Boltzmann-Clausius entropy* (designated as S_{BC}) and the latter as the *Shannon entropy* (S_S) and that S_{BC} be viewed as a subset of S_S . According to these suggestions, there are many different kinds of S_S , of which only S_{BC} is subject to the Second Law of thermodynamics. In contrast, Jaynes and his followers, for example, assert that S_S and S_{BC} are identical within proportionality constant, implying that S_S also obeys the Second Law of thermodynamics which is thought to be false.

Self-identification

Science

Chemical thermodynamics is a subdiscipline of thermodynamics, one of the major branches of natural sciences which include astronomy, Newtonian mechanics, optics, electromagnetism, relativity theory, quantum mechanics, and statistical mechanics. All these disciplines represent systematic knowledge about the universe that has been acquired through observations/experimentations, analysis of data utilizing mathematical and computational methods, and testing logically inferred predictions.

Characteristics

Chemical thermodynamics is the study of the changes in heat production or absorption and structural organization and disorganization that result from chemical transformations in macroscopic and microscopic scales. This contrasts, for example, with mechanics whose main focus is the study of the motions and their causes of material

objects (also called particles), both macroscopic and microscopic, in space and time.

Relevance to Science and Religion

Since chemical thermodynamics is one of the best established branches of natural sciences, it should shed important light on the relation between science and religion. For example, the fact that both organisms and abiotic objects such as rocks and stars are constituted of the same set of chemical elements and subject to the same set of thermodynamic principles (e.g., the First and the Second Laws) may have profound consequences for the basic tenets of many religions in the world. Although both organisms and abiotic systems are built out of the same building blocks, their properties and behaviors are dramatically different because the way these building blocks are organized in space and time is different.

Sources of Authority

The authority of chemical thermodynamics as a subdiscipline of thermodynamics derives from the fact that the laws of thermodynamics have been tested and upheld by experiments without any exception so far, since the late eighteenth century.

Ethical Principles

The principle of honesty and objectivity in accepting the results of experiments as they present themselves to us is paramount in all scientific activities, irrespective of whether or not the experimental data fit our theoretical conjectures.

Key Values

The principles and accumulated knowledge of chemical thermodynamics are essential for scientists and engineers to explain and understand their experimental data about material transformations

in and around us, which is a prerequisite for solving practical problems in industry and biomedical sciences.

Conceptualization

Nature/World

It is common among chemical thermodynamicists to accept the model of nature and the universe formulated on the basis of astrophysical observations in the form of the Big Bang theory.

Human Being

Human being or *Homo sapiens* is thought to have originated on this planet about 2 million years ago in Africa and spread around the world thereafter. Analysis of fossils gathered in Africa shows that *Homo sapiens* has evolved from the first living systems that originated on this planet some 3–4 billion years ago through spontaneous generation of self-reproducing chemical reactions-diffusion systems, probably driven by thermal gradient on the earth surface or deep in the ocean floor.

Life and Death

There are now sufficient chemical and computational evidence to indicate that life could have originated on this planet from primordial pools of ordinary chemical compounds subject to temperature gradient some 3–4 billion years ago. Some simple aspects of life, which is astronomically complex phenomenon, have been and is being successfully reproduced in laboratories around the world.

Reality

Chemical thermodynamicists tend to view reality as something that exists out there objectively and independently of the observer and that the regularities embedded in reality can be uncovered through experiments, logical analysis of data, and hypothesis testing.

Knowledge

A system of organized information that can be applied to solving practical problems.

Truth

A statement or proposition that has been formulated based on logic, experimental data, and daily life experiences.

Perception

The sum total of the stimuli that enters our consciousness, leading to some registered traces in our nervous system.

Time

A physical parameter that increases unidirectionally just as the entropy of an isolated system does.

Consciousness

The property of our nervous system that is aware of its surrounding and its own activity, i.e., self-aware.

Rationality/Reason

The ability of our mind to carry out thought processes in accordance with a set of logical rules as well as natural laws.

Mystery

Although much has been learned about the laws and principles underlying chemical transformations in abiotic systems, there still remain many mysteries in chemical thermodynamics, especially when applied to living processes. For example, we all know that life cannot exist without chemical reactions (e.g., eating food) and yet the molecular and submolecular mechanisms that couple chemical reactions to even the simplest of living processes, e.g., muscle contraction or active transport, are still poorly understood.

Relevant Themes

With rise of computers that can manipulate digital sequences, the coding of “information” using digital sequences has resulted in a growing interest in the concept of information. This has led some to identify two major theoretical and philosophical problems facing contemporary thermodynamics – (a) the relation between *entropy* and *information*, and (b) the relation between *energy*

and *information*. The debate on the *entropy-information relation* began in 1948 with the appearance of Shannon's entropy formula for the average amount of information carried by a message, and the discussion of the *energy-information relation* may be said to have begun in 1985 when it was postulated that all living processes are driven by *gnergy*, defined as the complementary union of energy and information (reviewed in Sect. 2.3.2, 4.7 and 4.13 in (Ji 2012)). There are scholars who believe that *entropy* and *information* are basically identical. There are equally numerous scientists and philosophers who support the opposite views. These debates are relevant to the science-religion discourses because science is primarily concerned with energy and matter, while religion has its own perspectives on the origin of everything in our Universe including energy, matter, and information.

Cross-References

- Astrophysics
- Complex Systems
- Energy in Physics
- Physics
- Time

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Child Surgery

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Related Terms

[Paediatric surgery](#); [Pediatric surgery](#); [Surgery in childhood](#)

Description

Child surgery deals with all diseases of childhood, for which a surgical operation may contribute to therapy. Childhood comprises all humans from birth to 16 years of age and also includes fetuses and premature newborns ([The European Pediatric Surgeons' Association](#); [The American Pediatric Surgical Association](#); [World Federation of Associations of Pediatric Surgeons](#)). While child surgery encloses diseases of all organs of the body and thus is the historical root of the discipline ► [pediatric surgery](#), the latter nowadays concentrates in most countries on diseases of the inner organs and skeletomuscular system (Ashcraft et al. 2005; Oldham et al. 2005). Especially surgery of the heart, the eyes, the ears, and the brain concerning specialized operations in children have recently become subspecialties of the organ surgery specialties. Because of the relative rarity of many surgical diseases of childhood, pediatric surgery is more and more concentrated to large children's hospitals and university clinics.

Self-Identification

Science

Pediatric surgery deals with the treatment as well as research of diseases of humans during the period of growth and differentiation, that is,

fetuses to approximately 16 years of age. Important aspects are the normal physiology of growing organs and tissues, as well as the pathophysiology of abnormal developments and resulting malformations. Furthermore, surgically relevant acquired diseases of childhood caused by infections and inflammation, trauma and neoplastic (tumor) growth are subject of research and treatment in pediatric surgery.

In research, pediatric surgery is active in performing (1) basic biological investigations and (2) clinical studies. Here, methods and techniques of cellular biology, molecular biology, genetics, physiology, anatomy, physics, chemistry, microbiology, biology, mathematics and statistics are applied according to the rules of these natural science disciplines. For clinical research single or multicenter randomized or nonrandomized patient studies are used according to the rules of good clinical practice in order to develop evidence-based guidelines for treatment (von Schweinitz and Ure 2009).

In clinical practice, pediatric surgery deals with a broad spectrum of malformations and diseases (subspecialties in parenthesis): those of the inner organs of the thorax and the abdomen (pediatric visceral surgery), of the urogenital system (pediatric urology), traumatic alterations of the skeletomuscular system (pediatric traumatology), traumata and malformations of the spine and the brain (pediatric neurosurgery), malformations in the newborn period (neonatal surgery), and – at this time still mostly experimental – of the fetus (fetal surgery). For diagnostics in pediatric surgery, all modern techniques of clinical investigation, laboratory, and radiology are applied modified to the needs of children. For treatment, pediatric surgery utilizes all modalities of surgery, drug therapy, physical therapy, and psychology used also in adults but modified to the needs of the individual age of the patients (Ashcraft et al. 2005; Oldham et al. 2005; von Schweinitz and Ure 2009). In research and clinical practice, pediatric surgery is a close partner discipline to all subspecialties of interne child medicine, that is, pediatrics.

Characteristics

Pediatric surgery is one specialty of human medicine. It is distinctive to other medical disciplines in that it is concerned with disorders of fetuses, children, and adolescents with a surgical relevance, that is, may need a surgical operation. Therefore, the special interest lies on the biology, diagnosis, and treatment of these diseases and malformations.

Relevance to Science and Religion

Because of the many relationships the developing human individual is bound to and the many influences he or she is subject to, pediatric surgery is interested in many scholarly areas. This accounts for all disciplines of human biology, as far as they are dealing with the development of humans and their malformations and diseases, also all specialties concerned with the body, mind, and soul of children and adolescents, but also with scholarly areas engaged in the living and welfare of families, education, sociology, culture, and politics including national and international conflicts (i.e., pediatric traumatology and war damages), finally ethics and religions.

Sources of Authority

Historically, the first authorities in the developing discipline of pediatric surgery were surgeons who realized that the treatment of children with malformations or diseases need specially trained physicians as well as a clinical setting adapted to the needs of children. In the nineteenth century, first departments of pediatric surgery were established in Boston – USA, Paris – France, London – UK, Munich – Germany, and other European countries. Today, authorities for pediatric surgery and its subspecialties exist worldwide. These usually have published handbooks (some see reference list) and are organized in national and international scientific pediatric surgical organizations (see reference list).

Important periodicals are the Journal of Pediatric Surgery, the European Journal of Pediatric Surgery, and Pediatric Surgery International.

Ethical Principles

As a medical discipline, Pediatric Surgery throughout the world acknowledges and is guided by the Hippocratic Oath and the rules of the Declaration of Helsinki of 1971. Because fetuses, newborns, and children are not able to give informed consent as adults, a special concern for the welfare of the individual patient in clinical practice and research is mandatory for pediatric surgeons.

Key Values

The key values of Pediatric Surgery are:

1. The optimal treatment of malformations and acquired diseases of the growing human being of all age groups,
2. The care of these patients in the clinical setting and at their home,
3. To undertake research to better understand the causes, pathophysiology, diagnostics, and possible treatment of these malformations and diseases,
4. To teach medical students and physicians all aspects of this discipline.

Conceptualization

Nature/World

Nature and its rules and interactions are the basis of life and thus also of the human body, its organs and tissues, its cells and its development, growth and differentiation. The world comprises of the materials of all planets and the interspersed space of the universe as well as all aspects of human mind and possible other intelligences unknown to us.

Human Being

The human being is a product of nature with a body including a highly developed brain, giving

the human being the possibility of feeling and abstract thinking, of philosophical and religious conceptualization. The body as well as the mind are subject to development from one cell at the beginning pregnancy.

Life and Death

Life is the presence of functions of biological systems including reproduction, growth, and differentiation. Death is the termination and absence of such functions.

Reality

Reality is understood as the materialistic world as well as actions and products of minds, which can be sensed by the individual human being.

Knowledge

Knowledge is the accumulation of experiences, facts, ideas by biological systems including the human being as well as by physical systems as books, electronic devices, and others.

Truth

Truth is defined as the realities and ideas proven by multiple experiences of human beings or laws of nature, which both are thought to have universal character.

Perception

Perception is explained as the conscious sensations and experiences of all aspects of the physical world of a human being in dependency of health and disease, the momentary situation, and the developmental stage.

Time

Time is a physical category of chronically ongoing processes in the material world, which can be perceived by human beings and objectively measured, implementing aging of biological systems.

Consciousness

Consciousness is understood as the status of the human mind, which enables the individual to perception, mental workup, active reaction, and storage of external influences.

Rationality/Reason

These are thought to be the ability of the human mind to explain, to deal with, and to react to perceptions, feelings, and other influences using logical thoughts. This is dependent on mental health status as well as on the stage of mental development during childhood.

Mystery

Mysteries are perceptions, feelings, and other influences, which cannot be explained rationally by an individual. This is dependent on mental health status and mental development, but also on experiences, culture, religion, and education of an individual and/or group of human beings.

Relevant Themes

The most relevant issues of Pediatric Surgery are not only cure from surgical diseases and malformations of the growing human being, but furthermore the well-being of children in all aspects of life in order to facilitate their development to healthy, mentally intact, and responsible adults ([The European Pediatric Surgeons' Association](#); [The American Pediatric Surgical Association](#); [World Federation of Associations of Pediatric Surgeons](#)).

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Chiliastic

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The term is derived from the Greek *chilioi*, meaning a thousand (years). The idea was widely held that one thousand years after Christ, Christ will return and a new age will dawn. This led to the expectation of a thousand years' rule of Christ. This idea was secularized by Marx and Engels and later by the Nazi ideology into a secular Thousand Years' Reich. It can also mean the triumphant and overzealous attitude to bring about paradisiacal conditions through one's own efforts.

Chinese Psychology of Religion

- [Psychology of Religion China/Asia](#)

Chorography

- [Geography in Islam](#)

Christ Event

- [Divine Action](#)

Christian Cosmology

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Related Terms

[Big bang cosmology](#); [Creatio continua](#); [Creatio ex nihilo](#); [Creation](#); [Multiverse](#); [Natural evil](#)

Cosmology is the scientific study of the Universe *as a whole*, seeking to understand its origin, evolution, and structure. Until modern times, there was no difference between scientific and religious cosmologies; scientific cosmology was at the same time religious cosmology. Its major concern was to strengthen and unfold the biblical idea of creation as depicted in the book of Genesis, by invoking empirical insights about the world. Simultaneously, in introducing God as the ultimate cause of natural processes, one could provide an explanation for all empirical facts involved. Many contemporary theologians follow the ancient thought, that is, how to embed scientific findings the biblical message and the core Christian doctrines – the product of centuries-old theological reflection based on the first chapter of Genesis. However, after science became decoupled from theology, the competences have been redefined. Given the (methodological) autonomy of science, contemporary Christian cosmology seems to be best understood as theological reflection about physical cosmologies in terms of a *coherence test*, which means, in reflecting scientific cosmologies, theologians see it as their task to integrate new scientific insights into the traditional doctrines of Christianity as well as to reinterpret (or reformulate) these doctrines insofar as that is necessary for the integration of scientific theories (cf. Barbour 2000). Consequently, while physical cosmology seeks to understand the origin, evolution, and structure of the Universe, Christian cosmology seeks to integrate the results of the scientific endeavor into the core Christian doctrines of divine creation.

The Origin of the Universe

The traditional Christian doctrine – as formulated, for example, by Saint Augustine – states that in the beginning God created the Universe out of nothing (*creatio ex nihilo*), which means, directly or indirectly, *everything* owes its existence to God, or to put it another way, God is the ultimate cause of the Universe (cf. Craig and Copan 2004).

According to the classic understanding of Genesis 1:1, *creatio ex nihilo* entails that the Universe had a *temporal beginning*. However, following the tradition of Boethius, Anselm, and Aquinas, divine perfection requires that God exists outside of time, is timeless. Understanding the world as temporal while God as atemporal became one of the major problems for philosophers of religion. Hence, some modern theological concepts assert that God is genuinely in time even if God created a world *ex nihilo* (*open theism*) or formed an eternally existing “stuff” (*process theology*).

Understanding God as Temporal Cause of the Universe

Traditionally, the question if God can be considered as the temporal cause of the Universe arose in the context of the so-called *kalām cosmological argument*, which was introduced by medieval Arabic theologians – therefore also the name *kalām* that was applied to the argumentative theism employed in defense of Islamic orthodoxy beginning in the ninth century. More recently, the *kalām* argument was revived and defended by American philosopher William Lane Craig (cf. Craig and Smith 1995). The *kalām* argument infers from the existence of the universe to God’s existence by proving that the universe is in need of a temporal cause, in reconciling the traditional doctrine of *creatio ex nihilo* with physical cosmology. The question is, thus, if the Universe is in need of a temporal cause?

Contemporary proponents of the traditional understanding appeal to two different scientific developments to support the doctrine of *creatio ex nihilo*, namely, mathematics of infinity and the big bang theory. Allegedly, the mathematics of infinity could provide an a priori argument for a finite-age universe insofar as a (temporally) infinite universe implies the existence of an actual infinite. Thereby, an actual infinite represents a timeless totality that neither decreases nor increases in the number of members it contains, whereas a potential infinite is a process that comes closer and closer to infinity but never reaches it – a distinction originally introduced by Aristotle to resolve Zeno’s paradox

(cf. Bostock 1973). By referring, for example, to a hotel as an actual infinite which can accommodate a new guest even if its fully occupied (called Hilbert's Hotel, cf. Gamow 1989), proponents of the *a priori* argument from the mathematics of infinity argue that the existence of an actual infinite seems intuitively absurd, which leads them to the conclusion that an absolute infinite cannot exist. That is to say, with regard to its temporal extension, the Universe represents a potential but no actual infinite. However, this *a priori* argument counts as a fairly weak one, mainly because it seems to tell us more about our cognitive capacities than about reality itself. For it is at least not evident that things we cannot imagine (or consider to be an absurdity) cannot exist. If that were the case, general relativity or quantum physics should also be regarded as absurdities, which surely is not the case. In conclusion, mathematics of infinity is not very helpful, insofar as it is impossible to prove by way of *a priori* considerations that the Universe is a potential and not an actual infinite.

In order to reconcile the traditional understanding of *creatio ex nihilo* with modern science, it is perhaps more promising to appeal to the standard big bang theory (Cf. article on ► [cosmology](#) by Kenneth R. Lang in this volume). As a matter of fact, the classic interpretation of the fact that the universe (including space-time) arose out of a singularity, that is, out of an original state of infinite density and temperature, and no size (i.e., the universe had a temporal beginning), was mostly welcomed among theologians. Indeed, the big bang theory suggests that physical cosmology directly supports the core theistic belief in *creatio ex nihilo*.

However, the classic interpretation of big bang theory is not fully accepted by all physicists. The possibility that a physical theory could prove that science has reached its boundaries appears dissatisfying to most physicists. Therefore, various alternative theories were developed. Such an alternative theory, or rather bundle of theories, is the theory of oscillating or cyclic universes as presented by Paul Steinhardt, Neil Turok, or Roger Penrose, stating that our big bang is but one in a series of countless "bangs": The universe

goes through repetitive cycles of expansion and contraction; a new big bang occurs when the antecedent big bang universe reached its end phase, that is, after it arrived at a completely homogeneous, highly dense, and extremely hot state (Big Crunch). Another possibility to avoid a temporal beginning provides the theory of inflation, first suggested by MIT-physicist Alan Guth in 1981. Inflation posits a stage of rapid expansion in the very early universe, originating in a quantum vacuum state. Thus in the framework of inflationary cosmology, the universe does not need to have a temporal beginning insofar as the quantum vacuum might be eternal. While cyclic universe cosmologies are often considered as too speculative, the theory of inflation is widely regarded as a necessary complement of standard big bang cosmology, filling the explanatory gaps of the latter, the striking large-scale homogeneity of our universe, and the origin of structure. Yet, even if inflationary theory does not necessarily rule out a temporal beginning insofar as the quantum vacuum state does not need to be eternal, the classic interpretation of standard cosmology is not compelling. Indeed, the fact that the field equations lead to a singularity (when tracked back in time) could simply mean that general relativity does not apply to the epoch before inflation, so that we are in need of new physics to explain that era.

To sum up, if the classic interpretation of standard big bang cosmology turns out to be the only proper understanding of the theory, the traditional understanding of *creatio ex nihilo* can be considered compatible with science. However, until there are serious alternative theories (or interpretations), the empirical basis of the *creatio ex nihilo* doctrine (understood in terms of a temporal beginning) remains questionable.

Not only scientists question the assumption of a temporal beginning for the Universe, also theologians have their doubts. It has often been argued that a proper interpretation of the Bible does not imply a temporal beginning. Rather, the opening verses of Genesis start with depicting a watery chaos: "The earth was without form and void, and darkness was upon the face of the deep and the spirit of God was moving over the

face of the waters.” In fact, church historians have recently pointed out that the idea of *creatio ex nihilo* was first formulated in the second century, as a response to the Gnosis teaching that matter is evil. Accordingly, the doctrine of *creatio ex nihilo* had a twofold aim. Firstly, it asserted that God is the source of matter as well as form against claims that a preexisting matter could limit divine power. Secondly, it asserted God’s transcendence against the idea that the world was an emanation of God, made of the divine substance and sharing its characteristics. Indeed, the interpretation of *creatio ex nihilo* in terms of a temporal beginning was first elaborated by Augustine and cannot, therefore, be regarded important for the self-definition of the early church. Particularly, scientist-theologians Ian Barbour and John Polkinghorne argued against conceiving of God as a temporal cause of the Universe (Barbour 2000 and Polkinghorne 2006). They hold that such a view rests upon a theological misunderstanding of Genesis that – sooner or later – becomes entangled in contradictions with science. Instead, they emphasized that we should think of divine creation as a “fundamental and enduring relationship” between the faithful God and the world (*creatio continua*). As a proper interpretation of Genesis 1:1, they suggested to conceive of God, the Creator, as the nontemporal or metaphysical cause of the Universe (Cf. article on ► [divine creativity](#) by Gloria Shaab and the article on ► [creator – co-creator](#) by Barbara Ann Strassberg in this volume).

God as Metaphysical Cause of the Universe

The common strategy to argue for God as the metaphysical cause of the Universe operates by distinguishing different kinds of modality, contingency, and necessity.

That God is conceived of as a *necessary being* is known as the *sovereignty-aseity intuition* (Plantinga 1980, Davidson 1999). Thereby, the idea is the following: Necessarily, *x* depends on *y* for its existence iff *y* were not to exist, neither would *x*. In other words, if the number four depends on God for its existence, then the truth of four exists depends counterfactually on the

truth of the proposition God exists, if God exists were false, then four exists would be false (Matthew Davidson 1999). In turn, this means that four is a *contingent being*, that is, dependent upon the existence of another being (be it contingent also or necessary). Another approach to understanding necessary and contingent beings comes from modal or metaphysical logics. Understood as such, a necessary being exists in all possible worlds, while there is at least one possible world in which a contingent being does not exist.

By applying this distinction, proponents of the *metaphysical argument* believe to have shown that even if the Universe has no temporal beginning, it is contingent and thus depends on something else. Here an additional premise is assumed, however, according to which a contingent being always has a cause of its existence – this assumption is usually called the *principle of sufficient reason*. In fact, it is this principle that calls for a necessary being to be the ultimate cause of the Universe. The final goal of the argument is then to show that this necessary being can only be God.

To sum up, if it turns out that standard big bang theory implies a temporal beginning of the Universe, the doctrine of *creatio ex nihilo* can be considered valid in its classic interpretation; on the other hand, regardless whether science predicts a temporal beginning of the Universe, God can be considered as the ultimate metaphysical (or nontemporal) cause of the Universe, responsible for its origin and for sustaining it (as understood in terms of *creatio continua*). However, compatibility does not imply exclusivity. That is to say, the scientific picture clearly allows for both a theistic explanation and a naturalistic interpretation.

The Evolution and Structure of the Universe

The more philosophical question whether God can be conceived of as the ultimate cause of the Universe is closely related to the problem of explaining the evolution and structure of the Universe. Suppose that an ultimate metaphysical

cause (which might be a necessary being) is needed to count for the existence of the Universe. However, whether this ultimate cause is indeed God as God is understood in classical theism, depends on whether the Universe *as it is* can be ascribed to a morally perfect, omniscient, and omnipotent being. Furthermore, according to Immanuel Kant, it is not evident that the necessary being (*ens necessarium*) is the absolute (or mostly real) being (*ens realissimum*). Nor can the biblical account of divine creation be reduced to the belief that God is the ultimate cause of the Universe (Cf. further article on ► [divine action](#)).

In fact, to reinforce naturalistic interpretations of big bang cosmology, it has often been claimed that, though the Universe could be contingent, God cannot be considered its ultimate cause, insofar as characteristic features of the Universe are incompatible with the Christian image of a faithful God. In this context, particularly the problem of evil (cf. further article ► [evil, problem of](#), by Thomas Anderberg in this volume) has been often cited as an argument against divine creation – whether in terms of *creatio ex nihilo* or in terms of *creatio continua*.

The Fine-Tuning Argument

Contemporary cosmologists study the laws governing the entire Universe and hence focus (primarily) on physical laws describing the structure and evolution of the Universe. While so doing, they assume the *cosmological principle*. Usually, the cosmological principle says that, “viewed on a sufficiently large scale, the properties of the Universe are the same for all observers” (Keel 2007). This implies that the Universe is homogeneous and isotropic, which means, despite its immense size, the same natural laws apply everywhere in the Universe.

The cosmological principle is regarded empirically extremely well confirmed – the most striking evidence comes, again, from the impressing homogeneity of the cosmic microwave radiation we already discussed above as empirical evidence for an expanding universe. In several theological reflections, it is – unsurprisingly – precisely the cosmological principle by way of which the characteristic traits of the Universe are

linked with the conditions here on Earth, in particular with human life. If the Creator wanted intelligent life to evolve somewhere in the Universe – so the argument runs – the Creator had to establish the laws such that they allow for the evolution of intelligent life. That means, the structure of the entire Universe has to reflect the possibility of intelligent life – even if intelligent life can factually evolve only within a tiny fraction of the entire Universe.

In order to strengthen this somewhat bold idea and to harmonize it with current scientific insights, theologians usually refer to the fact of *fine-tuning*, that is, that both the mathematical form of the laws and the values or constellation of the fundamental parameters which together characterize the structure and evolution of the Universe are such that even minimal deviations from the observed values would have led to massive changes in the physical evolution, possibly ruling out the emergence of intelligent life.

Consider, for example, the mass ratio between proton and neutron: Although their mass difference is only 1.29 MeV ($\sim 0.14\%$), which is vanishingly small, it is nevertheless bigger than the tiny mass of the electron ($\sim 1/1,836$ of the proton mass). However, if the electron were more massive than the mass difference between proton and neutron, free neutrons would be stable and could not decay into a proton-electron-antineutrino triple. As a consequence, most of the protons and electrons in the early Universe would have combined to form neutrons and neutrinos. In such a universe, only neutron stars could have emerged, the emergence of atoms or other chemical elements would not have been possible, not to mention the emergence of life. If instead of changing the mass ratios, we would change the electromagnetic into gravitational force strength ratio of 1,036 by reducing it to, for example, 1,033, the consequence would be that only a short-lived miniature universe could exist. Hence, there would simply be no time for biological evolution. The probability that we find even a few fundamental parameters having the observed ratio to one another, which is necessary for our very existence, appears to be extremely small, and the totality of them together vastly

more so; according to calculations of physicist Lee Smolin, the probability is about one chance in 10^{229} . Recognizing this remarkable coincidence, scientists in the 1960s suggested that it should be considered a physical phenomenon (or explanatory pattern) *sui generis*, which became known as the *anthropic principle* (Tipler and Barrow 1988). This principle is based on observations that the laws of nature and parameters of the Universe necessarily take on values consistent with the conditions for life on Earth.

For theological considerations, the point of anthropic reasoning lies in the *post hoc* character of the argumentation, reducing cosmic fine-tuning to the existence of intelligent life. Even though it is not supposed to be an implication of the scientific argument, in facing the extremely small probability of the observed constellation, anthropic reasoning seems nevertheless to suggest a *teleological interpretation* (cf. Leslie 1989). If the Universe has expected us from the very beginning, assuming the existence of a divine creator appears fairly plausible. By reverse conclusion, the anthropic principle might present an empirical argument for the existence of God. Moreover, it has the potential to refute another empirical argument against the existence of God, namely, the atheistic claim according to which the Darwinian explanation of the origin and evolution of life on Earth in terms of random mutations and natural selection makes the creation hypothesis obsolete. In order for evolutionary processes to occur, the observed fine-tuned parameters, initial conditions, and natural laws are needed. This, in turn, brings God back into play.

Objections

However, the anthropic principle has been largely criticized. The argument is that none of the finely tuned phenomena require human life or some other sort of carbon-based life. Rather, it is said, any form of intelligent life would do (Stenger 2011). In response to criticism, the anthropic principle has recently been redefined in the argument from fine-tuning.

However, the only scientific alternative approach to explaining fine-tuning does not

appear more promising: To solve the fine-tuning problem, scientists have questioned the apparent uniqueness of our Universe by referring to quantum many-worlds or inflationary multiverse scenarios. If our Universe – so the argument runs – is but one among infinitely many other universes, it seems hardly surprising that in one of these universes the observed constellation is realized. For the sake of argument, let us suppose that there are indeed infinitely many universes. What would the existence of such a bundle of universes mean for Christian Cosmology? Consider the following two cases: (1) All universes in the multiverse are described by the same Theory of Everything (2) The universes in the multiverse can be grouped into bundles, which are described by different theories of everything, respectively. In the first case, the problem of fine-tuning is only shifted, insofar as the question still remains open *why* the multiverse is described by the given Theory of Everything, characterized by certain fundamental parameters and a certain mathematical form. In the second case, the fine-tuning argument can be regarded resolved only if all mathematically possible forms are realized. This, however, entails the extension of physical reality over tremendous dimensions, while the only motivation for this is a purely metaphysical one, to provide a naturalistic interpretation of cosmic fine-tuning.

All in all, there is a price to pay when the theistic interpretation of cosmic fine-tuning should be replaced by way of multiverse theories, and in face of the ontological curiosity multiverse theories entail, it is in the final analysis left to the philosophical or theological preferences if one asserts the theological or the naturalistic alternative. Yet, being merely metaphysical assumptions, multiverse theories cannot be considered as a serious objection to a theistic or Christian interpretation of cosmic fine-tuning. Furthermore, if our Universe is not the best of all possible worlds (which seems quite likely), it is even plausible to claim that God created all universes above a certain axiological threshold than to assume that God created only our Universe while neglecting to create any better ones. That is to say, it seems possible that neither just one



universe exists solitarily nor all possible universes exist simultaneously, but God created a subset of all logically possible universes, whether interconnected, whether causally inert. Clearly, advancing the possibility of creating a world that is a multiverse, the most important question is why God chose the actual world, why God preferred one possible world to an enormous number of others. In other words, for a multiverse theory to be successful, it is necessary to identify *world-good-making properties*, that is, conditions for a world to be worthy of creating. Indeed, developing a comprehensive theory of theistic multiverse is today an emerging research field in both theology and philosophy of religion (Kraay 2012). In the near future, we can hope for interesting results.

Concluding Remarks

Christian Cosmology has always been conceived of as the endeavor to reconcile the biblical message of creation with the actual scientific insights concerning the origin, structure, and evolution of the entire Universe. Understood as theological reflection about physical cosmologies from a Christian point of view, Christian cosmology is not about direct inference from facts about the world to knowledge of ultimate reality but can be a powerful tool to harmonize the biblical idea of creation with contemporary culture. Therefore, promoting the dialogue between scientific and Christian cosmologies appears inevitable to make the biblical message understandable in modern societies. At the same time, Christian belief can provide an overall context for scientific cosmologies, demonstrating that the mutual interaction of science and religion can indeed arrive at a comprehensive and coherent worldview.

Cross-References

- [Cosmology](#)
- [Creator – Co-creator](#)

- [Divine Action](#)
- [Divine Creativity](#)
- [Evil, Problem of](#)

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Christian Education

- [Religious Education, Protestant](#)

Christian Epistemology

- [Epistemology, Reformed](#)

Christian Ethics

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Description

Christian ethics is an enormously rich and diverse field of study that investigates a wide range of ethical topics and issues using moral resources often drawn from but not necessarily limited to the Christian tradition. As a critical reflection on Christian morality, Christian ethics seeks to answer hard questions about the sources and criteria of moral knowledge as well as the normative claims made by Christian morality in response to various ethical issues and problems. Despite the fact that the phrase “Christian morality” may seem to suggest otherwise, all Christians of course do not hold the same moral views; the Christian moral tradition is more like a huge repository of many divergent ideas, beliefs, and practices born out of distinct Christian communities than a monolithic system. Thus, it should be of no surprise that there are a number of ways in which the study of Christian ethics is done and can be done. So how should we attempt to canvass this vast field in a limited space?

For our purposes, I suggest that we make use of some conceptual distinctions often used by moral philosophers in order to clarify and outline some of the important ideas and schools of Christian ethics.

We can begin by noting a distinction between first-order accounts and second-order accounts of moral reasoning. The former, typically referred to as normative ethics, raises questions about the content of ethical claims, such as the standards of moral judgments and the rules of moral obligation. The latter, often known as metaethics, is concerned with the status and nature of ethical claims. Metaethics seeks, among other things, to answer questions about the nature of moral knowledge and truth as well as the metaphysical status of moral properties. Later in Part two, I will discuss only some of the epistemological issues

in metaethics. The distinction between normative ethics and metaethics should serve us well as we consider a variety of approaches and topics within Christian ethics.

Normative Issues in Christian Ethics

Ethics is commonly defined as the knowledge of right and wrong (as well as good and bad). This short definition, though insufficient to capture all areas of ethics, highlights something important in ordinary moral reasoning: standards of moral judgments. We human beings make moral judgments about the actions and characters of moral agents, which are implicitly or explicitly based on certain moral standards. Though normative ethics has become a highly specialized field within analytic moral philosophy, ethical discourse involving moral standards still largely draws upon the traditional normative theories: psychological egoism, ethical egoism, deontologism, consequentialism, and ► [virtue ethics](#). Our question in this section is whether Christian theologians and ethicists ever appeal to the moral standards proposed by these normative theories.

The short answer to this question is clearly, “yes.” From Christian love ethics to ► [liberation theology](#) and from just war theory to biomedical ethics, the kinds of moral judgments commonly made in Christian ethics cannot avoid using moral norms. Let me illustrate this by focusing on the debate over moral norms from the 1960s to 1980s, during which Christian ethics in Europe and North America was deeply engaged with the criteria of moral norms. Ethical issues such as contraception, abortion, and euthanasia often dominated Christian ethical discourse. Interests in such issues were not accidental; this era saw an unprecedented technological development in medicine that engendered ethical questions about certain reproductive and medical practices, and the debates about these questions eventually became a part of the contemporary social and political landscape.

If there was one book in Christian ethics that created a firestorm during this era of social and cultural upheaval, it was Joseph Fletcher’s *Situation Ethics*. In this book, Fletcher argued that

there are no moral absolutes except love (Fletcher 1966). The basic idea was first the claim that the only legitimate criterion for judging the moral status of an action is whether it can be justified by love, that is, the New Testament notion of ► *agape*, and second, the assertion that love justifies the means to any given end. Alarmed by the denial of moral absolutes and moral laxity in the wider culture and in the church, the Roman Catholic Church began to confront these questions head-on. In his papal encyclical letter *Humanae Vitae*, published in 1968, Pope Paul VI made it clear that direct sterilization, artificial contraception, and abortion (with the exception of therapeutic abortion) are illicit. Paul VI's views on these matters would be reaffirmed later by Pope John Paul II and Pope Benedict XVI. What is important for our purposes is that they all insisted, based on their interpretation of natural law and church tradition, that there are certain acts that are intrinsically evil by virtue of the material means they used, and regardless of the agent's intentions or the consequences of the act. This view is often called "absolute, exceptionless moral norms" and it created a controversy not only among Catholic moral theologians but also among Protestant ethicists. Proportionists, a group of Catholic moral theologians such as Peter Knauer, Joseph Fuchs, Louis Janssens, Richard McCormick, and Bruno Schüller, instead argued that the morality of an act cannot be determined without considering carefully the final end or the intention of the agent (*finis operantis*) and the end of the act (*finis operis*). Briefly, their view is that we may permit the evil effect of our act only if (1) this result is not intended in itself (i.e., the end is indirect) and (2) it is justified by a commensurate reason (i.e., it is proportionate to the morally acceptable intention of the agent within the totality of his act). In contrast, those who hold the absolutist position have accused proportionists of being consequentialists who hold that one may do evil in order that good may come.

We should also note a Protestant ethicist who was particularly interested in the debate about moral norms. Paul Ramsey, a well-known ethicist in the twentieth century, was vehemently opposed

to consequentialism, calling its harmful effects the "wastelands of relativism." Like Fletcher, Ramsey viewed Christian love as central to Christian morality; however, these thinkers could not be farther from one another in terms of how they understood the normative meaning of Christian love. For Ramsey, Christian love, which is grounded in the righteousness of God and Jesus' teaching about the Kingdom of God, has a covenantal character. According to him, Christian love signifies disinterested love for one's neighbor in obedience to the sovereign rule of God. For Ramsey, the point of Christian moral life is not to maximize happiness for oneself or others but to value each human for his or her own sake as the image of God. His ethics is also noteworthy because it regards moral rules as specifiable or revisable in light of certain moral facts relevant to moral cases. On this view, since they impose actual rather than *prima facie* moral duties, alleged exceptions to moral rules are not really *exceptions*, but instead should be considered further specifications of moral rules (Ramsey 1968).

All this clearly indicates that various positions among Christian thinkers involve normative ethical theories. On closer examination, Fletcher's situation ethics is a form of act-utilitarianism (or act-agapism) which uses the principle of utility as the only criterion of morality. In contrast, the official teachings of the Catholic Church advocate a rigid deontologism that allows no exception to moral rules. Catholic proportionists, however, disagree with this official position by offering a version of rule-utilitarianism that holds to the primacy of moral rules in promoting the utility of an action. Ramsey's Protestant ethics offers a moderate deontologism that recognizes the possibility that *prima facie* moral duties can be overridden by other actual moral duties.

Ironically, the fierce debate about moral norms helped other Christian thinkers to shift their focus onto a different kind of moral standards: virtue (Hauerwas 1981; Porter 1995). Since 1980s, there has been a movement against rule-oriented ethics and toward character-oriented ethics. Virtue ethics, of course, is not uniquely a contemporary phenomenon; it is traceable to, among others, the ethics of Aristotle and Aquinas. Yet, the recent resurgence of

virtue ethics is not accidental. On the one hand, it is a critical reaction to modern individualism and the Enlightenment morality that emphasized the role of reason in moral judgment. On the other hand, it is also an effort to reclaim the distinct moral ethos of the Christian community.

Epistemological Issues in Christian Ethics

From the early church to the contemporary church, there have been various claims to religious and moral knowledge. Disagreement between Christian communities makes these claims appear problematic; what a particular Christian community purports to be a true belief is not always the same as what another Christian community holds to be true. Unfortunately, differences in beliefs between distinct Christian communities have often led to social oppression and even political persecution, as seen during the Radical Reformation, the 30 Years War, the English Reformation, and the American Puritan struggle for religious freedom. Sometimes, change of moral beliefs has occurred within the same religious community as a result of such periods of oppression. Consider the history of Christian attitudes toward usury, slavery, and women's suffrage; in these examples, we see a long-standing church tradition changing its course after a long and difficult period of social, political, and religious transformation.

All this should raise a question about how true moral beliefs in a given Christian community can be held justifiedly. Can those who claim to possess knowledge give sufficient grounds for holding their beliefs to be true? Have Christians or Christian communities tried to offer such grounds for justification? In the following, we will consider some commonly cited sources of evidence in Christian ethics.

Scripture

Christians have long depended upon the Bible for moral guidance, and have done so for a good reason: the Bible has been believed to be or to contain the Word of God and, thus, is thought to possess normative authority for the Christian moral life. Of course, assuming that this is true, we can raise an additional question of whether the biblical text is really a good evidential basis for moral knowledge.

Though there are plenty of people who believe that the Bible gives us unambiguous moral truths, it is an undeniable historical fact that, since the early church, the correct interpretation of the Bible has been highly disputed. Christian theologians have long been aware of the difficulty of using the Bible as a moral guide. To mention only a few, St. Clement introduced allegorical method of biblical interpretation in order to avoid literal interpretations of the Bible. St. Augustine rationalized the idea of just war by appealing to the love of one's neighbor. St. Aquinas explained self-defense as a natural right for all, and did so in the face of a long-standing church tradition on the contrary.

Therefore, it should come as no surprise that many contemporary Christian ethicists caution against attempts to declare the Bible as the ultimate authority for Christian ethics or to equate biblical ethics with Christian ethics. For example, arguing that there are many sources of moral reflection for Christians, H. Richard Niebuhr has said that his ethics is "bible-informed," and not "bible-centered" (Niebuhr 1963). Niebuhr's position is just an instance of the more general contemporary move deviating from the use of scriptures as infallible proof of Christian moral claims.

Tradition or Community

Christians often appeal to their tradition or community as the grounds for justifying their moral beliefs. Historically, the Roman Catholic Church has long held that it is the apostolic tradition of the church that gives authority to scripture. In his famous debate with Martin Luther, for instance, John Eck renewed the Catholic doctrine of the authority of tradition over against that of Scripture. In his view, it is the church that had created Scripture and established its canon, and thus, the church has proper authority over Scripture.

In recent years, however, there has been a wider appeal to the Christian community as the grounds for justifying moral beliefs. One important source of influence, in this regard, has been a particular version of Wittgensteinian philosophy, according to which truth is not a property that a statement has when it

corresponds to reality, but rather is merely a function of language. George Lindbeck, known as a representative of the Yale School of “narrative” theology, along with Hans Frei, made it his theological thesis that Christian truth claims should not be understood as propositions that can be known as true or false outside of one’s particular linguistic community or as expressions of individual religious experience, but rather should be viewed as referring to the world only as described by the users of a particular linguistic community (Frei 1974; Lindbeck 1984). Lindbeck held that since the meaning of a linguistic statement is a function of its use, the truth of any given statement is explainable in terms of the linguistic rules accepted and employed by the statement’s users.

Another source of influence is the rejection of universal, objective morality based on foundationalist ► [epistemology](#). Some Christian thinkers complain that Christian ethics has lost its distinct message in the liberal state by trying to make the Christian narrative more palatable and intelligible to those who are not Christians and by adopting the public moral language of the liberal state. Stanley Hauerwas and John Milbank, for instance, claim that because all morality is particular to historical, social, and societal practices there is no such thing as a *universal* morality. According to them, there is no Archimedean point of view from which we can judge the moral beliefs of a particular society other than our own. What this means is that no one outside of the Christian community has the authority or ability to judge the truth of Christian convictions. They submit that only the Christian community can furnish the principal criterion for justifying Christian beliefs, and hold that the intelligibility of theology and ethics derives only from the practices of the church.

Critics of such contextualist theory of justification point out that this kind of Christian ethics is a sectarian theology that divorces the Christian community from the wider world (Gustafson 1985). They also argue that it is a form of moral relativism since the truth of moral beliefs is made relative to particular societies.

Experience

Ever since Latin American liberation theology came to the fore in 1960s, there has been a plethora of new ethical theories that make the particular experience of a certain group of Christians their centerpiece: black liberation theology and ethics, feminist ethics, womanist ethics, Asian liberation theology, postcolonial theology, Latino/Latina ethics, and so on. In this regard, these theologies and ethics employ an inductive approach to moral knowledge, deriving the latter from experience. Despite many differences among these theologies and ethics, there is one important commonality. In a way, they are all distant relatives of the nineteenth century’s liberal theology, which made human experience the most important source of doing theology. In any such experience-based Christian ethics, the experience of a particular group becomes both the source and the criterion of moral knowledge.

Another similarity among these theologies and ethics is that they all seek liberation as their goal. To put this in a simplistic manner, Latin American liberation theology, for instance, focuses on the liberation of the poor and those who are politically and economically oppressed in Latin America; feminist ethics seeks to emancipate women from patriarchy and gender-based inequality; womanist ethics seeks to liberate black women from their oppressive social, cultural, and economic systems. However, there is a widely shared view among contemporary liberationists that all who are oppressed are connected with each other not only through their shared suffering but also the oppressive systems themselves. In this regard, there is a growing tendency among various groups of liberationists to collaborate and join the resistance movement. One such example is an alliance between feminists and environmentalists, both of whom are interested in addressing the degradation of nature, which many feminists believe mirrors the oppression of women. Thus, ecofeminists argue that the liberation of women can also lead to the liberation of nature and vice versa (Ruether 2005). Needless to say, there are many divergent views among liberationists, and this makes a fair assessment of their ethics very difficult. Having said this, there

are two main difficulties with experience-based ethics. First, they are prone to identity-dependent ethical and political discourse where members of certain social, cultural, or religious groups are often overly sensitive to external criticisms by appeal to their shared experiences, and second, their attempts to justify values such as equality and individual liberty may be self-defeating, since they also deny the very existence of universal human values based on shared human experience.

Reason

Historically speaking, reason has held a venerable position in Christian ethics. Many early church fathers tried to defend the Christian faith in the time of persecution, emphasizing the harmony of reason and faith. In the Middle Ages, Aquinas continued this emphasis by synthesizing reason and revelation in his twofold theory of happiness. Bishop Butler, John Wesley, and Jonathan Edwards all acknowledged that there is an important place for reason and for natural morality derived from reason. Most significantly, the Catholic moral law tradition has long considered reason to be a reliable, though not perfect, guide to basic moral knowledge. According to this tradition, God imprinted natural law on reason so that basic moral truths can be known to rational people upon due reflection.

Though reason has been one of the major sources of Christian ethics, interest in the study of reason as the source or criterion of moral knowledge has waned significantly in the recent decades. This is in large part due to the wide influence of postmodernism in the field. Briefly, postmodernism is a school of thought that seeks to critique the notion of universal reason and the objectivity of knowledge. In particular, postmodern ethics has strongly assailed any appeal to universal morality and the rule of law based in reason.

Can reason, contrary to the claims of the postmodernists, furnish basic moral knowledge? In contemporary analytic moral philosophy, moderate intuitionism (distinguished from the classic intuitionism of Sidgwick and Moore) is gaining new momentum. Moderate intuitionists

(e.g., Audi and Shafer-Landau) claim that some basic moral truths are knowable through reason upon due reflection. They explain that this moral knowledge is supervenient upon natural facts without the former being reducible to the latter. Is Christian ethics compatible with intuitionism? If we consider reason to be an integral part of Christian morality and if we take revelation to be an additional resource to reason, it may be possible for Christian ethics to accept intuitionism. More importantly, Christian ethics can still draw upon other sources of Christian morality but also insist that reason plays a critical role in justifying Christian moral beliefs.

Cross-References

- [Agape](#)
- [Deontology](#)
- [Epistemology](#)
- [Liberation, Theology of](#)
- [Metaphysics](#)
- [Virtue Ethics](#)

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Christian Existentialism

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Related Terms

[Kierkegaardianism](#)

Perhaps the main representative for Christian existentialism is the Danish philosopher and theologian Søren Aaby Kierkegaard, (1813–1855) whose thinking had a broad but prominent influence on systematic theology, continental philosophy, literature, and arts. Within dogmatics, his thoughts have renewed and inspired both Christology (Karl Barth and Rudolf Bultmann) and Hamatology (Paul Tillich, Christof Gestrinch, and Wolfhart Pannenberg). Also, his view upon ethics and philosophy of religion has been innovative and of considerable importance in the process of rethinking Christianity on postmodern premises. Kierkegaard's status as founding father of existentialism is well known and recognized as is his concrete influence on Martin Heidegger, Gabriel Marcel, Jean Paul Sartre, and Albert Camus. Also, dialogical philosophy has been inspired by Kierkegaard's view on subjectivity and its relational nature, and Franz Rosenzweig, Martin Buber and Emmanuel Lévinas have through a critical dialog continued the inspirational path following from Kierkegaard's relational thoughts. Many authors, play writers, poets, and other artists from all over the world have also been inspired or bewitched by the Kierkegaardian universe.

At that time, Denmark changed from having been a feudal society into a capitalist society. Many people moved from the rural areas into the cities, which among other things caused that

the social structure changed from having been a rigidly hierarchical one to a relatively horizontal one. In its turn, this implied firstly that social identities were unusually fluid and secondly that there was a proliferation of normalizing institutions which produced pseudo-individuals. Hence, it became more and more difficult to find one's identity. One of Kierkegaard's greatest concerns was "how to become a Christian in Christendom." His concern about identity with a focus on Christian identity is why he is regarded not only as the father of existentialism but also as a Christian existentialist.

One of the major works done within Christian existentialism is *Begrebet Angest (The Concept of Anxiety)* (1844), in which he makes a revision of the traditional doctrine of original sin going back to St. Augustine. He emphasizes that sin always enters the world through the concrete sin of the single individual, whereby sin must not be understood as a hereditary deformity of human nature. In this work, he starts with analyzing the first anxiety experienced by human beings, namely, Adam's anxiety related to whether he should or should not eat from God's tree of knowledge. The act that he did eat from the tree of knowledge became known as the original sin. That he suffered from anxiety has also to do with Adam having a free will, the will to obey God (staying away from "that" tree) or not, to sin or not. According to Kierkegaard then, anxiety preceding sin is the presupposition for hereditary sin. However, anxiety also has the power to save individuals because it informs them of their choices, self-awareness, and personal responsibility. Anxiety is the bridge between unself-consciousness and self-consciousness.

In *Philosophiske Smuler eller En Smule Philosophie (Philosophical Fragments)* (1844), Kierkegaard writes under the pseudonym Johannes Climacus and sharpens the understanding of faith and Christianity. He takes his point of departure in Socrates, who presupposes that human beings posit the truth within themselves and therefore they can reach it in an immanent

way. As an alternative to this understanding, Climacus claims that Christianity presupposes that human beings are in sin by their own guilt and therefore it is not possible for them to relate to the truth by themselves but only through a transcendent power. From this thought stems the understanding of God as the absolute paradox.

Kierkegaard's doctrine of the absolute paradox is fully developed in *Afsluttende uvidenskabelig Efterskrift til de filosofiske Smuler* (*Concluding Unscientific Postscript*) (1846). In addition, this work is written under his pseudonym Climacus. The paradox is a key concept in Kierkegaard's attempt to interpret Christianity as a contradictory unity of time and eternity, which defies discursive understanding. The Christian paradox consists in the fact that the eternal truth is a paradox: the infinite God has become a finite human being at a certain point in history and as such has suffered death on the cross.

This is also shown in the doctrine of the stages as a theory about the relation between the three spheres of existence: the aesthetic, the ethical, and the religious. In the religious stage, the ethical commitment is combined with faith in a personal God (religiousness A), who not only demands obedience but also forgives human beings their disobedience, their sin, in Christ (religiousness B, or the paradoxical religiousness). The transition to religiousness B happens by a leap of faith.

In the authorship after 1846, Kierkegaard radicalizes his understanding of Christianity and stresses that suffering, martyrdom, and imitation are essential signs of true Christianity. *Kjerlighedens Gjerninger, Nogle christelige Overveielser i Talers Form* (*Works of Love, Some Christian Reflections in the Form of Discourses*) (1847) analyzes the relation between human love and neighbor love and represents Kierkegaard's contribution to Christian ethics. It is in *Works of Love* that the radicalization of Christianity and the critique of "Christendom," the notion of Christianity as a cultural artifact, are visible.

In *Sygdommen til Døden, En christelig psykologisk Udvikling till Opvækkelse*. (*The Sickness unto Death, A Christian psychological exposition for edification and awakening*) (1849) by anti-Climacus, the exposition of sin from *The Concept of Anxiety* is continued, and here Kierkegaard analyzes key concepts like despair and offence as constitutive for true Christianity.

Cross-References

- [Christianity](#)
- [Concept of God in Contemporary Philosophy of Religion](#)
- [Existentialism](#)
- [Love \(Affective, Sexual\)](#)
- [Love \(Alterity, Relationship\)](#)
- [Names of God](#)

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Christian Faith

- [Revelation](#)

Christian Healing Cultures

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Related Terms

[Christianity](#)

Description

The rise of Christianity in Late Antiquity until its establishment as state religion of the Roman Empire led to a change in the societal status of various professions, including of physicians. Doctors lost their relatively independent position, since quotations from the Old and New Testaments indicated that God the Father and his son Jesus appeared as physicians and the medical art had to subordinate itself to Christian premises (Ex. 32.39; Lk. 5.31; Mk. 2.17).

From the sixth to the twelfth century, cloister medicine was the most important form of professional medical practice. It had already been codified in the “Institutiones” of the Benedictine monk Cassiodorus around 560, and in the following centuries, other monastic orders and the increase in the supply of resources (pharmacies, monastery gardens, collections of lore) expanded it. The Benedictines regarded medicine as part of lived faith. The initiative to establish and maintain medical facilities was the purview of the local heads of the Church; there were no defined medical curricula and qualifying tests. The medical knowledge of Antiquity was passed down in the Mediterranean region by Isidor de Sevilla and others, and in the following centuries, Irish and Scottish monks on missionary journeys spread this knowledge throughout the Occident, often in the form of copies or interpretations of the “Corpus Hippocraticum” and texts from Late Antiquity. Research done by Arab physicians also influenced Western Christian medicine.

The life work of Hildegard von Bingen is generally regarded as the high point of cloister medicine. Her nine-volume “Physica” comprises descriptions of the effects of about 500 medicinal plants, foodstuffs, elements, metals, and stones. It can be assumed that she had advisors assisting her in writing her books. Bingen describes how herbs are to be boiled up, smoked, and applied in powder form. Centuries of experience with monastic and folk medicine are summed up here and supplemented with therapeutic suggestions.

The cloister medicine of the High Middle Ages relied primarily on dietetics as a means of preventing illnesses or of rapidly restoring health by intervening to maintain the humoral pathological balance of humors, or body fluids. To this end, various poisons, phytotherapeutic medicines, or foodstuffs were employed; their power was supposed to be revealed solely to knowing and believing Christians and to be effective solely in the latter’s hands. Dosages varied greatly, depending on the region and the traditions of ancient writings. To recognize diseases and prepare the medication therapy, monks and nuns used the diagnostic method of uroscopy. Taking the pulse played only a subordinate role (in contrast to Arabic medicine). If the therapeutic measures taken did not seem to help, the medieval physician shifted to isolating the patient while continuing comprehensive pastoral care. In this way, it was possible to contain leprosy, for example.

In the course of the High Middle Ages, the proponents of cloister medicine lost their dominant position in the treatment of disease with the development of worldly educational institutions, the greater spread of physicians with private practices in the flourishing cities, and the development of folk-medicine networks. But, with their religiously argued concepts based on the ancient doctrine of the humors, all the healing professions had great difficulties treating the plague, or Black Death, after 1348. This failure of medicine led to intellectual unrest in occidental society.

In the following centuries, there was a gradual movement, repeatedly interrupted and influenced

by reverse tendencies, to break with the foundations of medieval healing arts. Anatomical investigations spread in the early modern period, the Reformation ended the dominance of cloister medicine for good, and the institution of state control instruments for the supervision of public health limited the Church's influence in the field of medicine.

Discoveries in physics, chemistry, anatomy, and geography increasingly made it difficult to explain disease in terms of divine influence. There was a final unfolding of Christian healing cultures in the period of idealism, in which the invocation of the healing vital powers harmonized with the idea of a comprehensive system of dietetics and an appeal to humoral pathological approaches that integrated the discoveries of the natural sciences since 1750. The discovery of the law of the preservation of energy, the development of inorganic chemistry, cell pathology, and bacteriology, as well as the spread of Charles Darwin's theories lastingly destroyed Christian healing cultures' theoretical foundations and attempts to explain the behavior of the human organism. In the decades after 1880, Christian physicians reoriented themselves toward issues of medical ethics. They thereby adhere to static, unchanging moral principles, for example, placing the right and duty to live above all secular considerations. They can, but need not, have a rejecting attitude toward Darwin's theory of evolution. This is true also of the clergy who appeared as forerunners of modern complementary medicine, for example, the hydrotherapist Sebastian Kneipp and the "clay pastor" Emanuel Felke, who combined naturopathy and homeopathy. Homeopathy itself entails belief in divine curing power and can thus be regarded as located on the margins of Christian healing cultures.

Self-identification

Science

The adherents of Christian healing cultures were for centuries the sole practitioners of natural scientific, medical, and transcendental research in

Europe. The question of scientific validity did not arise in this period. After the loss of this position in the nineteenth century, explicitly, Christian doctors have regarded themselves as belonging to conventional medical culture but claim to be the sole representatives of special ethical principles.

Religion

The basis for these actors' work is the Christian religion. They regard themselves as agents of the divine will.

Characteristics

While clergy are primarily concerned with the welfare of people's souls in the afterlife or beyond, representatives of the healing cultures are mainly engaged for health in this world. They thus function both as a marginal organization and as a special complex within an increasingly secularized Christian world.

Relevance to Science and Religion

The representatives of the healing cultures regard themselves as an integral component of the Christian world, and they are recognized as such not only by their hierarchical superiors but also by some vehement opponents of Christianity. In missionary regions, they are especially often the targets of terrorist attacks.

Sources of Authority

They derive their authority from two sources: first, their success in treating patients and second, their membership in the clergy of the Churches.

Ethical Principles/Key Values

The fundamental principle of Christian healing cultures is the orientation toward a Christian

worldview. This means that one sees oneself as the agent of the divine will and that the only ethical guidance one accepts is the Bible, divine revelation, and the doctrines of salient Church scholars (for example, popes).

Conceptualization

The same conditions for action, regulations, and considerations are valid as for all actors of the Christian Churches. The attitude toward death has a special role: adherents of Christian healing cultures stand in a dilemma in this regard. On the one hand, they see it as their duty to preserve life; on the other hand, reverence for the divine indirectly obligates them not to interfere in its workings. Here, individual case decisions dominate, for example, in questions of life-extending measures, abortion, and whether to regard brain death as the end of life. Standards on these questions are not unified in either Protestant or Catholic communities of faith.

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Christian Theology

► Constructive Theology

Christianity

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Description

Christianity is, from a historic point of view, a religion born from the life, preaching, and destiny of Jesus, called “the Christ” by His followers. The collected memories about that man gave rise to a growing network of communities in the first century A.D., forming what has been designed ever as since “the Church.” This institution has fixed doctrines, codes, and ritual practices that constitute a tradition going back over 20 centuries, and diversifying into many expressions or “denominations.”

Scholars have pointed to a broader sense of “Christianity” beyond the institutional boundaries of the churches and their creeds and even beyond the limits of organized religion. It reflects rather an “idea” or understanding of reality, based on concepts such as “► [incarnation](#)” – the continuity between the divine, human, and immanent reality; “redemption” – the assumption that evil can be overcome through repentance, sacrifice, regeneration, and radical love. This is a rather cultural program that influences our way of seeing human nature, society, and the whole of reality. Obviously, this second sense of the word presupposes a tradition too, even if it feels less bound to doctrinal constraints or to institutional duties.

Concerning developments, it is worthy to take into account the following: denominationalization, modernization, secularization, and revival.

“Denominationalization” refers to the steady fragmentation of Christian churches into ever smaller communities, trying to adapt to social, cultural, and ethnic niches, resulting in an extensive pluralism of expressions. As a result of this fragmentation process, seen primarily in the Americas, the “internal competition” between denominations has increased, dynamizing most

of the churches in many areas. This competition contrasts with religious entities living in a regime of monopoly, such as the state religions of Europe. However, the fragmentation process has at the same time brought confusion resulting in too many contrasts, endangering any ecumenical attempt or sense of communal belonging.

“Modernization” can be considered together with “rationalization” as forms of adaptation to modern times and societies. Christianity – in its many expressions – has attempted to renew itself assuming formats that try to be more fitting in advanced societies. This process has been pioneered by the so-called ► **“liberal” theology** and churches but is characteristic of many denominations struggling to survive in cultural environments radically different from those that existed in their historical beginning and long tradition. Many strategies have been tried. Not every attempt has shown equal effectiveness.

► **Secularization**” is closely linked with modernization since it refers to both: the process of assimilation of Christian communities to their modern, secular entourage, discharging part of their own “religious burden;” and the negative effect of an increasingly secular society that erodes the influence of churches and lowers the levels of commitment of their faithful. This development is threatening the continuity of many Christian entities in Western countries; it is indeed the religious tradition most affected by such a disruptive tendency. This circumstance has caused many scholars to think that Christianity is intrinsically a “secularizing” religion or is worldly driven by its own structure and identity.

“Revival” goes against the former tendency. It describes movements that, in a cyclical way, have since the ninetieth century brought constant impulses of enthusiastic missionary engagement, revitalizing entire churches or big sectors of them. Over the last few decades, there have been several waves of revival, most at the hands of Evangelicals and Pentecostals, bringing a deep transformation of Christianity in many regions of the world, beyond the local traditions that have been present for many centuries.

Characteristics

Reflecting about the most distinctive traits of Christianity, the following can be proposed: the idea of ► **incarnation**, of redemption, of community, and of the human. The “incarnated God” is perhaps one of the most exclusive doctrines among developed religions; even if it finds roots and similarities in many other religious traditions, the most far reaching has been this faith: stating that God becomes man, and hence the divine becomes worldly, breaking the usual separation between transcendence and immanence. The idea of a “suffering God” to redeem or liberate humankind is also unique. Christianity proclaims that God incarnated suffers an atrocious death to rescue humans from ► **evil** and ► **death**. Even if this is an archetype of the religious mind, Christian faith has brought this motive to its latest consequences. The idea of community or church is intrinsic and distinctive to Christian faith and praxis, which encourages the formation of social units, presided over by the law of mutual ► **love**, forgiveness, and engagement. The Christian ► **anthropology** assumes a particular format, describing human beings as “images of God” fallen into sin and self-destructive tendencies but rescued by grace to live a new life in faith and love. Such a distinctive anthropology is the base of Christian view of human dignity, rights, and respect.

Christianity is clearly distinctive among other religious traditions. This distinction probably works in a clearer way with some of them and less with others. Christianity, for an instance, is very close to ► **Judaism**; indeed, it shares a good deal of its sacred texts and values; some of its ritual practices have been inspired by Jewish ► **rituals**, and the boundaries between both religions sometimes become fuzzy. The distinction is clearly sharper regarding Eastern religions, like Hinduism and ► **Buddhism**; there is often a completely different worldview, anthropology, and values system. Often in recent times, the distance has prompted greater interest in these Eastern religions, while at the same time the proximity has sometimes nourished misunderstanding and hostility.

Relevance to Science and Religion

Christianity is one of the religious traditions more involved in the area of “science and religion.” Just looking at the data of specialized societies membership, scholarly papers, and books, there is an overwhelming majority of Christians among the practitioners of that subdiscipline. However, some nuances seem pertinent at this point. Not all Christian churches are involved in a similar way in that endeavor, indeed rather a minority of them. And only some of their theologians have shown interest on this field. Some historical developments need to be recalled. Christian thought was very committed to contemporary expressions of reason and science during middle ages. At some point in the ulterior history, a deepening differentiation began to grow between the realms of theology and sciences. Even if many scientific developments up until modern times were delivered by clergymen and very committed Christians, the growing tendency has been a rising independence between both realms, and even a mutual ignorance and discredit. Some Christian branches have been more interested in scientific progress, especially the liberal ones, while those more orthodox or traditional usually found themselves suspicious about the scientific milieu and progress.

The current situation is heir of the split experienced during the last century and reflecting two different mentalities: one more engaging with their own culture, society, and time; and other marking more its distinction, sometimes reacting to contemporary developments, and proclaiming the self-sufficiency of faith before the perceived threat of competing ideas or world-views. At the present, some churches stress more than others the importance of engaging in a serious dialogue between faith and reason that obviously includes the sciences. It happens that most revivalist Christian expressions often – if not always – refuse to go into a mutually engaging relationship with science.

It is not easy to assess the implications that “science and religion” as a living steady dialogue have in the real life of Christian churches. Probably the reach of this effort is rather short and its

influence small, even at the level of teaching or formation of leaders. The expectation is that a greater awareness of the risks born from ignoring the challenge. The opportunities involved in this dialogue may prompt a deeper engagement from theologians and pastors to an adequate Christian message to a cultural environment massively influenced by science.

Sources of Authority

The most important source of authority for all Christian churches is the Bible, which is nevertheless interpreted in various ways, in a spectrum that goes from more fundamentalist to more flexible forms of understanding the sacred text; these distinctive positions correspond with the identities and styles of different Christian denominations. Indeed for those more “Evangelicals,” the Bible becomes the only authority to be taken into account. What makes the Bible authoritative is its character of being “revealed” by God, in the sense of transmitting God’s will and message for humanity; no other text shares this unique characteristic.

Other Christian churches stress the value of traditions codified in dogmas or corpus of doctrines and the authority of the so-called Big Tradition, including the most recognized masters of the ancient and medieval church; this is more present in some traditional churches, like Catholic, Eastern Orthodox, and, to some extent, the Anglican Communion. Other sources of authority depend on the structure and organization of the churches. Every church has its distinctive authorities, like the Pope and councils for Catholics, the bishops for many traditional churches, or pastors in others. Theologians usually keep some authority but almost always only in the academic field. Indeed, there is a clear correlation between type of authority – more or less centralized – and the unity or cohesion of a church.

The question of authority is today closely linked to choices about the most effective way to preserve a church’s own identity and to adapt to changing times. Decisions need to be made after the perceived need to cope with different aims: to keep unity – and to be able to diversify – to be

faithful to tradition, and to be open to dialogue with contemporary reason. From the tensions between the extremes and the search for balance, different strategies and ecclesial forms arise.

Ethical Principles

The main ethical principle for Christians is the commandment of ► [love](#). This is however a too broad stance to become meaningful. Indeed, the Christian idea of love has gone through many discussions and knows a certain degree of pluralism. Some consensus has been reached resorting to philological analysis: love expresses at least three different attitudes: renouncement of self for the benefit of others (► [agape](#)), emotional attraction and engagement (*eros*), and friendship that implies mutuality (*philia*). Christian love represents some pluralism of expressions, or would try to keep some balance between these three dimensions, even if the first one has seemed for an entire modern tradition the most pertinent or specific to Christian identity. In any case, love is proposed in radical terms in the canonical Christian texts and experiences: as a disposition to sacrifice one's own life for God and for others or as complete forgiveness and love even to one's enemies.

Key Values

The key values of this tradition are in tune with the described ethical principles. However, broadening the presentation, it could be stated that the key values are those of ► [faith](#), ► [hope](#), and ► [love](#). Briefly, faith refers to an attitude of complete trust in God that invites one to follow His will as expressed in His revealed texts; this is a more of a behavioral than a cognitive disposition since faith not only assumes a code of beliefs but also a way of living. Hope is born from faith and expresses a conviction that God will accomplish His promises and will deliver His blessing and will provide a good life to everybody who follows the Gospel. Hope is lived even if apparently those without faith or far from divine commandments are better off, while many believers

need to struggle. The value of love has been already exposed. Probably other values rank high in this tradition as well, like the disposition to ► [conversion](#) or changing one's mind and life in the pursuit of ► [truth](#) and salvation. However, trying to become more concrete and essential, the highest value for Christians would be to feel God's presence and love, which explains the interest and passion of mystics, a special branch of very committed Christians, as a way to better express this superior value.

Relevant Themes

There are several questions that clearly interfere in the relationship between Christian faith and science and that need to be taken into account:

- *Cosmological issues*, especially concerning the origin of the universe, are important because creationists are indeed a branch of Christian fundamentalists, and they are clashing vehemently with evolutionists and scientific views in general, endangering a peaceful dialogue with science. There is nevertheless a mainstream of Christians who take for granted a compatibility of the Christian doctrine describing God as creator and provident, and the scientific view of reality. There is furthermore a sometimes diverging way to understand time, the possibility of God's action, and the limits of the real, including the limits of science. These are points of contention but not of exclusion preventing a fruitful interaction.
- *Anthropological issues* are important because few religious traditions are committed to a view of human beings exalting their dignity, freedom, and spiritual dimension, as Christianity does. Such a view has been rendered less plausible after the rise of more scientific anthropologies. This poses problems of mutual understanding and criticism since it tries to debunk some of the Christian traditional insights. Secular humanists have often led the censure against reductive views of human beings born by scientific developments; Christians are probably more akin to this humanist position.

- *Social issues* are important because the Christian view of society is tailored after ideals of “God’s Kingdom” expressing a growing fraternity, while the models derived from social sciences – especially economics and political science – often conflict with the expected Christian idea of human organizations and social links, giving rise to divergent paths of social progress.

Mainstream Christianity aims at offering a positive contribution for the progress of humankind; however, sometimes its way to understand what is better for humans contrasts with what other voices deem as better. In the end, a dialogue is necessary that can be built on different models and values, not just on issues of detail.

Cross-References

- [Agape](#)
- [Anthropology](#)
- [Buddhism](#)
- [Christian Healing Cultures](#)
- [Conversion](#)
- [Death](#)
- [Evil](#)
- [Faith](#)
- [Hope](#)
- [Incarnation](#)
- [Judaism](#)
- [Liberal Theology](#)
- [Love](#)
- [Messianic Judaism](#)
- [Rite](#)
- [Secularization](#)
- [Truth](#)

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Christology

- [Incarnation](#)

Chronic Pain

- [Pain Medicine](#)

Church

- [Ecclesiology](#)
- [Religious Education Theory, Roman-Catholic, Southern Europe](#)

Circulatory System

- [Cardiology](#)

Classical and Quantum Realism

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Related Terms

[Classical physics](#); [Quantum physics](#); [Realism](#)

Introduction

Fundamental physics deals with some of the most general, abstract, and basic concepts in our view of the world such as space, time, mass, energy, interaction, or causality. The revolutionary changes in fundamental physics have challenged our usual concepts and view of the world leading to a prompt philosophical rethinking of some of our basic presuppositions in the description of nature or even a fundamental reorientation with regard to our cognitive or ontological positions in relation to the world. The emergence of quantum theory is a paradigmatic example of such revolutionary change.

The elementary, nonrelativistic *quantum mechanics* is without any doubt the most widely discussed and controversial theory in modern physics. It is routinely considered to be the empirically most successful theory of twentieth century physics and, at the same time, to be incomprehensible, mystifying, or intrinsically anti-realistic. Its relativistic generalizations in the form of *quantum field theories* provide the conceptual framework which is at the basis of the so-called *standard model* in modern particle physics, that is, the fundamental theory of elementary particles and basic forces in the universe. However, quantum field theory inherits all of the strangeness of quantum mechanics and adds some of its own. This is why most of the discussions have been focused on elementary quantum mechanics. Here the problems may be seen clearer and, furthermore, it is often thought that we have to get a proper understanding of elementary quantum mechanics first, before we can hope to disentangle the open issues in quantum field theory (Cushing 1988).

Two of the main issues of quantum mechanics are the questions about *realism* and *intelligibility*, that is, (a) Can the theory be seen as an objective description of an independent physical reality? and (b) Is the theory physically understandable, that is, does it provide us with an understanding of the physical world? Certainly these issues are connected in the sense that, in so far as we are realists about the physical world and want our theories to give a realistic account of the world,

we also tend to demand that this account is understandable. Conversely, we often say that if a theory is not understandable it cannot be accepted as a realistic description of reality. The alternative would be to admit that the human mind cannot understand reality – which most physicists and philosophers would regard as an admission of a defeat in the scientific enterprise.

Now, these broad concepts of *realism* and *intelligibility* are actually full of pitfalls, as we shall see later. For now we may just record the fact that the main concerns about quantum mechanics are that it is (a) *not realistic* and/or (b) *not intelligible* or, in brief, that it does not provide a *realistic understanding* of the quantum-world.

Intelligibility and Realism

There is no doubt that quantum mechanics is non-intuitive in so far as it is both (a) non-picturable (non-visualizable) and (b) radically contra-intuitive or “strange” in the broader sense of being very different from everything we are accustomed to – both ordinary common sense experience and classical physics. The difficulty, however, is in deciding what exactly to make out of this. First, it is difficult to give an absolute sense to the notion of strangeness or contra-intuitiveness (b), for things are either strange or not strange relative to our expectations – formed from earlier experience – or theories, and if we systematically rejected everything which seemed counterintuitive in the light of established knowledge, then we would never discover anything really new (non-Euclidean geometries, theories of relativity, the heliocentric world-picture, Darwinian evolution, etc.). Intuitiveness in the narrower sense of picturability (a) appears to be more absolute – at least if it is released from the vague notions of mental imagery and defined in terms of the possibility of a comprehensive model in space and time – but it is still unclear if this is really necessary for intelligibility: Aren’t there a lot of things which we may claim to understand but which are not picturable in this sense?

And, even so, it is not at all clear why reality should conform to this standard. Our ordinary experience unfolds continuously in space and time and so does the world according to classical physics, but it would be a sheer prejudice or anthropomorphism to suppose that the micro-world has to conform to such conceptual structure. Therefore, we should be aware of uncritically identifying or even defining intelligibility in terms of criteria borrowed from ordinary experience or classical physics. And furthermore, we should be even more careful of using such established or accustomed notions of intelligibility as criteria for realism.

As for realism, it is important to recognize that *realism* is a transitive concept. You cannot just be a realist full stop, that is, a realist about nothing in particular. The realistic stance is always *about* something X (which may be God, platonic ideas, the physical world, moral values, or whatever) where X is the *ontological content* of the realism in question. In this sense, the formal scheme for realism is (1) X exists objectively, that is, independently of our minds and knowledge (*metaphysical realism*) and (2) we have or may obtain knowledge of X (*epistemological realism*).

Actually, standard accounts of the so-called *scientific realism* are variations on this scheme: We are scientific realists in so far as we (1) take scientific theories as true or false accounts of the objective world (metaphysical component) and (2) take sufficiently well-confirmed, explanatory, successful, etc., scientific theories as true (approximately true, valid in a given domain or the like) theories of the objective world (epistemological component) (Ladyman 2007, p. 335f; Chakravartty 2007, Chap 1). Such definitions are, as they should be, quite neutral with regard to *which* theories actually are true or should be accepted as true, that is, they are quite neutral with regard to *what* actually the world is like and *what* kind of entities and structures our best theories are going to introduce in our scientific world-picture.

Nonetheless, in the quantum-discussions the concept of realism is handled with much less care in so far as questions of realism are often mixed

up with questions of ontology. When it is said that quantum mechanics is intrinsically anti-realistic just because it does not exemplify universal value-definiteness like classical physics, quantum mechanics is actually measured by the standards of classical physics, by criteria of reality borrowed from the ontological framework of classical physics. In this sense, it is actually just a complaint that quantum mechanics is not like classical physics. Gibbins refers to this highly widespread attitude when he says: “Realism in the philosophy of quantum mechanics means the idea that quantum systems are really like classical particles” (Gibbins 1987, p. ix).

In exactly the same way, the arguments that quantum mechanics is necessarily anti-realistic *just because* it is intrinsically probabilistic, or *just because* it contains discontinuities in the time-development (measurement collapse), or *just because* it does not give us a spatiotemporal picture of the quantum world are implicitly using criteria of reality which stem from classical physical experience and which are at home only in the classical physical world-picture or ontology. The same, of course, goes for the general attitude that quantum mechanics must be false or meaningless as it is “strange” or “weird” in the broader sense that it is contra-intuitive in terms of our ordinary experience or classical physics.

We should clearly separate *questions about realism* from *questions about ontology*, that is, questions about the particular nature and structure of physical reality. Every fundamental physical theory contains a physical ontology and very different physical theories may contain very different physical ontologies, which may involve different conceptions of intelligibility and even different criteria of what counts as a realistic description. We are not just physical realists or not (at least unless one is simply denying the very existence of the physical world), but realists concerning some particular physical theory(ies) or other and therefore *about* what this theory(ies) says(say) about the world, and hence *about* some particular physical ontology. As all known physical theories are ascribing *states* to *physical systems*, lay down dynamical *laws* for the time-evolution of the states, establish

connections between states and *observables* (alias *physical quantities*), and eventually introduce *fundamental physical constants*, we may say that full-fledged realism concerning physical theory T involves something as follows:

- (R) (a) Realism about the kind of *physical systems* described by T (i.e., *entity-realism*)
- (b) Realism about the *state-descriptions* and *dynamical laws* of T (i.e., *physical state-realism* and *nomic realism*)
- (c) Realism about *observables* which are well defined on the state of the physical system concerned, including the *values*, if any, of such observables (*realism about observables* or *quantities*)
- (d) Realism about any *fundamental constants* figuring in T (*universal constant realism*)

In this sense, physical realism may be said to be realism concerning a particular physical ontology, namely, the ontological structure obtained by concretely completing items (a–d) for a particular physical theory or set of theories. In terms of such a scheme one may be a realist about different physical theories and so about quite different physical ontologies. No particular physical theory or associated physical ontology can be said to *define* what physical realism is.

Classical Realism

Classical physics is fundamentally classical mechanics and classical field theory which, of course, are quite different theories associated with different physical ontologies, namely, a classical particle ontology and a classical field ontology. If classical particles or classical electromagnetic fields are put under items (a), (b), etc., in the scheme (R), realisms will be obtained for the different ontologies of classical particle mechanics and classical electromagnetism (Hebor 2005, p. 39). Nonetheless, and this being the important point here, there is an underlying ontological deep structure common to all of

classical physics of which classical particle and field theories are just variants, and which sets classical physics apart from quantum physics – and so actually justifies the contrast *classical* versus *quantum* physics. This ontological structure is such a deep-seated, well-integrated conceptual framework, involving its own criteria of objectivity, completeness, intelligibility, and reality, that the acceptance of this conceptual framework may be defined as a particular kind of realism, namely, a *realism concerning classical ontology* or, briefly, *classical realism*. As this ontology is presumably more familiar to most people than is quantum ontology, this entry has been presented very briefly (for details cf. (Hebor 2005, Chap. 3)). It could be formally described by means of the following:

Basic Classical Ontological Structure

- (1) *Classical state-observable structure*:
 - (a) Every state S of a classical physical system is a real function of (in principle) observable physical quantities (called *state variables* or *observables*) o_s and is represented by real numbers: $S(o_{s_1}, \dots, o_{s_n})$;
 - (b) The state $S(o_{s_1}, \dots, o_{s_n})$ uniquely determines the value of every other observable $o_{\bar{s}} \notin \{o_s\}$ pertaining to the system in state S , so actually (the values of) all observables o pertaining to a system are functions of the small set of state observables $o(o_s)$.
- (2) *Value-definiteness*: Every observable in classical physics has (at all times) a definite value, namely a real number, for every physical system for which it is defined at all.
- (3) *Space-time character of observables*: Classical observables are defined in space-time, that is, every observable o_k is a function that essentially includes space and time in its domain of definition: $o_k = f(a, b, \dots, \mathbf{r}, t)$, where $a, b, \dots$ may be other physical quantities, themselves being observables, $\mathbf{r}$ a position vector, and t time.
- (4) *Non-quantum postulate* (continuity): The state observables o_s and hence the states are continuous functions of time, and classical physics allows continuity of fundamental

physical interactions, that is, there is no limit to the gradually turning off an interaction: for any positive ε the physical action ($\text{Energy} \times \text{Time}$ or $\text{Momentum} \times \text{Length}$) may be less than ε .

Comment: This excludes any Planck-like constant like $\hbar$.

(5) *Classical non-superposition of states:* (a) At any time t a classical system is in a definite state (by (1) and (2)); (b) no state S is a superposition of states S_1 and S_2 such that any observable o_S belonging to S is not simply a function $o_S = f(o_{S_1}, o_{S_2})$ of observables belonging to S_1 and S_2 and hence value-definite.

(6) *Separability:* Any classical state for a composite system is *separable*, that is, it may at any time t be thought of as composed of independently existing, spatially coordinated, physically well-defined sub-states pertaining to (a) the constituent subsystems and hence (by (3)) to (b) every spatial domain or location of the composite system in question.

Comment: Note that this does not mention interactions between physical (sub)systems and so is *not* a locality principle. Principles of *general locality* (no actions-at-a-distance) or *relativistic locality* (no super-luminal interactions) hold in both classical and quantum physics. However, separability means that any correlations between observables pertaining to distant systems have to be by way of present causal interactions or common causes.

(7) *Classical determinism:* The specification of state at any time t_0 uniquely determines (by way of dynamical laws which may be represented as differential equations: Hamilton's equations, Maxwell's equations, etc.) the state of the system at any other time t (for an isolated system). Any lack of knowledge of future states (predictability) is purely epistemic, not ontological, and this also goes for the so-called *chaotic systems*.

Comment: By (1) this means that *all* observables for the system at t are determined by the state at t_0 .

Consequences for Classical Physical Epistemology

(8) *Classical description:* Observed and unobserved systems are described in exactly the same way. That is (a) observed systems are (ideally) described as if they were unobserved and (b) unobserved systems are described as if continually observed. In brief: observation or measurement does not figure at all as an essential (non-eliminable) factor in theoretical description. This means more particularly

(a) *No measurement problem:* Any measurement-interaction is continuous and may be neglected or controlled so that the observed system may be described as if the measurement-interaction actually was nil (*Ideal of detached observer*).

(b) *Visualizability:* Unobserved systems are described as if they were subjected to optimal, idealized observation (a *God's eye-view of the world*).

Comment: (8b) should not be understood in the sense of mental imagery (mental images of four-dimensional curved space-time or even $d\mathbf{r}/dt$ cannot be formed in classical physics) but rather in the sense of a comprehensive, continuous geometrical picture in space and time. In this sense (a) classical *states* are visualizable in as much as systems and observables are embedded in a comprehensive spatial model and (b) classical *processes* are visualizable in the sense that any time-evolution is seen as a continuous sequence of states in time.

Comment: In this regard, classical physics is in fact much more tied to observational categories than is quantum mechanics. As classical states are functions of value-definite observables the world is actually described as if continuously observed by an omnipresent, detached observer.

(9) *Classical completeness:* A complete description of the state of a physical system must by way of the state-observables (implicitly) specify the values of all observables pertaining to the system.

Comment: Any lack of value-definiteness in the description is, thus, a sure sign of the incompleteness of the description.

- (10) *Classical objectivity*: A physical description D of a physical system S is *objective* in so far as D represents S as it is in itself, that is, the nature and state of S as it *is* or *would be* independent of the description D , including any experiments or measurements that may underlie D .
- (11) *Classical realism*: Physical systems (a) exist objectively, that is, independently of any (physical) description and of any consciousness, and (b) they always exist objectively in definite *classical states* and hence also (c) are objectively characterized by *definite values for every observable* pertaining to the system. Furthermore, (d) *universal constants*, if any (like c in relativity), are integral parts of the state-description and so have objective existence.

Comment: These are just (a–d) in the general scheme (R). It should be clear that the traits specific to classical physics are contained in items (b) and (c), that is, the classical structure for states and observables, namely, (1) and (2) above.

This classical realism (11) with its associated ontology (1–6) and epistemology (7–10) is largely a quantitative refinement and extension of our ordinary empirical common sense with regard to our macroscopic environment. Hence, this kind of conceptual structure seems to be deeply ingrained in our instinctive way of seeing the physical world. Quantum mechanics, however, presents quite another conceptual structure if seen as a realist description of physical reality.

Quantum Realism

Quantum realism could be formally described by means of the following:

Basic Quantum Ontological Structure

- (1) *Nonclassical state-observable structure*: (a) Every (pure) state of an *individual* quantum system is *completely* represented by a normalized vector (*state vector*) $|\psi\rangle$ in a complex, linear vector space with inner

product H (*state space*, *Hilbert space*). (b) Observables (dynamical physical quantities) $A, B, \dots$ are represented by generally non-commuting linear self-adjoint *operators* $\hat{A}, \hat{B}, \dots$ acting on vectors in H , each defining a spectrum of definite *eigenvalues* $\{a_1, a_2, \dots\}$, $\{b_1, b_2, \dots\}$ and an associated set of *eigenvectors* $\{|\alpha_i\rangle\}$, $\{|\beta_i\rangle\} \dots$ satisfying *eigenvalue equations* $\hat{A}|\alpha_i\rangle = a_i|\alpha_i\rangle$, $\hat{B}|\beta_i\rangle = b_i|\beta_i\rangle \dots$, such that each set of *eigenvectors* $\{|\alpha_i\rangle\}$, $\{|\beta_i\rangle\} \dots$ provides complete, though (generally) different, *eigenbases* for the state space, that is, every state vector in H may be expressed as linear combinations of state vectors for the various operators $|\psi\rangle = \sum_n \langle\alpha_n | \psi\rangle |\alpha_n\rangle = \sum_n \langle\beta_n | \psi\rangle |\beta_n\rangle = \dots$ = the same state vector in different *representations*.

Comment: For convenience (1) considers only the discrete case. For operators with continuous eigenvalue spectra the sums must be replaced by integrals. The fact that $|\psi\rangle$ represents *individual* systems is what separates quantum realism from *statistical ensemble interpretations*, and that it does so *completely* is what separates it from *hidden variables theories* (see below). It should further be noticed that neither the abstract state vectors nor the operators by themselves provide any physical information. The state-observable structure of quantum mechanics is an *integrated vector-operator structure*.

- (2) *Value-indefiniteness*: In a quantum state $|\psi\rangle$, there are generally no definite values for any of the physical observables, the exception being when $|\psi\rangle$ is an *eigenstate* for observable A (eigenvector for $\hat{A}$). Furthermore there are never definite values for all observables pertaining to the systems in question, there being no common eigenbases for non-commuting operators, $\hat{A}\hat{B} \div \hat{B}\hat{A} = i\hat{C}$, so that $|\psi\rangle$ being an eigenstate for $\hat{A}$ entails $|\psi\rangle$ generally *not* being an eigenstate for $\hat{B}$ but rather a superposition of such states $|\psi\rangle = \sum \langle\beta_n | \psi\rangle |\beta_n\rangle$, and vice versa. For canonically conjugate observables like position and momentum there are no common eigenstates at all, the commutator being $\hat{Q}\hat{P} \div \hat{P}\hat{Q} = i\hbar$ and resulting in the famous

Heisenberg relations $\Delta q_i \Delta p_i \geq \hbar/2$. What the vector-operator structure *does* allow, however, are *definite values* when $|\psi\rangle$ is an eigenstate of $\hat{A}$, $\hat{A}|\alpha_i\rangle = a_i|\alpha_i\rangle$, specification of the *possible values* for observable A (spectrum of eigenvalues for $\hat{A}$), *probabilities* for getting result a_i in a measurement of A on a system in state $|\psi\rangle$, $P(a_i||\psi\rangle) = |\langle\alpha_i|\psi\rangle|^2$ (*Born-rule*) and *expectation values* $\langle A \rangle = \langle\psi|\hat{A}|\psi\rangle$.

Comment: The universality of definite values in classical physics is, thus, replaced by largely probabilistic magnitudes. It is, however, crucial that the theory does provide non-probabilistic information by way of eigenvalue spectra and actual eigenvalues too. Any statistical test of expectation values and transition probabilities has to be done in terms of actual and not just possible values for observables. Hence, the importance of the measurement collapse into eigenstates for the measured observable.

(3) *Non-space-time character of observables:*

Corresponding to the general value-indefiniteness, quantum operators are defined on state-space and not physical space-time.

(4) *Quantum postulate (discontinuity):* Quantum mechanics is based on the fundamental constant $\hbar$ with the dimension of *action* ($\text{Energy} \times \text{Time} = \text{Momentum} \times \text{Length}$). The finite value of $\hbar$ entails a fundamental discontinuity in all quantum interactions (even though eventually hidden by the superposition principle as in *quantum entanglement*, see below).

Comment: The discontinuity does not show up in the continuous time-development of the Schrödinger equation for an isolated system, but reveals itself with a vengeance in the measurement collapse.

(5) *Quantum superposition of states:* It follows from the very vector structure of quantum mechanics that a (normalized) linear combination of two different states is a new state (*superposition principle*), and it follows from the completeness of eigenbases that any state may be expanded as a linear combination of any operator from the same state space.

Thus, $|\psi\rangle = \sum_n \langle q_n | \psi \rangle |q_n\rangle = \sum_n \langle p_n | \psi \rangle |p_n\rangle = \dots$, which means that $|\psi\rangle$ at the same time may be in a superposition of position eigenstates $|q_i\rangle$ and momentum eigenstates $|p_i\rangle$ with neither position nor momentum definite.

Comment: The superposition principle in itself entails value-indefiniteness, and in contrast to some interpretations of the Heisenberg-relations, it is clear that this kind of value-indefiniteness is not a result of measurement-disturbances. The value-indefiniteness here is ontological – the system simply *has not* definite values for position and momentum – if you accept the reality of quantum states. Such superpositions cannot be described in classical language and it is important to be aware of attempts to do so in popular and semi-popular expositions.

(6) *Non-separability or entanglement:* Quantum states for composite systems which have interacted in the past generally are not separable, that is (for a two-particle system), the state for the composite system $|\Psi\rangle_{12}$ cannot be expressed as a product of single-particle states, $|\psi_i\rangle_1 |\psi_j\rangle_2$, but instead has to be expressed as a sum (integral) over such product-states: $|\Psi\rangle_{12} = \sum a_{ij} |\psi_i\rangle_1 |\psi_j\rangle_2$. In such *entangled* or *non-separable* states (a) there is a well-defined quantum state for the whole system but individual states for the component systems are not defined at all, which (b) shows itself in the fact that there are correlations between the results of the possible measurements on the two particles – correlations which are quite independent of the distance.

Comment: It is worth noticing that non-separability is just a consequence of the superposition principle for many-particle systems in that the entangled states are simply superpositions of different product-states for the component systems involved. The existence of non-separable two-particle states lay at the root of the original version of the *EPR-paradox* (Einstein et al. 1935) and has, in general, been a subject of extensive discussions on the foundations and interpretation of quantum mechanics. The simple example

of the spin- $\frac{1}{2}$ singlet state $|\Psi\rangle_{12} = 2^{-\frac{1}{2}} [|+\rangle_1 |-\rangle_2 + |-\rangle_1 |+\rangle_2]$ shows the essential features. Regardless of the distance between the two particles and regardless of the spin direction chosen to measure, opposite values are always to be obtained (perfect anti-correlation) as long as the measurement is done along the same direction on both particles. And if different measurement-directions are chosen for the two particles, stronger correlations may be obtained than that is possible if the particles were in separable states, which is the content of *Bell's inequality* (Bell 1964; Auletta 2000, Chap. 34f.). The existence of such strong quantum-correlations has since been amply confirmed experimentally, but this result unfortunately is often summed up in the statement that *local realistic* theories are ruled out – that is, if realism is maintained the correlations can be accounted for only by introducing non-local (superluminal) interactions between the particles – and that quantum mechanics is nonrealistic. Actually Bell's theorem follows from the twin assumptions of *separability* and *locality* so what is called “realism” here is not *realism* but the *separability* assumption in classical physics (Hebor 2005, Chap. 5). This is a clear instance of the fallacy of confusing *physical realism* with the specific assumptions in *classical ontology*, that is, with *classical realism*. Further, *non-separability* should not be confused with *non-locality*, for in as much as the component systems have no individual states it has no sense to speak of interactions between the systems. Beyond this it can be proved that non-separability cannot be used for any kind of superluminal communication (Auletta 2000, p. 633f.).

(7) *Quantum determinism and indeterminism:*

The time-development of state vectors for isolated systems, the so-called *unitary time-evolution* as given by the *time-dependent Schrödinger equation*, $\hat{H}|\psi\rangle = \div i\hbar \frac{\partial |\psi\rangle}{\partial t}$, is as deterministic as any classical dynamical law (being given by a first-order differential equation). The state vector, however, generally does not contain values for the observables (and never for all, cf. (2)), and obtaining these by measurement introduces the

indeterministic feature in so far as for non-eigenstates the theory only gives probabilities for different results within the spectrum of possible results (the Born-rule).

Comment: Whether this is of any relevance for human freedom is at best unclear. It is not clear that the human brain operates by measurement-like collapses on quantum-level, and beyond that it is not clear that human freedom can be identified with pure chance.

Consequences for Quantum Physical Epistemology

(8) *Quantum description:* Unobserved systems are represented by abstract state vectors, and state vectors are not observables. Observed systems are described by the result of operators acting on state vectors. Definite values for observables are generally obtained at the cost of non-eliminable interactions with the system, resulting in discontinuous collapse of the state vector. This leads more particularly to the following:

(a) *Measurement problem:* The question of what is necessary and sufficient for collapse, and where the boundary between quantum superpositions and the definiteness of macroscopic bodies is, is an unsolved problem (Auletta, pt. IV). It is sometimes inferred from this that we should deny the existence of state-collapse and try to apply the superposition principle even to macroscopic bodies (*Non-collapse theories*, see below). Another response, however, is to say that the domain of the superposition principle is what is at present not known and thus, something to be investigated rather than just replacing the lack of knowledge by extrapolations (Primas 1983; Hebor 2005, Chap. 6).

(b) *Non-visualizability:* The description of unobserved systems by state vectors means that the quantum world is radically non-visualizable. From a quantum realist point of view, however, $|\psi\rangle$ has to be regarded as a *symbolic* (not picturable)

representation of the intrinsically non-visualizable quantum state but, notice, still a representation of something *real*.

- (9) *Quantum completeness*: A complete description of the state of a quantum system S means that the state is represented by a *non-degenerate* state vector, that is, when there is only one state vector corresponding to any possible eigenvalue resulting from measurement on S . Or more formally, $|\psi\rangle$ is complete if $|\psi\rangle$ is defined in a state space spanned by eigenvectors of a *maximal set of commuting operators* $M = \{\hat{A}, \hat{B}, \hat{C}, \dots\}_{Max}$ corresponding to observables defined for S , *maximality* of M just meaning that the addition of any single operator to M results in a non-commuting set of operators.

Comment: Equivalent to this is the statement that all observables are fully represented by self-adjoint operators. The *hidden variables* of hidden variable theories (see below), on the other hand, are exactly physical variables which are *not* represented by self-adjoint operators so that the state vector is not seen as a complete representation of the physical state in hidden variables theories (Bohm and Hiley 1993; Auletta 2000 Chap. 32). So the quantum realist assertion of the essential completeness of quantum mechanics is the denial of hidden variables, not the statement that physics is completed.

- (10) *Quantum objectivity*: In quantum physics, no interaction-free observation or description (by way of at least preparation) is possible according to the very nature of the theory. An objective description accordingly includes the interaction of the system with all other systems in so far as these systems are part of the quantum-description (by way of entanglement) and with the whole measurement setup: *contextuality of quantum measurement* (Bohr 1949). This holds for the description of states and for the measurement of observables, respectively.

Comment: This is again very different from what *objectivity* means in classical physics. From a quantum realist perspective, however, the physical world is governed by $\hbar$ (cf. (4)) and interactions

are theoretically, not just practically, non-eliminable when we are investigating a physical system. Taking the theory seriously, thus, means to accept the interactions as part and parcel of the phenomena to be investigated and integrated in the very description of the phenomena. So objectivity here rather means *including*, not *excluding*, the interactions in the description (Bohr 1949). In this sense, quantum mechanics may be seen as a *theory of interactions* rather than as a theory of independent, interaction-free substances.

- (11) *Quantum realism*: *Physical systems* (a) exist objectively, that is, independently of any (physical) description and of any consciousness, and (b) they always exist objectively in definite *quantum states* (exception: subsystems in entangled states, but pure states exist for the whole system). Therefore, (c) definite *values* never exist for all observables but at best for a set of observables corresponding to a maximal set of commuting operators. (d) $\hbar$ lays at the basis of the whole conceptual structure and so *the quantum of action* has objective existence.

Comment: This again is a concrete implementation of scheme (R) but of course in terms of quite another physical ontology than is classical realism. The specific features again are contained in items (b) and (c) corresponding to the radical nonclassical state-observable structure in quantum mechanics, namely, (1) and (2) above.

Outlook and Alternatives

Of course, it might be tempting to try avoiding this kind of quantum realism. However, there is no easy way out if one wants to be true to what the experiments say.

It might be tempting to try denying that quantum mechanics deals with *individual systems* and opt for a *statistical ensemble theory*. Then, of course, the strange features like value-indefiniteness, superposition, and entanglement are just properties of ensembles and not the individual systems. But this does not account for the 2-slit experiment and other experiments which

may be made on individual systems (at a time). In general, ensemble theories are either quite unclear with regard to the individual systems, or they have to say that there are differences between individual systems in the same quantum state and in that case, they just degenerate to hidden variable theories without explicit specification of the hidden variables (Home and Whitaker 1992).

It might be tempting to try denying that quantum mechanics gives a *complete description* of the individual systems and so opt for the existence of *hidden variables*, that is, variables not represented by operators and so not part of the quantum description of states. There are, however, several no-go theorems severely constraining the nature of such hidden variables, showing that they have to be both *nonlocal* (allowing superluminal causal interactions) and *contextual* (values of different observables not being independent of each other). Hence, the advertised intelligibility typically disappears on closer inspection (Auletta 2000, Chap. 32; Cushing et al. 1995). The most popular variant, Bohmian mechanics, may look plausible as long as the focus is on the nice drawings of continuous particle tracks (Bohm and Hiley 1993, pp. 33, 53, 76), but such particle tracks are brought in at the expense of a multidimensional, nonlocal “guiding field” which has all the features of a pure ghost field. It carries no energy, has no sources, but nonetheless instantaneously and distance-independently guides the particles without being acted on by the particles, and it is only defined in an N -dimensional configuration space ($N \gg 3$). Nevertheless, it has to be assumed real if the Bohmian theory is to be understood at all realistically (Holland 1993, pp. 278–279). If a realist understanding of the guiding field is given up, a realist understanding of Bohm’s theory is given up – and if so, why bother with the hidden variables?

It might be tempting to try giving up the assumption of *measurement collapse* and so to try applying standard quantum mechanics to macroscopic bodies and measurement devices (so-called *Non-collapse theories*). However, the so-called *Decoherence theories* actually do not solve the problem of accounting for the

emergence of definite values in the classical domain (Schlosshauer 2007) and the attempt to simply accept the unrestricted superposition principle for macroscopic bodies, including ourselves and our measurement devices, as in the different variants of the *Many-world theories* are certainly not less bizarre than is standard quantum mechanics. (For the many faces of *Many-worlds* cf. (Barrett 1999), and for some of the technical problems cf. (Jaeger 2009, p. 139f)).

Then of course, *realism* may itself be given up, but this seems just to give up trying to understand the physical world at all. In short, it is difficult not to admit that the micro-world has very strange features from a human perspective.

As for connections to religion there have certainly been attempts to solve the quantum perplexities by introducing God and divine intervention (Baggott 2004, p. 257f.), but most people would see this as a clear instance of *obscurum per obscurum*, and the same goes for the several attempts of invoking eastern wisdom here (Stenger 1995, Chap. 1). A more promising link might be to see the micro-world as a great “other,” trying to tell us something very important and strange about the world and our place in it – in a nonpictorial language that we must struggle to understand.

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Classical Mechanics

► [Mechanics](#)

Classical Philology

► [Classics](#)

Classical Physics

► [Classical and Quantum Realism](#)
 ► [Energy in Physics](#)

Classical Studies

► [Classics](#)

Classics

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Related Terms

[Classical philology](#); [Classical studies](#)

Description

In contemporary academia, *Classics* is an umbrella term that refers to an interdisciplinary field of study, unified by its focus on the world of ancient Greece and Rome from prehistory to late antiquity. And because the Greco-Roman culture had such a far-reaching sphere of influence through trade and conquest, study of any of the early Mediterranean civilizations, such as that of Persia, Egypt, Israel, and so on, might also be considered as fitting under the *Classics* umbrella. Within this broad field, a wide range of disciplines intersect: anthropology, history, archaeology, philology, literature, art, linguistics, and many others. Each discipline employs its own methodology and perspective even though the evidence being studied from one discipline to another remains the same – artifacts such as manuscripts, inscriptions, works of art, architecture, and other material remains of these ancient cultures. Successful scholarship in the field almost always requires knowledge of ancient languages and literatures, particularly classical Greek and Latin.

Study of the *Classics* has long been intertwined with the concept of education in the Western tradition and so has been seen as studying the origins of Western culture. In fact, it could be considered the oldest of the academic

disciplines, being the forerunner of the modern ► **Humanities**. The concept of the *Classics* began with the ancient Greeks and Romans themselves, who educated their future citizens by having students imitate great works of literature. This practice was intended to teach rhetoric, grammar, ethics, aesthetics, and the best elements of culture from one generation to the next. Classical scholars began compiling lists of the works worthy of being imitated and discussing criteria for the assessment of such works. Although such lists varied from one individual to another, the practice developed into the concept of the canon, the “standard” works of literature, history, and philosophy identified as being those with which any educated person would be familiar. Even though the individual works identified as canonical changed, belief in the value of a classical canon to provide an educational foundation persisted.

This concept of the classical canon influenced Western European education for centuries, long after the time when the classical languages of Latin and Greek ceased common usage. In the Middle Ages, a formal education began when children first learned Latin through the imitation of selected classical works of literature, history, and philosophy. Then, institutions of higher learning used a Christianized canon to teach rhetoric, grammar, and logic, the foundation necessary for any advanced study. With the spread of humanism during the Renaissance, knowledge of classical texts expanded beyond medieval Christian boundaries, and application of classical concepts appeared in everyday life, including education. So classical authors and their concepts of a literary canon shaped the educational practices of the European Renaissance. Study of the classical canon of texts, along with the classical Latin and Greek languages, remained the foundation of Western European education until the rise of the modern university system.

By the nineteenth century, the new discoveries and the development of new methodologies that accompanied the creation of modern academic disciplines had remodeled the Western tradition of education. It had also expanded the definition of the field of *Classics* beyond studying classical languages and a specific canon of literature to

include the study of objects of art, politics, religion, archaeology, and myriad other facets of classical civilization.

The etymology of the term *Classics* explains why this field of study has been so valued in the past as well as why its influence appears to be currently declining. In its original usage, *classic* indicated socioeconomic status. The *classici* were the ancient Romans in the top socioeconomic classes, the opposite of the *proletarii*, who were in the lowest. Then, in the second century C.E., the Roman author Aulus Gellius applied the judgment of *classic* to literature, distinguishing a *scriptor classicus*, a writer of high quality, from a *scriptor proletarius*, or a writer of common quality (Sandys 1988, p. 200). For Gellius, the determining feature of a *scriptor classicus* was that it provided a model worthy of being followed, and his terminology implied a connection to the highest level of socioeconomic status. Studying the canon, studying the “best” works, was a practice of the upper class, and the judgment of the works included in the canon, the “best” works to study, arose from the values of the upper class.

And to identify something as a *classic* today still attaches the connotation of having a valued social status. In the postmodern, international world of the early twenty-first century, such value is increasingly questioned rather than merely accepted as it was in previous generations. Thus study of the *Classics* is increasingly becoming marginalized. Classical Latin and Greek are no longer widely taught in public school systems. The once-mandatory classical canon has been replaced with canons reflecting the modern nationalism of individual countries. Classicists today face the challenge of justifying the value of their work in the modern world, an ironic situation at a time when new technologies and archaeological discoveries are exponentially increasing their knowledge of the ancient world.

Self-Identification

Science

The *Classics* is defined by subject matter and purpose of understanding classical Greek and

Roman civilization. It is possible, though, for an individual topic being researched with the empirical methodology of a science to fall within the Classics paradigm if the subject matter and purpose of the research are appropriate.

Religion

Religion may be a discipline of study contained within the *Classics* paradigm. Understanding the various religious practices and beliefs of the classical era helps *Classics* scholars understand the literary and philosophical texts of that time. In addition, scholars interested in the modern discipline of religion frequently find knowledge of the *Classics* essential because that era shaped the development of the world's major religions – Islam, Judaism, and Christianity – as well as some of the less widely practiced religions.

Characteristics

Study of the modern *Classics* is distinct among other disciplines because its existence relies on the interaction between a variety of disciplines in order to understand the ancient civilizations of Greece and Rome. Its focus on understanding the past is similar to several other individual disciplines. History concerns itself with cause and effect as it attempts to reconstruct the order of human events. Anthropology studies the beliefs, practices, and cultures of living human beings while archaeology studies human culture by examining the material remains of human beings. Philology is the study of language and literature. The *Classics* relies on all of these disciplines as it focuses on creating as complete an understanding as possible of the culture of a specific time period and geographic location.

Relevance to Science and Religion

Study of the *Classics* is relevant to “Science and Religion” because it reveals the philosophical and/or historical foundation for contemporary Western concepts and practices in both

science and religion. In addition, study of the *Classics* reveals the differences between the perspectives of the ancient and modern worlds. The basic conceptual category of “science” as it is understood in modern times was not used in the classical era, even though many of the subject areas and methodologies now considered to belong to “science” were being developed and explored during that time. Perception of the conceptual divide between the ancient and modern worlds allows an intellectual distancing from modern assumptions and so encourages a critical examination of modern understanding.

Sources of Authority

The most authoritative source in the study of the *Classics* is primary source material. Because such a vast period of time exists between the modern and the classical world, scholars must rely first on the only objective information available, primary source material, rather than relying on prior interpretations of that information to build knowledge.

Another type of authoritative source is found in the classical canon; the selection of Greek and Latin works judged to possess the most merit and so considered to have been influential in shaping Western culture. The fact that the canon is primary source material selected to reflect a particular set of values can make it problematic to use in understanding the classical world because every era has identified its own canon. Careful attention must be given to who has made the judgments about the works included. For example, relying on fifteenth century selections to understand life in first century Rome must be suspect. And yet if the canonical decisions being examined were made in the first century, then they reflect significant insights into the values of that time. The canon is usually more relevant to understanding recent eras than classical ones because it gives insights into how a particular time period interpreted the classical authors and objects of art judged to be worthy of study in that time.

Ethical Principles

The ethical principle guiding study in the *Classics* is remaining as true as possible to the primary source material. Knowledge of a broad range of source material – archaeological evidence, objects of art, literary/philosophical/historical texts – is essential as well to ensure understanding the source within the context of its own time period. This also necessitates knowledge of a range of interacting disciplines and methodologies, such as literature with skills in textual analysis, philology with skills in translation, philosophy with knowledge of philosophical argument, archaeology with the use of statistics, and so on.

Key Values

Study of the *Classics* demands respect for the culture of classical Greece and Rome, as well as the belief that this culture is relevant to present and future civilization. This relevance might come from the direct influence and/or knowledge of classical traditions and values in the present culture or it might come from the interaction of previous historical eras with the classical culture. In addition, *Classics* scholars work directly with primary materials from the classical era, so direct knowledge of the ancient languages and cultures is important. New discoveries are regular, and so the field is constantly growing. Finally, because the *Classics* is an interdisciplinary field, the constant interaction between disciplines requires openness and responsiveness to a variety of methodologies and conclusions of a range of perspectives.

Conceptualization

Because the *Classics* exists at the intersection of a variety of disciplines, defining these terms depends on the individual perspective being applied at any specific time. For example, in one context, a term might carry the meaning used during the classical era, while in another context, the term might carry a modern disciplinary

perspective. So identifying a single definition for each term is not possible.

Relevant Themes

No other issues/themes/concepts are critical to a discussion of Science and Religion.

Cross-References

- Christianity
- Humanities
- Monism
- Monotheism
- Religion, History of
- Soul

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Cleverness

- Intelligence

Clinical Genetics

- Medical Genetics

Clinical Health Psychology

► Behavioral Medicine and Health Psychology

Clinical Microbiology

► Medical Microbiology

Clinical Neurophysiology

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Description

Today clinical neurophysiology (CN) is mainly devoted to diagnosis and objective measures for the clinical syndromes caused by diseases affecting the *brain*, *spinal cord*, *peripheral nerves* (*electroneurography*, *ENG*), and *skeletal muscles* (*electromyography*, *EMG*). History of modern CN is usually dated back to the discovery of the electroencephalogram (EEG) and its clinical applications by the German scientist Hans Berger (1873–1941) between 1920 and 1930. Immediately before and after World War II, neurophysiological techniques devoted to the study of muscle fibers and peripheral nerves by Lord Adrian in UK and Fritz Buchtal in Denmark enlarged the scenario of modern clinical neurophysiology. More recently (from mid-1970s), techniques able to capture selective brain and spinal cord signals in response to specific stimuli, as well as able to identify brain responses to cognitive tasks were acquired under the heading of *stimulus-related* and *event-related evoked potentials*. Since the 1980s, techniques for non-invasive electric and magnetic transcranial brain stimulation have been introduced. During the same year, Sam Williamson & Collaborators introduced modern sensors to capture the

magnetic counterpart of the EEG called magnetoencephalography (MEG).

Particularly in Scandinavian countries (but now also in UK, Italy, Spain, and many other countries) CN progressively became a discipline of its own, being treated as a separate entity from *Neurology* even if in several countries it is still regarded as part of neurological specialty (i.e., Germany).

Modern EEG aims at clinical evaluation of epileptic syndromes, sleep disturbances, comatous states (with the impelling discrimination between a “brain death” and “brain vegetative” conditions, a prerequisite for organs donation); MEG is mainly employed in neuroscientific research and in presurgical localization of high-risk brain centers (i.e., language) for drug-resistant epilepsy undergoing neurosurgical procedures; EMG and ENG help in diagnosing peripheral nerves and muscles disease, while TMS helps in evaluating brain excitability and corticospinal fibers conductivity in multiple sclerosis and spinal cord diseases, as well as in following up brain plastic reorganization following a traumatic or vascular (i.e., stroke) lesion.

Self-Identification

Science

CN has followed the track of basic research in neurophysiology as a natural science. It sees itself as a scientific instrument to enhance knowledge about the pathophysiology of the human [► nervous system](#) and the related musculature. In a clinical context, it has been progressively used as an extension and refinement of the neurological examination, being able to provide objective measurements as well as to unveil abnormalities in a preclinical state (i.e., before a neurological disease is provoking symptoms). Correlations between electrophysiological abnormalities and structural damage were developed in decades following the introduction of computerized tomography and of magnetic resonance imaging of the brain allowing to test in vivo the presence, nature, and extension of the lesion.

In line with neurology, CN applies the scientific methods of the natural sciences for clinical

and basic research as well as for diagnostic procedures. For instance, CN definitely established a causative relationship with the generalized or localized presence of transient paroxysms in the EEG like spikes, spike-and-waves, and alpha depression and various types of epilepsies, and to understand that sleep is not a simple and continuous state, but is the result of a complex pattern of micro-states which develop according to a well-defined hierarchy during the hours separating falling asleep from awakenings.

More recently, neurophysiological parameters were integrated with information from techniques investigating brain function by measuring local blood flow and metabolism (i.e., oxygen and glucose consumption) as well as production of neurotransmitters as in *functional MRI and positron emission tomography (PET)*. International CN is governed since 1949 by the International Federation of CN (IFCN) to which more than 50 national societies are affiliated. IFCN – on its own – is divided into geographical chapters (i.e., European, Latino-American). IFCN has a scientific journal with an about 60-year long tradition, originally entitled *Electroencephalography & Clinical Neurophysiology* and recently renamed *Clinical Neurophysiology*.

Characteristics

CN is mainly dealing with function of brain, spinal cord, peripheral nerves, and muscles as reflected by their electromagnetic spontaneous or stimulus-related activities. Moreover, CN aims to establish a strong relationship between clinical symptoms on one side and the topography of lesion on the other. Symptoms – broadly speaking – include movement deficits, abnormalities in sensory perception/processing, cognitive abnormalities (i.e., memory disturbances). Neurophysiological recordings *in the presence* of such symptoms (particularly when they are transient) help in identifying which is the neural network affected. In fact, once a lesion has been established, it can produce symptoms due to the neural tissue directly damaged, but also from the indirect effects at distance in all the relays

connected with the damaged area, even if they are structurally healthy. This is an important concept which helps understanding how CN can nicely integrate techniques which only evaluate brain structure and not function.

Relevance to Science and Religion

CN is sometimes touching areas relevant to a religious view of life, particularly when it is employed to find out a “sign of death” to define the end of life of a living person. The most universally accepted instrumental parameters for “brain death” definition are nowadays the complete lack of any EEG activity and the absence of any vital sign from the brain stem (an area controlling autonomic life including heart rate, respiration, blood pressure, etc.).

Sources of Authority

Since its beginning, CN has been quite close to human basic physiology on one side and to clinical neurology on the other. Along the neurophysiological tradition, there are a number of Nobel Prizes (i.e., Adrian for neuronal excitation mechanisms), excellent physiologists (i.e., Moruzzi & Magoun for sleep mechanisms), and outstanding clinicians (i.e., Gastaut for epilepsy). More recently, Guidelines & Recommendations regularly published by IFCN, Handbooks of CN, and – most important – the official organ of the Federation the journal *Clinical Neurophysiology* represent a first line of authoritative information and sources of references for doctors and technicians working in the field of CN

Along the history of this specialty, the group of Pisa (Giuseppe Moruzzi) was the frontline world place for the study of sleep mechanisms, the team of Marseille (Henry Gastaut) was a center of excellence for epilepsy in the 1950s and 1960s, the University of London was a reference place for Evoked Potentials (Martin Halliday who recently disappeared), the research group in Iowa City (Jun Kimura) was following the pioneering studies of Buchthal in Copenhagen on electromyography and reflexes.

Ethical Principles

As for every medical discipline, CN follows the rules of the “Hippocratic Oath,” i.e., a set of ethical principles for the medical community regarding the care and treatment of patients which were developed by the ancient Greek physician Hippocrates, and the more recent lines of the Declaration of Helsinki of 1971 which is a set of ethical principles for the medical community regarding studies with human beings. The declaration was developed by the World Medical Association, as well as of the Good Medical Practice as requested by the European Union.

Key Values

Along the vein of the “mother discipline” of neurology the key values of CN is helping to diagnose and treat properly symptoms and deficits due to ► [nervous system](#) and muscles diseases, finally ending in physical, mental, and cognitive/behavioral impairments.

Conceptualization

Nature/World

The field of such conceptualization is – for CN – restricted to the human being which is approached within the frame of the types and patterns of electromagnetic activities that the living brain, spinal cord, nerves, and muscles are producing throughout life (including maturation and aging). The “world” is only conceptualized either as a micro-environment (namely the one within or around the individual neuronal cell and its prolongations and contacts) or as a macro-environment, that is, the physical space within which the patient is living.

Human Being

As previously stated, all the basic and highly sophisticated functions of the nervous systems and muscles are conceptualized within a frame taking into account their electromagnetic counterpart.

Life and Death

Life is conceptualized as the presence of brain activity as measurable via EEG and evoked potentials recordings, particularly for those signals originating from the brain stem. Lack of such activity for a prolonged period of time (i.e., 6 or 12 h according to different national legislations) leads to the definition of “► [brain death](#).”

Reality

Reality is considered the physical world (external, outside the body, and internal to the body, i.e., visceral activity) in direct contact with the nervous system through senses.

Knowledge

Learning and knowledge is now seen as a complex mechanism of transient (minutes or hours) or prolonged (months and years) modifications of synaptic contacts and neuronal wiring leading to storage of physical, educational, and emotional experiences. This is based on cellular mechanisms named after the Nobel Prize Eric Kandel, *Long-Term Potentiation and Depression* (together with the genetic and proteic and biochemical changes combined to them) and can be represented as a dynamic process (probably consolidated by certain function of night sleep) continuously evolving from birth to death.

Truth

Truth is conceptualized as the scientific validity of a theory which has usually a midlife of 5–10 years, with the exception of some basic concepts including those for cellular excitability.

Perception

Perception can be *conscious, preconscious, and unconscious*; modern techniques of CN (particularly event-related potentials) help in classifying. Perception is usually linked to one of the five senses or – more frequently – is an amalgam of multisensory and emotional matrix which makes perception an exquisitely individualized experience, still within the frame of a general world.

Time

Time is a brain category aiming to classify modifications in the physical world (external and internal) as well as the human feelings related or combined to such changes.

Consciousness

Consciousness is the ability to voluntarily perceive, classify, and eventually react to any physical stimulus in the outside or inside world. Different types and levels of consciousness can be defined either in normal (i.e., awake, drowsy, and sleeping states) or in pathological situations which affect transiently, acutely or progressively and steadily consciousness (i.e., epileptic attack, dementia, light or deep coma, vegetative comatous state, etc.).

Relevant Themes

Critical points within these concepts include the definition of the conceptualization of the *SELF* both in normal situations (i.e., in the newborn) and in brain diseases which steadily (i.e., in severe retardation, dementia, etc.) or transiently (i.e., epileptic attack, post-traumatic amnesia, transient global amnesia) affect the ability for sensory processing/classification, problem solving, and decision taking.

Clinical Psychology

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Related Terms

[Counseling psychology](#); [Mental disease/disorder treatment](#); [Psychiatry](#); [Psychopathology](#); [Psychotherapy](#)

Description

From a historical point of view, clinical psychology is a relatively young discipline that developed out of medicine, psychiatry, and philosophy at the end of the nineteenth century. Broadly speaking, it applies knowledge about psychological processes to the understanding, assessment, prevention, and treatment of psychological distress of individuals (children, adolescents, and adults), couples, families, and groups. Its history has been dominated by four major theoretical approaches: (a) psychoanalytic/psychodynamic, (b) learning/cognitive-behavioral, (c) humanistic/experiential, and (d) family and systems (Hersen and Gross 2008).

Although each of these four approaches encompasses a broad array of evolving theories and clinical applications, they each have a number of specific assumptions and foci that distinguish them from the other theoretical approaches. The psychoanalytic approach, which originated in the work of Freud, mainly focuses on the role of psychological conflict, the importance of unconscious factors, and the complex ways early development influences psychological functioning across the life span. The learning/cognitive-behavioral approach focuses primarily on learning processes and how these give rise to cognitive-affective schemas that influence our perceptions and behavior. Humanistic/experiential approaches center on an understanding of the whole person and the self-actualizing tendencies and potentialities within each person. Family and systems approaches focus on the complex interactional processes within couples and families and how these determine the functioning of the individual, couple, and family.

Within each of these approaches, interventions have been developed that are still widely practiced today and that have been the subject of systematic treatment evaluation in both controlled and naturalistic research (Lambert 2004). This includes, for example, long-term and brief psychoanalytic psychotherapy (psychoanalytic approach); (cognitive-) behavioral, dialectical, and more recently mindfulness-based therapy

(learning/cognitive-behavioral approach); client-centered, gestalt, and humanistic therapy (humanistic tradition); and family and couple therapy (family/systems tradition). The continuing influence of these four theoretical approaches is also exemplified by the fact that major figures within these approaches are among the most famous and most cited psychologists, including Sigmund Freud and Erik Erikson (psychoanalytic tradition), Burrhus F. Skinner and Hans J. Eysenck (learning psychology), Carl Rogers (humanistic/experiential tradition), and Gregory Bateson and Paul Watzlawick (family/systems theory).

The last decades have witnessed clear integrative trends among these major theoretical approaches both in research and practice (Lambert 2004). For instance, many practitioners use insights, methods, and techniques from these various approaches in their clinical work. In this context, at least two forms of integration have been distinguished. First, there are clear trends toward *technical* integration, with practitioners from various orientations incorporating techniques used in other theoretical approaches. Second, there are increasing signs of *theoretical* integration with the aim of developing more encompassing and overarching theories about normal and disrupted psychological development. Both these trends have resulted in integrative “waves” within each tradition. Within the psychoanalytic tradition, for instance, there has been more attention to experiential, cognitive and behavioral aspects in human functioning, which also has led to the development of shorter, more focused treatments. Within the cognitive-behavioral tradition, in turn, there has been a growing openness for more dynamic, interpersonal, developmental, and experiential issues. Within the experiential and family/systems traditions in particular, ideas and techniques from both the psychoanalytic and cognitive-behavioral tradition have been widely incorporated.

Yet, integration between the various approaches continues to be hampered by various factors, not in the least because each of these major approaches has in part developed in reaction to (perceived) shortcomings of the other

theoretical approaches. Hence, each of the major theoretical approaches is based on partly incommensurable assumptions about human nature, normal and disrupted development, and the aims and nature of prevention and treatment strategies. Thus, currently, “assimilative integrationism” (Messer 1986), which means that concepts, hypotheses, and therapeutic techniques borrowed from other theoretical orientations are assimilated in a theoretically meaningful way in an existing theoretical framework, predominates. A truly integrative theoretical framework, therefore, is unlikely to emerge in the near future.

In addition, clinical psychology has made major contributions in the areas of assessment of both normal and disrupted psychological capacities and processes (e.g., intelligence, personality, neuropsychology, and psychopathology) and the classification of psychiatric disorders (Hersen 2008). More recently, the field has witnessed an important shift from a focus on psychopathology and its treatment to the prevention of psychopathology and behavioral problems and distress more generally (Lambert 2004). The fields of behavioral medicine and health psychology in particular have emerged as a strong force within clinical psychology, which has resulted in a substantial broadening of the scope of clinical psychology, encompassing so-called positive psychology (the scientific study of happiness and well-being), and interventions aimed at ameliorating quality of life and well-being in patients confronted with somatic disease and other health problems.

The future of the field of clinical psychology is difficult to predict as many scientific and extrascientific factors influence its course. As noted, integrative trends are likely to continue, but it seems highly unlikely that the field will reach a consensus soon with regard to the classification, assessment, and prevention/treatment of psychological problems, as major differences remain between the various theoretical approaches with respect to their views of human nature and, ultimately, their worldview. Other factors that are likely to determine the future of the field include the increasing influence and

pressure of managed care and economic considerations (e.g., concerning the cost-effectiveness of psychotherapy) as well as the growing dialogue and integration with the neurosciences. Finally, the rapidly expanding fields of behavioral medicine and health psychology, with psychologists being involved in increasingly broader domains, including the prevention of both physical and mental disease, are likely to transform clinical psychology as it exists today. The assimilation and integration of these influences are major challenges for the future of clinical psychology.

Self-identification

Science

Although clinical psychology self-identifies as a science, based on the rigorous empirical scrutiny of its theoretical assumptions, techniques, and methods (Kazdin 2003), there are important differences in this regard among the four major theoretical approaches. Without any doubt, the learning/cognitive-behavioral tradition identifies most strongly with the view of clinical psychology as a science. This tradition has been the strongest advocate of the so-called scientist-practitioner model, which stresses that practitioners should rigorously train in and apply scientific findings in the prevention and treatment of psychological problems. Thus, the learning/cognitive-behavioral tradition has strongly emphasized the value of the scientific model, as is also exemplified in the emphasis on the systematic evaluation of interventions, use of evidence-based techniques and methods, and, perhaps even more importantly, the view that the scientific model also provides a model for the prevention and treatment of psychological problems. Indeed, although some current models tend to adopt a somewhat different view, the cognitive-behavioral approach started from the assumption that patient and therapist should become involved in a so-called collaborative empiricist stance attempting to identify and then falsify particular beliefs and assumptions about

reality. Therefore, within this tradition, science is not only valued as a way of gaining knowledge but also provides a model for treatment.

Historically, psychodynamic, experiential, and family/systems approaches, although generally acknowledging the importance of science, tend to emphasize equally and sometimes perhaps more the importance of intuition and personal factors and qualities. Within these approaches, clinical psychology (and psychotherapy in particular) is seen not only as a science but also as an art. Or, perhaps better, it is seen as a profession that not only involves and is based in scientific knowledge but also necessitates specific personal qualities (such as empathy and psychological mindedness) as well as a personal growth process that involves learning from experience. Thus, for example, we see the emphasis in these approaches on extended and, to a certain extent, lifelong supervision and even personal therapy.

Although there is growing consensus in the field that clinical psychology is not a “pure science,” differences in opinion about the role and importance of the “science” versus “art” issue remain. These differences continue to lead to heated debate.

Religion

The relationship between (clinical) psychology and religion has been a troubled one ever since Freud's claim, in his seminal work *The Future of an Illusion*, that religion is an expression of infantile needs, a “childhood neurosis” (Freud 1927, p. 53), relegating religion and religious experiences more generally to the realm of illusion. This led psychoanalysts and subsequent clinical psychologists more generally to regard religion with suspicion and even disdain and associate religion with infantile longings for protection, omnipotence, and omniscience. This negative attitude was further reinforced by Freud's assertion that “The religions of mankind must be classed among the mass delusions” (Freud 1930, p. 81). Similarly, Albert Ellis (1960), one of the founding fathers of learning/cognitive-behavioral tradition, saw religion as

a set of irrational assumptions from which individuals had to be liberated.

In recent years, a more positive and even reconciliatory attitude toward religion has developed within clinical psychology. While psychologists and psychiatrists continue to be far less religious than their clients, most psychologists and psychiatrists have a positive attitude toward religious issues in clients. This is further exemplified by a more positive attitude and acceptance of religiosity and religious experiences as well as spirituality. This growing openness is also the result of a shift in what is currently conceived of as religion, specifically, a shift away from traditional, organized religion that is focused on the truth of religious beliefs, toward a more personal interpretation and experience of religion. Likewise, in psychoanalysis, there has been a growing appreciation of the realm of illusion. This can be traced back at least to Winnicott's (1953) work, particularly his work on the importance of transitional space. Similarly, within the cognitive-behavioral tradition, Eastern spiritual practices are increasingly incorporated and integrated in so-called mindfulness-based and acceptance and commitment-based treatments (Hayes et al. 2003). Moreover, the shift within religion and religiosity to a greater emphasis on personal experience, rather than an emphasis on organized religion and the endorsement of particular beliefs, has also fostered the dialogue with humanistic and experiential approaches within clinical psychology that always have had a greater openness toward spiritual issues and experiences. This is further reinforced by the growing role of qualitative approaches to research, often inspired by constructivism and critical theory, that focus much more on personal, intimate experiences and how these are shaped in part by cultural forces, including religion and spirituality.

Finally, the growing dialogue between religion and clinical psychology is also exemplified by the emergence of a so-called spiritual strategy, promoting the integration of religion and/or spirituality and psychotherapy. These proposals have ranged from the integration of traditional

Christian elements such as prayer and biblical exegesis or Eastern practices such as yoga and meditation with traditional forms of counseling and psychotherapy to the development of religious/spiritually inspired forms of psychotherapy. Findings that religion and spirituality are often positive for both physical and mental health, and that integrating religious/spiritual elements is associated with better treatment outcome, especially among religious clients, have further promoted these developments. Yet, criticism remains, arguing that clinical psychology as a science should remain neutral with regard to religious issues and should not strive to promote religious or spiritual beliefs.

Characteristics

Because of its focus on both normal and disrupted human development, clinical psychology has close ties with neighboring sciences and approaches, most notably psychiatry and other social sciences (e.g., sociology, philosophy, anthropology) and, to some extent, also religious and spiritual worldviews (Lambert 2004). Its strong focus on the importance and role of psychological processes in explaining normal and disrupted human development distinguishes clinical psychology from neighboring scientific approaches such as psychiatry (which focuses more on biological factors) or sociology (which focuses primarily on social factors). Yet, given our increasing knowledge of interactions among psychosocial and biological factors, the boundaries between these various scientific disciplines are increasingly becoming blurred. The future is likely to witness the emergence of a more integrative science of human behavior.

The focus on psychological factors distinguishes clinical psychology from religious and spiritual traditions as it studies the role of psychological factors within religion/spirituality but does not attempt to explain (or explain away) religion and spirituality as such nor does it attempt to offer a consistent worldview ("Weltanschauung").

Relevance to Science and Religion

Clinical psychology has always had a vivid interest in the science-religion debate. In some respects, (clinical) psychology originated from what was conceived as a need for emancipation from religious views and explanations, particularly concerning so-called abnormal behavior, replacing religious explanations with psychological explanations of these phenomena. For instance, behaviors that were seen as an expression of possession by evil forces such as the devil or the result of sinful behavior were explained in psychological terms (e.g., projection, wish fulfillment). Moreover, psychological explanations were invoked to explain the origin of religious/spiritual explanations and religion/spirituality itself. As noted, Freud's theories about religion as reflecting the human need for certainty and control over the forces of nature (Freud 1927, 1930) and Ellis's views of religious belief as a set of irrational attitudes that provide a false sense of control and purpose in life (Ellis 1960) are cases in point. In general, historically, clinical psychology has been very critical of religious/spiritual beliefs, largely reducing them to psychological needs for certainty, control, and purpose in life. Yet, paradoxically, there have always been more favorable views of religion within clinical psychology, particularly within humanistic approaches. Finally, clinical psychology has largely abandoned attempts to explain the origins of religion; it currently focuses mainly on the role of psychological processes in religion and religious behavior rather than attempting to explain religion as such.

Sources of Authority

Major sources of authority include seminal figures that have played a key role in the development of clinical psychology, many of which are still among the most highly cited psychologists, including Sigmund Freud, Burrhus F. Skinner, Hans J. Eysenck, Ivan Pavlov, Carl Rogers, Paul Watzlawick, and Aaron Beck, to name only a few. Their influence can still be felt nowadays

and continues to influence the field. Also, the scientific method, particularly the strong dedication to quantitative research and statistics from a neopositivistic perspective, is an important source of authority (Kazdin 2003). More recently, the importance of qualitative methods and narrative and constructivist approaches is increasingly recognized. These lead to more relativistic, constructivistic view of scientific knowledge rather than the neopositivist correspondence view of the relationship between scientific knowledge and reality that dominated much of clinical psychology in the past.

Authoritative journals, evidenced by their high impact factor, include *Annual Review of Clinical Psychology*, *Clinical Psychology Review*, *Development and Psychopathology*, *Journal of Child Psychology and Psychiatry*, *Journal of Abnormal Psychology*, *Journal of Consulting and Clinical Psychology*, *Journal of Abnormal Child Psychology*, *Neuropsychology Review*, and *Psychological Medicine*.

Ethical Principles

Despite obvious differences in the worldview and view of human nature underlying the different theoretical approaches within clinical psychology, there has been a remarkable agreement on the basic ethical principles guiding the discipline across these theoretical approaches. The American Psychological Association Ethical Principles and Code of Conduct, for instance, specifies the following ethical principles that are largely shared by all clinical psychologists: (a) beneficence and nonmaleficence, (b) fidelity and responsibility, (c) integrity, (d) justice, and (e) respect for people's rights and dignity. Moreover, as a profession, clinical psychology has invested much effort in the development, dissemination, and use of ethical guidelines in the conduct of research and the practice of clinical psychology.

Key Values

In agreement with its ethical principles, these include respect and openness for the person's

rights and dignity (e.g., concerning gender orientation, spiritual/religious beliefs, values), trust, integrity, and the attainment of a satisfying balance between autonomy (e.g., individuation) and relatedness (e.g., the capacity to attach to others in meaningful ways), enabling individuals a greater sense of internal freedom and satisfaction with life. In this context, clinical psychology generally promotes a benevolent neutrality toward religious/spiritual issues, leaving it to the individual whether he or she wants to pursue or not a spiritual/religious path in life.

Conceptualization

Nature/World

Nature and world are not only or merely conceptualized as preexisting, biological realities but also partly as sociocultural and psychological constructions.

Human Being

The major theoretical approaches have had very different concepts of what it is to be a human being. From a traditional psychoanalytic point of view, human beings are seen as intrinsically characterized by conflicts between desires, wishes, and impulses on the one hand and the exigencies of external reality, initially represented by attachment figures which are increasingly internalized, on the other. Learning and cognitive-behavioral approaches see human beings primarily in terms of experience-expectant information processing systems. Humanistic/experiential approaches primarily conceptualize human beings in terms of self-actualizing potentialities. Family/systems approaches, finally, consider human being's role and position within broader systems, such as the couple, family, and society, emphasizing less the individuality of the person, but seeing persons as influenced by and playing a role in complex dynamics and laws involved in systems.

Life and Death

Life and death are considered to be fundamental coordinates that human beings have to confront.

Clinical psychology has documented how coming to terms with issues such as mortality and death characterizes the human condition and may lead to considerable distress (e.g., narcissistic denial of mortality by vigorously pursuing power and status, feelings of depression). The psychoanalyst Erik Erikson was among the first to conceptualize this process of coming to terms with life and death. He pointed out that unsuccessfully working through these issues can lead to despair, whereas coming to terms with them is associated with feelings of integrity, i.e., the sense that one's life has had a meaning and that one has contributed not only to one's own life but also to the life of significant others such as a partner, children, and society more generally. Such integrity also involves the acceptance of death as an inevitable part of life.

Reality

Within clinical psychology, various conceptions of reality coexist. They range from a correspondence view of reality (i.e., that science discovers reality and truth and thus assumes that scientific knowledge corresponds to reality) to views that see reality as a construction based on meaning-making processes. There are different positions between these two extreme poles. Within this context, the various theoretical approaches within clinical psychology have been influenced by different philosophical schools of thought. However, they have rarely made explicit their own assumptions with regard to the nature of reality and its relationship to the science of clinical psychology, despite the obvious importance of such issues (e.g., with regard to the nature of intelligence, the distinction between "normality" and psychopathology, or "abnormal" sexuality). Although several movements, including anti-psychiatry and feminism, have questioned many assumptions of clinical psychology about reality, currently these issues seem to have disappeared into the background even though they occasionally reemerge.

Knowledge

Clinical psychology sees knowledge as the result of a complex learning process in which both trial and error and insight play a considerable role.

Although some approaches have tended to consider knowledge and its application in isolation, developmental clinical psychology has clearly shown that knowledge first and foremost develops in an interpersonal matrix and thus is intimately tied to the development of social cognition and interpersonal relationships (Fonagy et al. 2007).

Truth

As in any science, clinical psychology has been dominated by a search for truth based on a correspondence versus consensus view of the relationship between scientific knowledge and reality/truth. Also, the major therapeutic approaches derived within clinical psychology all include to a considerable degree a search for truth. In this respect, searching for truth is either conceived as a search for truth in the sense of reconstructing one's past and factors that have influenced one's life course as they have really happened ("historical truth") or what is true for the individual regardless of historical truth ("narrative truth") (Spence 1982) or a combination of these two positions.

Perception

Clinical psychology has contributed in important ways to our understanding of perception as influenced by expectations which in turn are the result of experiences and interactions that have been internalized over time as internal working models or cognitive-affective schemas. Although on the positive side, these schemas bring order to our perception of reality, make reality more predictable, and thus prevent the individual from being overwhelmed by information, they also have the potential to bias or distort our perception in important ways.

Time

Time is an important concept within clinical psychology. Almost every psychological process or capacity develops over time and is constantly subject to change across time (e.g., memory, personality, intelligence). Moreover, several psychological processes seem to be intimately related to time. An episode of depression, for

example, appears to spontaneously disappear with the passing of time in many depressed individuals. Similarly, the process of mourning takes time. Related to this, clinical psychology has also pointed to a distinction between objective and subjective time, i.e., time as it is experienced by individuals. Subjective time can be influenced by many factors, such as mood and fatigue. For example, depressed individuals often experience a slowing of time to the extent that some feel "frozen in time." Likewise, psychotic disorders may seriously disturb the experience of time. As most psychological capacities, the capacity to experience time and to envision oneself in the past, present, and future develops across the life span, and several psychological disturbances may perturb this capacity.

Consciousness

The role of consciousness has been a matter of great debate within clinical psychology. Whereas some, such as the early behaviorists, considered consciousness as a mere epiphenomenon with little or no influence on behavior, other traditions, such as the phenomenological and humanistic, considered consciousness to be a central causative factor in explaining human behavior. Still other traditions, such as the psychoanalytic approach, saw consciousness as only a small, though not negligible, aspect of human psychological functioning, putting the priority on unconscious psychological processes. Currently, there is an emerging consensus not only that many psychological processes that determine behavior are unconscious (i.e., happen outside the individual's awareness) but also that consciousness and particularly the ability to reflect on one's own internal mental states (mentalization) are equally important determinants of behavior. Also, emerging is consensus that the capacity for reflective functioning may play a key role in distinguishing human beings from nonhuman primates and other animals (Fonagy et al. 2007).

Rationality/Reason

Congruent with the different emphasis on science in the major theoretical approaches, the different traditions in clinical psychology show clear

differences in their attitudes toward and valuing of rationality and reason. Within the learning/cognitive-behavioral tradition, rationality and reason are most strongly emphasized, whereas in the other theoretical approaches, the limits of rationality and reason are more clearly acknowledged and embraced.

Mystery

Because clinical psychology partly emerged as a reaction against religious/spiritual explanations, striving to develop into a strong science, there has been a clear tendency toward demystification in clinical psychology. Because of this, with some important exceptions, the implicit assumption that all of human behavior could be explained in terms of psychological (e.g., wishes) and/or biological (e.g., activation of neural circuits) processes has dominated clinical psychological research and practice. Thus, for instance, belief in ghosts and, in a similar vein, religion and mystical/spiritual experiences is explained in terms of anxious expectations, wish fulfillments, and/or antedated modes of thinking and experiencing reality, for example, omnipotence of thought or projection. Although there always has been a countermovement arguing for the limitations of psychological explanations in explaining the mysterious (e.g., the meaning of life, “religious” or “spiritual” experiences, beliefs about life after death), congruent with its scientific stance, the assumption that all experiences can be explained by laws governing psychological processes dominates clinical psychology.

Cross-References

- [Cognitive Psychology](#)
- [Conditioning and Learning](#)
- [Consciousness](#)
- [Developmental Psychology](#)
- [Medical Psychology](#)
- [Personality Psychology](#)
- [Psychiatry in America](#)
- [Psychiatry in Europe](#)
- [Psychology of Religion](#)
- [Religious Coping](#)

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Clock Gene

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It is suggested that clock genes are involved in autoregulatory transcription/translation-based feedback loops which turn these genes on and off in a circadian cycle of about 24 h.

The mammalian *per* genes are rhythmically expressed and their proteins PER are found within “clock cells” of the suprachiasmatic nucleus, SCN, the central circadian pacemaker in mammals. The SCN, located in the ventral anterior hypothalamus, obtains retinal input and drives the rhythmic secretion of the hormone melatonin in the pineal gland. This hormone communicates the circadian timekeeper’s information to various parts of the body. Mammalian photoreceptors, too, contain the circadian pacemaker. However, findings suggest that PER1 proteins play roles in the retina different from those established in the SCN.

Cognition

- ▶ [Cognitive Psychology](#)
- ▶ [Cognitive Science Psychology](#)
- ▶ [Theoretical Psychology](#)

Cognition and Culture

- ▶ [Cognitive Science of Religion](#)

Cognitive

- ▶ [Neuropsychology](#)

Cognitive Anthropology

- ▶ [Cognitive Science Psychology](#)

Cognitive Developmental Psychology

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Cognitive Ethology

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Cognitive Neuroscience

- ▶ [Biological Psychology](#)

Cognitive Niche

- ▶ [Externalism and Internalism](#)

Cognitive Processes

- ▶ [Cognitive Psychology](#)

Cognitive Processing

- ▶ [Intelligence](#)

Cognitive Psychology

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Related Terms

[Cognition](#); [Cognitive processes](#)

Description

Cognitive psychology is concerned with the scientific study of the mind. As a branch of

experimental psychology, cognitive psychology utilizes experimentation to study such topics as attention, memory, perception, language, and reasoning. The term “cognitive psychology” was first introduced by Ulric Neisser in his 1967 book, *Cognitive Psychology*. At the time, cognitive psychology partly arose as an alternative to behaviorism, which had denied that internal mental states can be studied scientifically. Because mental processes are not themselves directly observable, behaviorism focused strictly on stimulus–response associations, without theoretical consideration of the mental processes that occur in between. Unlike the behaviorists, cognitive psychologists assume that mental processes can (and should) be studied scientifically.

Several factors contributed to the emergence of cognitive psychology as a discipline. Among them was World War II’s contribution to the military need for understanding cognitive processes. Another contributing factor was the advent of the computer, which provided a useful metaphor for theorizing about mental processes at several levels, including the notion of representation, information processing, and the distinction between hardware and software.

Cognitive psychologists often use a factory example to illustrate what cognitive psychologists do. The example is as follows: *One is observing a factory, trying to determine what goes on inside. Trucks deliver supplies at one end, while different trucks pick up finished products at the other. The only method available for determining what goes on in the factory is to manipulate the shipment of supplies then carefully observe what comes out at the other end. The mind can be viewed in a similar fashion. Cognitive psychologists want to know what goes on inside of it, but cannot actually see its inner activities. They can, however, examine what goes in and what comes out and can experimentally manipulate what goes in, examining what comes out, to test hypotheses about what occurs inside.* Cognitive psychologists, therefore, are very concerned with experimentation and theory. Experiments are conducted to examine cognitive processes, and theories of those processes are

developed, tested, and modified or discarded accordingly.

A classic issue in cognitive psychology concerns visual imagery: Do people form images in their minds that are pictorial analogs to their real-world counterparts? Shepherd and Metzler’s (1971) now-classic study of mental rotation examined this by presenting participants with three-dimensional shapes on a screen. Sometimes the shape on the right was different from the shape on the left. Other times, the shape on the right was identical to the shape on the left and merely rotated somewhat from the position on the left. Participants’ task was to determine if a given pair of shapes was identical (and just rotated differently in space) or different. The hypothesis was that participants perform the task by forming a mental image of the two shapes, then mentally rotating one of the shapes until it reaches the same position as the other to determine if they are the same. In support of this idea, when the two items were identical, participants’ reaction times to press a button indicating so increased linearly with the degrees of rotation from the left figure to the right. In short, the more a shape needed rotating to match its neighbor’s position, the longer it took people to recognize that the two were identical. This is a good example of manipulating what goes into the system, examining what comes out of the system, and making inferences about what must be going in within the system.

Recent developments in cognitive psychology are many. It is a rapidly growing field with many domains of research (e.g., attention, memory, language) and many real-life applications for the research within each domain, many of which can affect public policy. For example, research on divided attention using driving simulators has suggested that talking on cell phones significantly reduces driver’s braking time, leading to greater risk on the road. Research on memory has suggested that, in educational settings, what students “feel” is the best and worst way for them to learn is often the opposite of what actually leads to the best learning. Research on language has suggested that phonics may indeed be the best method of teaching schoolchildren to read.

Self-identification

Science

Because it relies on the scientific method, cognitive psychology has always self-identified as a science. One common misconception regarding psychology is that it is either not a science at all or a “soft science” when compared to more traditional disciplines like chemistry or physics. Cognitive psychologists argue that it is in fact a “hard science,” as it not only involves experimentation and hypothesis testing, but it also involves mathematical modeling of cognitive processes as well.

Characteristics

Cognitive psychology can be distinguished from other fields of psychology (such as industrial/organization psychology, social psychology, clinical psychology, or counseling psychology) by its subject matter (i.e., the internal workings of the mind) and its methodology (i.e., the *scientific method*) together. Specifically, cognitive psychology is the only area of psychology that focuses on the scientific study of the mind. It can also be differentiated from some areas of psychology by its emphasis on experimental methodology (as opposed to survey research, for instance).

A closely related field is ► [cognitive neuroscience](#). Cognitive psychology differs from *cognitive neuroscience* in that it focuses more on how cognitive processes work than on their neural underpinnings. Take, for example, the mental rotation study described above. There, the researchers examined a question regarding how a process worked without concern for the neural source of the process. Still, many cognitive psychologists are also cognitive neuroscientists, and most cognitive psychology textbooks include at least some cognitive neuroscience and reference to neural underpinnings.

Relevance to Science and Religion

Though cognitive psychology’s subject matter – the mind – might seem somewhat relevant to

religion insofar as many religions have notions about “mind,” cognitive psychology has largely left debates about the source of the mind to philosophers of mind. Whereas philosophers debate about such issues as whether reductive physicalism, non-reductive physicalism, or other approaches are better conceptualizations of the mind cognitive psychologists instead focus on testable hypotheses about specific cognitive processes, theories that are falsifiable, and empirical data generated through experimentation. The interest is more in discovering *how* specific mental processes work than in determining their source. While most cognitive psychologists tend to assume that mental processes are the result of neurological processes, it is entirely possible for a cognitive psychologist to be agnostic regarding the source of mental processes. Take the factory example or the mental rotation study described in response to section “[Description](#)”: In both cases, one can theorize about how a process works and can design experiments to test hypotheses about how that process works, all without speculating on the origin of the process or where exactly it is taking place (i.e., who is working in the factory, whether it is people or robots on the assembly lines, or in which particular room a given process takes place).

Outside of mainstream cognitive psychology, there is a growing domain of research examining the nature of religious beliefs and subjective reports of religious experiences. This relatively new area has its roots in social psychology and greatly overlaps with evolutionary psychology. As with evolutionary psychology, cognitive psychology does not focus on the religious validity of an individual’s belief or experience (as in the philosophy of religion) but, rather, is interested in exploring the nature of the beliefs and experiences themselves as well as in individual differences in such beliefs and experiences.

Sources of Authority

As a science, cognitive psychology has its roots in the dialectic process described by George Hegel (Sternberg [1999](#)), whereby the route to

discovering truth is assumed to start with a thesis, followed by an antithesis to that idea. Eventually, a synthesis that maintains only the best elements of both emerges. The idea is that, through the constant challenge of existing ideas, ideas are continually modified or replaced in ways that take a field one step closer to the truth. The logic is not unlike that behind US court systems or US governmental processes; in all of these cases, from the pitting of opposing forces against one another comes a better approximation of the truth than from one side alone. This is the logic used in cognitive psychology. Cognitive psychology as a field does not make appeals to authority alone for obtaining information. Within cognitive psychology, ideas must stand the test of scrutiny over time. In principle, all ideas are subject to scrutiny, even those of established researchers who are considered experts. Therefore, while there are top-tier journals and widely respected researchers and widely respected institutional programs, appeals are not to authority alone. One must make a case for any claim using logic in conjunction with empirical data, and once a case is made, it is subject to critical evaluation by peers within the field. This scrutiny happens both in the peer-review process and in the fact that published material is immediately scrutinized by other scientists.

For accurate information on the current state of the field for novices, introductory and advanced (Sternberg 1999) cognitive psychology textbooks are usually good sources. These sources usually provide some historical context as well as a lot of the now-classic studies in the field. For those with more experience in the field, journals such as *Trends in Cognitive Sciences*, *Current Directions in Psychological Science*, *Psychological Science*, *Psychonomic Bulletin & Review*, *Cognitive Psychology*, *Journal of Experimental Psychology: Learning, Memory & Cognition*, *Journal of Experimental Psychology: Human Perception & Performance*, *Journal of Memory and Language*, and *Memory & Cognition* are great sources of the latest research in cognitive psychology. Other top journals that frequently include cognitive psychology articles are *Journal of Experimental Psychology: General*,

Psychological Bulletin, and *Psychological Review*. What all of these sources (textbooks and peer-reviewed journals) have in common is that they contain contributions written by experts in the field.

Ethical Principles

The ethical principles that guide this discipline are the same as in other areas of science (i.e., honesty and integrity in conducting research and reporting results), with the addition of ethical guidelines aimed at protecting the human participants on which research in cognitive psychology depends. The American Psychological Association currently lists five general principles that all psychologists, including cognitive psychologists, are expected to follow in their research. The first principle concerns beneficence and non-maleficence, which is an obligation to strive for providing benefits from research and minimizing harm as a result of it. The second principle involves fidelity and responsibility. This is an obligation to uphold professional and ethical behavior at all times, which includes taking responsibility for one's actions and minimizing conflicts of interest. The third principle involves integrity, which is an obligation to conduct research in an open, careful, and honest manner in search of scientific truth. The fourth principle involves justice. One aspect of justice in psychology involves seeking to distribute research benefits fairly to all. The second aspect of justice involves the responsibility of knowing the limits of one's own knowledge in the hopes of minimizing abuses of power that may result from overstating such knowledge. The final ethical principle involved in psychology involves respect for people's rights and dignity. This includes being sensitive of the needs of special populations.

Cognitive psychologists working within academic institutions are generally required to follow guidelines set by an institutional review board (IRB) and to have all research proposals approved by this board before collecting data. Cognitive researchers who use animal models

are bound by additional ethical guidelines for the humane treatment of animals.

Key Values

The key values of cognitive psychology include critical thinking and critical evaluation of ideas, honesty, integrity, logical coherence of ideas, tightly controlled and well-designed experiments, and replication of experimental findings.

Conceptualization

Nature/World

In line with other areas of science, nature and the world can be viewed as operating according to the laws of physics, with humans and other biological organisms having come to be through evolution.

Human Being

Cognitive psychology's view of the concept of "human being" is generally the same as that taken in evolutionary psychology: A human being is the subspecies of *Homo sapiens* known as *Homo sapiens sapiens*.

Life and Death

Cognitive psychology as a field does not really concern itself with issues of the origins of life or of the matter of death. Perhaps only to the extent that evolutionary psychology is relevant to cognitive psychology (as in the proposed adaptiveness of certain cognitive processes) is the notion of death relevant.

Reality

There are two ways in which the notion of reality is relevant to cognitive psychology. First, George Hegel's dialectic approach is relevant here, as the idea that reality can come to be understood through a process of continually pitting of opposing ideas against each other is prevalent in cognitive psychology. Second, a relevant distinction

is between objective and subjective reality, as cognitive psychology relies on objective methods of investigation, yet often studies aspects of people's subjective realities using these objective methods. For example, whether people can form visual images in their minds when thinking is a question about a person's subjective reality that is examined using objective means (such as by measuring reaction time in different experimental conditions, as in the mental rotation study described in response to section "[Description](#)" above).

What has research in cognitive psychology suggested about subjective reality? One overarching finding is that past experiences affect the way that reality is experienced by a person. Existing knowledge affects the way that incoming information is perceived, as shown by the effects of context on perception, such as in the tendency to think that one hears a sound that is actually missing but would be predicted by the surrounding context (as when a phoneme is spliced from a word and replaced with a cough). Existing knowledge also influences what external information a person will attend to, as shown by findings indicating a bias to detect items in a scene that are personally or contextually relevant. Existing knowledge also affects how experiences are remembered, as shown by findings suggesting that people remember passages about famous people differently than identical passages about non-famous people (existing knowledge about the famous people gets incorporated into the memories for what the passages about them said). Finally, existing knowledge also affects decision-making and reasoning as shown by the many documented ► [biases and heuristics](#) that people use, such as the "*confirmation bias*" and the "*availability heuristic*."

Knowledge

There are two ways of viewing knowledge that are relevant to cognitive psychology: First, human knowledge is itself subject matter for study in cognitive psychology; second, as in any field, knowledge is relevant to becoming an expert at cognitive psychology.

Knowledge as a Subject of Investigation. With regard to the investigation of knowledge itself, a review of theories of knowledge representation and acquisition would go beyond the scope of this chapter. There are many theories of knowledge representation and knowledge acquisition in cognitive psychology. These are continually going through the dialectic process, without any clear sole winners as far as how knowledge is represented and acquired. Many good candidate theories exist, and scientists continue to investigate these. That said, a person's knowledge is thought to reflect the external world that he or she has experienced. As such, knowledge can be correct or incorrect in terms of truthfulness; stereotype representations are a good example. Particular word representations in the knowledge base reflect exposure to that language over time, as do other representations relevant to language (such as the syntactic aspects of language). Also, particular associations in memory (such as between bread and butter or between thunder and lightning) reflect exposure to the repeated cooccurrence of these things over time.

Knowledge as Expertise in a Field. With regard to the second conception of knowledge – knowledge as it applies to becoming an expert in the field of cognitive psychology – a cognitive psychologist must have a good grasp of the principles of experimental design and data analysis and of current theory and theoretical issues. Much research in cognitive psychology is domain-specific; therefore, researchers generally become experts in a particular domain of cognitive psychology (such as memory or language or attention). Becoming an expert requires knowledge of the literature and the history within the domain as well as knowledge of the current issues and controversies within the domain.

Truth

As mentioned in response to section “[Sources of Authority](#)”, George Hegel's notion of the dialectic process is perhaps most relevant to cognitive psychology's quest for truth about the nature of cognitive processes. A culture of open skepticism

is necessary in order to make progress toward discovering the truth.

Perception

Like knowledge, cognitive psychology considers perception itself a domain of research. Perception is not the external stimulus itself but, rather, the experience of the observer in response to that stimulus. Perception is understood to be complex, involving both bottom-up processes (i.e., sensory information coming into the system) and top-down processes (i.e., existing knowledge and memories exerting a role). Top-down effects are shown by the fact that the context in which a stimulus is presented affects how it is perceived. For example, when the first phoneme is spliced from a recording of a person speaking a word that ends in the sound *eel, participants will tend to perceive the sound “meal” if it is placed within the context “The *eel was on the table.” They will tend to perceive the sound “heel” if it is placed within the context “The *eel was on the shoe,” and they will tend to perceive “peel” if it is placed within the context of “The *eel was on the orange.”

Because knowledge itself (as well as the particular subset of knowledge that is most active at any given moment) will vary from person to person, it follows that perception in any given situation could vary from person to person as well. For example, if people are played the song “Another One Bites the Dust” in reverse, they are more likely to claim to hear the words “I like to smoke marijuana” when told beforehand that the reverse piece might contain references to marijuana than when told nothing beforehand. What is perceived from the reversed music is related to the knowledge that has been activated beforehand.

Time

Time is relevant to cognitive psychology in two ways: (1) Time is an important measurement tool in cognitive psychology, and (2) the subjective perception of time and the seemingly uniquely human ability to escape from the present moment are topics of interest to cognitive psychologists.

A basic tenet of cognitive psychology is that mental events take time. Therefore, one of the ways in which mental processes are studied objectively is by examining their time course, or how quickly they can be carried out. Measuring reaction time across different experimental conditions is therefore a common method in cognitive psychology. This was the method used in the mental rotation study described in response to section “[Description](#)”, where it was shown that reaction time to indicate that two shapes were identical increased linearly as the degree to which the second shape was rotated from the position of the first increased. Another common method in cognitive psychology that involves time is the response-signal (or signal-lag) procedure. In this method, the researcher varies the amount of time that a participant has to make a response to a stimulus. On some trials, there is more time allowed; on others, there is less. The goal is usually to determine when in time a process begins to emerge. For example, if some of the trials in question were items that were seen earlier in the experiment (“old” items) while others were new items, above-chance old-new discrimination might not begin to emerge until 300 ms or so. That is, on trials where fewer than 300 ms are given to make a response, old-new discrimination is at chance-performance levels. At time lags beyond approximately 300 ms, significant old-new discrimination can be seen, suggesting that the process requires approximately 300 ms to occur. Some processes require less time poststimulus to occur; others require more time.

Also related to time in cognitive psychology is people’s subjective experience of time. Relevant here are the notions of mental time travel and the subjective perception of time. Some argue that one unique feature of humans is their ability to mentally travel through time, a term that Endel Tulving termed *chronesthesia*. Humans can both think about the past and anticipate the future; memory plays a major role in this ability. Somewhat related to the notion of mental time travel is the notion of subjective time perception. Research suggests that human subjective perceptions of time can be relative; that is, they do not

necessarily follow objective indices of time. For example, one recent study showed that wearing prism glasses that distorted visual spatial perception appeared to distort time perception as well, suggesting that space and time representations are intimately tied in the mind. As another example, a different study showed that perceptions of time varied as a function of expertise in a relevant domain, with domain experts perceiving slower durations of domain-relevant stimuli than domain novices. This suggests that existing knowledge not only affects perception of visual and auditory stimuli (as described in response above under “perception” and “reality”), but it also affects perceptions of time (or perceptions of the duration of an occurrence).

Consciousness

At the broadest level, though many cognitive psychologists might argue that consciousness is an emergent property of activity occurring in the brain, many leave the specifics of debating about the source of consciousness to philosophers of mind. Still, many cognitive psychologists discuss the nature of consciousness, and a review of these discussions would go beyond the scope of this chapter.

In cognitive psychology, consciousness typically refers to the extent to which an individual is aware of a stimulus or mental process and the extent to which a mental process is under an individual’s self-control. For instance, cognitive psychologists often make the distinction between conscious, controlled processes, and automatic processes. An automatic process is one that happens very quickly in response to a stimulus. Its mechanisms tend to circumvent one’s own awareness and intentional control, perhaps because it happens too quickly. One is generally aware of the outcome of an automatic process but not the process itself that produced that outcome. An example is letter perception. Once a letter appears on a screen, it is automatically perceived by a person fluent in that written language. It happens rapidly and seemingly “just happens,” as the person cannot explain *how* it happens. The process itself is not open to introspection in that way. The process is also not under the person’s

willful control, as the person cannot stop the process for letter perception once the stimulus has initiated it: It comes to completion automatically; the person perceives the letter. In contrast, a conscious, controlled process is slower (e.g., requires more time to be carried to completion) and tends to occur within a person's span of awareness. It also tends to be under the person's intentional control, meaning that the process is not automatically carried to completion once initiated by a stimulus, but can be stopped willfully. An example is attempting to recall an episode from earlier in the week in response to a question. This takes more time than perceiving a letter on the screen, and a person can generally introspect on what he or she is doing during the attempt at recalling; furthermore, the person can stop the act of attempting to recall at any point in the process.

Consciousness in cognitive psychology can also refer to the idea that one's thought and behavior can be influenced by stimuli or memories that occur outside of his or her own awareness. For example, the phenomenon known as implicit memory is the finding that people can exhibit memory for information when tested indirectly, even when they appear to show no explicit memory when memory is tested directly. For example, even when a person fails to recall the word "POLICE" from an earlier study list, he or she will show an increased probability of responding to the word stem POL____ with the word "POLICE" relative to if the word "POLICE" had not appeared in the earlier list. This suggests that a memory for a prior episode can be present in one's mind and able to exert an influence on his or her thought and behavior, even though the person cannot consciously bring to mind the memory itself, or in this case, the reason why the word popped into mind.

A related issue is the controversial issue of subliminal perception, which is the idea that stimuli that are presented below the threshold of conscious awareness (such as stimuli that are masked and presented too rapidly to be identified) can still affect people's behavior even though they were unaware of the occurrence of these stimuli.

The issue of subliminal perception, however, is controversial.

Rationality/Reason

Rationality and reason are also themselves a topic of study within cognitive psychology. Two domains in particular are relevant to rationality and reason: (1) executive function and (2) decision-making.

Executive Function. Related to the notion of rationality and reason, executive function is the term used to describe the set of processes involved in controlling other cognitive processes. For example, in order to perform many high-level tasks, one must selectively attend to certain pieces of information while preventing irrelevant pieces of information from coming to mind. To do so, one may need to activate certain processes while suppressing others. Much evidence points toward a correlation between executive function and general fluid intelligence, which is the ability to problem solve or think creatively. In addition, evidence from *cognitive neuroscience* suggests a role of the prefrontal cortex in executive function.

Decision-Making. While many studies in the area of decision-making have focused on irrational behavior (i.e., findings suggesting that humans often ignore basic statistical rules, instead relying on heuristics or biases), there has been a recent interest in examining cases where people behave rationally. For example, people can sometimes override their emotions in favor of a rational response. For instance, susceptibility to framing effects has been shown to involve the amygdala (responsible for emotion), while the ability to resist framing effects has been shown to involve the frontal lobes. Interestingly, just as research in *cognitive neuroscience* has shown a relationship between frontal lobe function and executive function, this research suggests a role of the frontal lobes in making rational decisions.

Mystery

Mystery is not a term that is generally used in cognitive psychology. There are topics that are not yet well understood, but because the field concerns itself with ideas that can be empirically

tested, the focus tends to be on testable hypotheses. Thus, rather than calling something a mystery and leaving it at that, a cognitive psychologist will develop a hypothesis and aim to test it in the lab. If an idea is not something that can be investigated scientifically, it is generally not considered relevant to cognitive psychology.

Relevant Themes

Though the investigation of religious experience has largely remained outside the realm of mainstream cognitive psychology, its related field of cognitive neuroscience has begun to see some exploration of the neural substrates of subjective religious experiences. For example, some have induced subjective religious experiences in the laboratory by applying strong magnetic fields to certain parts of the brain using ► [transcranial magnetic stimulation \(TMS\)](#). Others have noted a link between specific brain activity (in the temporal lobe) and subjective religious experience based on data from individuals with a specific type of epilepsy. Importantly, however, such studies do not actually cross over from being science to being religion, as they merely examine subjective states of awareness without addressing the religious validity of the experiences. In other words, regardless of any particular research finding regarding religious experiences, it will remain possible for one to remain completely agnostic regarding whether that religious experience involves divine inspiration or is simply the result of a particular neural state that produces a feeling that is labeled a religious experience (in the same way that a particular neural state might produce a feeling that is labeled a tip-of-the-tongue state). No research finding on religious states will ever prove or disprove those religious tenets that require faith. Thus, it will remain possible for one who is faithful to remain faithful in the face of research findings on the neural substrates of religious experience. It will also remain possible for the nonbeliever to continue to assume no need for a belief in the supernatural. In this way, scientific research on subjective religious experience will always remain separable

from religion itself, even though the topic of researching subjective religious experience may seem tangentially related to religion itself.

Cross-References

- [Clinical Psychology](#)
- [Counseling Psychology USA/Europe](#)
- [Evolutionary Psychology](#)
- [Philosophy of Religion](#)
- [Social Psychology](#)
- [Theory of Mind](#)

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Cognitive Science

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A term used to refer to those disciplines involved in the study of mind and thought, usually understood to include the fields of cognitive psychology, cognitive neuroscience, psycholinguistics, branches of artificial intelligence, cognitive ethology (also referred to as animal psychology), and philosophy of mind. Related fields include anthropology, evolutionary biology, primatology, and behavioral economics. The roots of cognitive science are generally understood to coincide with the maturing of theories of computation and the development of digital computers in the 1940s and 1950s.

Cross-References

- [Cognitive Science of Religion](#)

Cognitive Science of Religion

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Related Terms

[Cognition and Culture](#); [Cognitive Science](#);
[Evolutionary Psychology](#); [Psychology](#)

Description

Cognitive Science of Religion (CSR) is a field that attempts to explain causally the recurrence of religious beliefs and practices, and the role they play in social and political arrangements by appealing to the underlying mental structures and dynamics that make people generally receptive to certain ideas and actions. CSR lies at the intersection of the cognitive sciences (especially cognitive, developmental, and evolutionary psychology), religious studies, and anthropology.

Though the field is very young, cognitive scientific approaches to the study of religion find their roots in the 1970s. Dissatisfied with a perceived paucity of crossculturally useful *causal* theories of religious phenomena, and drawing inspiration from Chomskian linguistics, early researchers in the area such as E. Thomas Lawson and Robert McCauley began considering whether ordinary human cognition provides something analogous to a “universal grammar” of religious ritual. In parallel, advances in schema theory from cognitive psychology and the role schemata play in shaping perception informed Stewart Guthrie’s decidedly cognitive resuscitation of the “anthropomorphism” theory of religion. In the 1980s, breakthroughs from developmental psychology concerning the early-developing (and apparently pre-cultural) mental structures in babies were appropriated by Dan Sperber in continuing to develop a cognitive scientific approach to cultural phenomena

generally. These conceptual and empirical developments led to several important books published in the early 1990s using a cognitive approach to the study of religion, specifically by Lawson and McCauley (1990), Guthrie (1993), Pascal Boyer (1994), and Harvey Whitehouse (1995). Experimental and other empirical testing of theories in the area and attempts to connect isolated projects began in the 1990s, birthing the subfield. These cognitive approaches came to be known as Cognitive Science of Religion in 2000 (Barrett 2000) because of a review article in *Trends in Cognitive Sciences* by Justin Barrett.

Self-identification

CSR self-identifies as a science but still relies heavily upon insights from humanities disciplines such as philosophy and religious studies. CSR justifies its identification as a science by the fact that it employs standard scientific assumptions and methodological frameworks. Cognitive scientists of religion attempt to generate empirically falsifiable hypotheses that may be tested through experimentation or other controlled forms of investigation including survey, interview, and semantic analyses of texts. Sources of data must be objectively observable, e.g., participation in religious rites, individual reaction times to computer-presented displays, answers on questionnaires, and verbal responses. Cognitive scientists of religion adopt a methodological naturalism perspective, seeking strictly natural mechanisms for the phenomena under considerations, foregoing alleged supernatural causes. As with other areas of cognitive science, not all cognitive scientists of religion are scientists or conduct scientific research.

Characteristics

CSR is related to and overlaps with Psychology of Religion, but the two fields have different emphases. Psychology of Religion, like other areas in psychology, tends to take individual thought and behavior as the primary unit of

analysis. In contrast, CSR attempts to explain general patterns across individuals. For instance, a psychologist of religion may be interested in why a given individual is an enthusiastic theist, whereas cognitive scientists of religion are more concerned with why theism is generally prevalent across cultures. Compared with *Psychology of Religion*, CSR places a greater emphasis on explaining why people (generally) are religious and why types of religious belief and practice are crossculturally recurrent, and shows little concern for the psychological consequences of religion.

CSR is sometimes conflated with another neighboring area, evolutionary studies of religion. While CSR draws heavily upon insights from evolutionary psychology and behavioral ecology, studies in CSR need not be evolutionary (and evolutionary studies are frequently not cognitive). Cognitive explanations of religious phenomena, which characterize CSR, appeal to mental structures and processes as informing or constraining the range of ideas or actions likely to be recurrent in a population. Evolutionary accounts may complement these cognitive ones by providing explanations for why the particular mental structures have arisen as they have.

For a recent discussion of CSR's distinctive features, see Barrett (2007).

Relevance to Science and Religion

CSR is directly and decidedly a science and religion area. It uses scientific methods to study the causes for religious belief and practice. An area of dispute is what bearing naturalistic explanations of religion from CSR have upon justification and warrant of religious beliefs.

Sources of Authority

Cognitive scientists of religion generally view their scholarship as gradually and collectively accumulating knowledge through controlled empirical investigation supplemented by

theoretical analysis. Consequently, as in the natural sciences, the most valued authoritative sources in this discipline are recent refereed journal articles rather than classic texts or pronouncements of prestigious individuals. The most important journal in the field is the *Journal of Cognition and Culture*. Nevertheless, as compared with neighboring sciences (such as cognitive psychology), books by field leaders carry greater weight, and well-developed theoretical constructs have been widely appropriated before refereed articles offering empirical evidence in their support have appeared.

Ethical Principles

In general, CSR scholarship is governed by standard scholarly ethical principles requiring honesty in reporting and not claiming credit for another's work. Observational data from human subjects are to be collected either through public observation or, if not in public, with the consent of those being observed. The gathering of data through interviewing or other forms of nonobservational interaction with participants is regulated in the same way as all psychological research.

Key Values

As a field scientifically studying religion, CSR values even-handed neutrality when treating various worldviews. While this ideal is difficult to live up to, CSR scholars are quick to call each other out for practicing stealth theology, anti-theology, or favoring certain religions over others. Cognitive scientists of religion have inherited a skeptical stance toward commonsense assumptions from their psychologist colleagues.

Conceptualization

Nature/World

In CSR, *nature* (as in "human nature") typically refers to those features of human thought and

behavior that are cross-culturally recurrent and do not tend to depend heavily upon any specific environmental conditions – be they physical, ecological, or social. Language use, walking, and regarding other humans as having minds are all seen as paradigmatically natural human practices, part of human nature. This broad sense of “nature” accepts environmental conditions as inextricable factors contributing to human thought and behavior and includes environmental regularities as part of the natural condition for humans.

Another sense of “nature” or “natural” used in CSR concerns the fluency or automaticity of thought or behavior. Those capacities that require little conscious effort or deliberation are said to be more natural than those that require more effort. With much practice, other processing fluency may occur as in many forms of expertise. For experts, a specific kind of information processing may become “natural.”

Both senses of what is part of human nature and what is natural can be used in a relative manner. That is, different attributes, ideas, or practices may be said to be more or less natural. Language use is more natural (in both senses) than algebra. Religious thought, according to CSR, is more natural in the first sense (and for most people in the second sense as well) than scientific reasoning. That something is judged to be part of human nature or not or relatively natural does not constitute a value judgment.

The concept *world* does not feature prominently in CSR, but could indicate the external environment of humans (as in “the world in which Tibetan monks live”) or the general entirety of humanity (as in “religion is practiced around the world”).

Human Being

In CSR, human beings are to be studied as members of a particular species, *Homo sapiens*. How human beings compare with other animals in terms of cognitive capacities and ability to develop cumulative culture (as in religious traditions) is an area of contention.

Life and Death

Cognitive scientists of religion are not concerned with the origins of life generally, but do consider folk conceptions of life, death, and the afterlife.

Reality, Knowledge, Truth, Perception

These four concepts are interrelated in CSR. CSR generally adopts the view that there is a real world that human cognitive systems normally perceive and understand reliably. For the sake of processing efficiency or utility, human conceptual systems may, however, lead to errors in accurately discerning reality. Scientific methods and reason are seen as methods for overcoming this inaccuracy and discerning truth about the world. Perception is the principal process through which humans come to know reality through the senses. Knowledge amounts to accurate beliefs about the world.

Time

The concept of historical time is not important in CSR. Cognitive faculties are assumed not to have changed meaningfully through history. When considering origins of religious thought, however, considerations of prehistory and evolutionary pressures in ancestral conditions lead to a longer-scale view of time.

Consciousness

CSR has not been concerned with philosophical questions concerning consciousness. Cognitive scientists of religion tend to use fairly common-sense understanding of consciousness, often labeling “conscious” only those processes of which one has either awareness or which one can verbalize. Nonconscious cognitive processes are seen as a major source of information and constraint on the emergence of recurrent ideas or cultural practices.

Rationality/Reason

As in psychology, CSR focuses on how people think and reason rather than whether they are rational or the nature of rationality. Reason is viewed as a consciously accessible, reflective

cognitive activity that is less tightly constrained than nonconscious thought.

Mystery

Cognitive science of religion resists classifying phenomena as mystery. Instead, it attempts to dissect mysteries into empirically tractable problems.

Relevant Themes

Recurrence

Cognitive scientists of religion often write about the recurrence of cognitive capacities and of ideas, behaviors, and forms of cultural expression. Recurrence refers to appearance across individuals. A recurrent cognitive capacity is fluency in processing human faces. Religion is said to be a recurrent form of cultural expression in that it appears across individuals and cultural groups but is not, strictly speaking, universal. CSR aims to account for recurrence of religious phenomena by appeal to recurrent cognitive capacities.

Cross-References

- [Cognitive Science Psychology](#)
- [Psychology of Religion](#)

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Cognitive Science Psychology

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Related Terms

[Cognition](#); [Cognitive anthropology](#); [Cognitive developmental psychology](#); [Cognitive science of religion](#); [Evolutionary psychology](#); [Experimental psychology](#); [Psychology](#)

Description

Cognitive science is an interdisciplinary science of the mind – particularly, but not exclusively, the human mind. One major disciplinary contributor is psychology. The subfields of psychology that contribute most to cognitive science are cognitive psychology, cognitive developmental psychology, evolutionary psychology, social cognition, and psycholinguistics. Cognitive psychology, a designation attributable to Ulric Neisser’s 1967 book of that title, is concerned with the structures and dynamics of (human) information-processing systems including attention, concepts and categorization, language structure and use, memory, thinking and reasoning, and sensation and perception (Neisser 1967). (Cognitive psychology should be distinguished from therapeutic forms of psychological study and practice that include the label “cognitive,” particularly cognitive therapy and cognitive-behavioral therapy.) Rather than having a different content focus, cognitive developmental psychology concerns how these mental structures and dynamics are acquired and if and how they change over the course of the life span. Particular attention has focused on early childhood and how children come to understand the world around them and learn to act upon it. Similarly, evolutionary psychology brings a particular perspective to the study of cognition rather than primarily representing a content area. As applied

to the study of cognition, evolutionary psychology attempts to explain why certain mental structures might have evolved to solve information-processing problems as opposed to others and how the cognitive architecture of *Homo sapiens sapiens* might differ from that of ancestral hominids and other animals and why (Buss 2007). Psychologists taking an evolutionary perspective will sometimes study the minds and behaviors of nonhuman species. Social cognition is a focus of social psychology on social thought, how humans form and use social categories (such as roles, races, groups, and relations), and how different cognitive capacities are activated by and, in turn, shape social interaction. On the one hand, psycholinguistics is the subfield of psychology concerned with how cognitive architecture enables the acquisition and use of language and how the language faculty then helps explain the range of linguistic expression observed around the world (Chomsky 1968). On the other hand, psycholinguistics concerns how language use impacts other cognitive capacities such as concept formation, reasoning, creativity, and perception. Because of its focus on one particular cognitive capacity that gives rise to a particular form of cultural expression, psycholinguistics is often treated as a distinct discipline rather than a subfield of psychology.

The genesis of the contemporary cognitive emphases in psychology may be traced to the so-called cognitive revolution that started in the late 1940s and gathered momentum in the 1950s and 1960s. For approximately the first half of the twentieth century, scientific psychology was dominated by behaviorism, a school of thought championed by John B. Watson and B. F. Skinner, wherein the only legitimate psychological science was the study of human behavior as it was shaped by environmental contingencies. Mental states were considered irrelevant and thus entirely ignored. This behaviorist focus assumed that within the range of normal biological development, the only factors that affected human behavior and led to differences in dispositions, expression, and so forth were environmental. The cognitive revolution rejected both the idea that minds and mental states could not be studied scientifically and the radical empiricist assumption

that human minds are naturally formless, blank slates indiscriminately waiting for the environment to write anything upon them. Early experiments demonstrated that people and animals are biased to create some associations over others (such as fear of snakes as opposed to daisies) and that human working memory (what can be held in conscious attention at once) is limited to approximately seven (plus or minus two) chunks of information. These experiments demonstrate that it is possible to examine the architecture of the human mind and how it might be naturally biased or restricted in the way it processes information. The findings also suggest that in the background of interindividual and intergroup differences in thought and behavior might be species-wide psychological generalities.

The broadening of psychology by the cognitive revolution has enabled psychology to explore fruitfully many areas of human thought and behavior. Exciting topics beginning to receive considerable attention over recent decades include creativity, moral and normative reasoning, social intelligence and related areas such as perspective taking and empathy, and applications to nonlinguistic forms of cultural expression such as art and aesthetics, music, and religion. Essentially, any area of thought is now considered amenable to psychological investigation.

Self-identification

Psychology self-identifies as a science and often self-consciously so. Because of the cultural prominence of the therapeutic side of psychology, psychologists active in the scientific side of the field sometimes refer to their work as “psychological science” or, if appropriate, “cognitive science.” This scientific face of psychology justifies its identification as a science by the fact that it employs standard scientific assumptions and methodological frameworks. Psychologists attempt to generate empirically falsifiable hypotheses that may be tested through experimentation or other controlled forms of investigation. Sources of data must be objectively observable behaviors such as reaction times to

computer-presented displays, answers on questionnaires, eye gaze direction, verbal reactions, pulse rate, or blood flow to parts of the brain. These data enable inferences to mental states, structures, and dynamics. Though psychologists may use qualitative data to contextualize and amplify their studies, studies based on quantitative data are the gold standard.

Like all natural sciences, psychology relies heavily upon experimental methods, but because ethical and practical constraints limit the amount of experimental control that psychologists can exercise over their subjects (particularly human subjects, also called “participants”), psychologists use statistics to control for those factors they cannot manipulate. For instance, when studying memory for lists of words, a psychologist could experimentally manipulate whether the words are presented orally or visually, but only statistically control for the age, sex/gender, or nationality of the subjects.

Behind all of these scientific methods, psychology presumes methodological naturalism. That is, psychologists generally search out strictly natural mechanisms for the phenomena under considerations, foregoing alleged supernatural causes, even in the case of psychology of religion.

Characteristics

Psychology is further distinctive among the so-called social sciences in that it generally takes a single individual as its unit of analysis. Ultimately, psychologists are interested in explaining individual thought, beliefs, and behavior; groups, such as those based on age, gender, nationality, etc., are only relevant insofar as placing individuals into them can help explain variability. Consequently, psychologists often take the perspective known as methodological individualism, which implies that the origin and development of social institutions can – and should – be explained in terms of the summation of the actions of individuals.

Psychology is generally distinguished from the other contributors to cognitive science by its reliance on data gathered from the behavioral

activities of individuals (usually humans). Further, unlike conventional anthropology, linguistics, philosophy, and much computer science, psychology places heavy emphasis on what can be learned through experimental methods, as described above.

Like other contributors to cognitive science, however, psychologists see the mind as a computer – that is, as a machine that is capable of processing information. The principles of computation that go into creating computers are therefore used to understand how the mind works.

Relevance to Science and Religion

From its inception, modern psychology has contributed to the scientific study of religion. Psychologists have investigated religious experience, origins of religious beliefs and practices, formation of individuals’ god images, religious development and conversion, and how religiosity impacts social attitudes, morality, and psychological adjustment – to name just a few representative areas. Questions such as whether religious participation is good or bad for individuals, whether religion is the result of psychopathology, and what emotional or relational functions religions serve are all decidedly psychological questions. This subfield of psychology called psychology of religion can claim more than 100 years of history, though its decidedly cognitive expression, such as that manifested in the area called cognitive science of religion, did not begin to emerge until the end of the twentieth century (Lawson and McCauley 1990; Barrett 2004).

Sources of Authority

As with scientists generally, psychologists view their scholarship as gradually and collectively accumulating knowledge through controlled empirical investigation supplemented by theoretical analysis. Consequently, the most valued authoritative sources in this discipline are recent refereed journal articles rather than classic texts or pronouncements of prestigious individuals.

Journal articles receive their authority by the assumption that they have been carefully scrutinized for methodological rigor and theoretical importance by experts in the field who are often blind to the identity of the authors and their institutional affiliation. The ideal empirical journal article in the field is written in such a way that critical readers could replicate the protocol and analyses for themselves. The truth of psychological claims is meant to be based upon broadly accepted principles of accurate scientific investigation and sound statistical reasoning and logic. Scientific psychologists are suspicious of arguments from authority, of the use of anecdotes as evidence, and of rhetorical flourish. Partly to reduce the influence of the latter on the way arguments are perceived, most psychological journals require that all submissions conform to the stylistic principles dictated by the American Psychological Association (i.e., APA style) (American Psychological Association 2009).

Ethical Principles

Today, psychologists have to comply with ethical guidelines provided by professional associations or university-wide boards (e.g., the Institutional Review Board system in the USA) that restrict the kinds of studies that are permitted on the basis of whether participation is likely to involve any ill consequences and ensure that participants' responses are anonymous and confidential, unless the research question requires otherwise. Most professional journals in psychology require that any data presented be obtained in accordance to ethical guidelines. Many psychological studies, however, use deception or misinformation in order to obtain data that would otherwise be impossible to gather. In all studies, but particularly in those that involve deceptions, participants are thoroughly debriefed after participation.

Key Values

Among the fundamental values to which most psychologists subscribe is a *healthy skepticism*

that leads to *questioning assumptions*. This skepticism motivates the investigation of issues that would otherwise be taken for granted. For example, most people believe that parental influence is the strongest determinant of children's religious or political orientation, that playing violent video games causes adolescents to become more violent, and that their preference for one object or face over another is not influenced by familiarity, but, in most cases, these beliefs are not based on data. Psychologists see it as their objective to provide such data, whether it confirms or disconfirms the commonly held belief.

In addition to this questioning approach, psychologists aim to avoid injecting their prejudices into the scientific process. It is good psychological practice to test an explanation that one believes to be correct against other, alternative explanations, even when the original explanation appears adequate to account for the phenomenon at hand.

Conceptualization

Nature/World

In psychology, *nature* can have several meanings. As psychologists explore human thought and behavior, they often consider whether mental structures, behavioral patterns, or even neural architecture are best understood as a consequence of *nurture* – the contingent factors in a given human's environment – or *nature*. *Nature*, in this context, typically refers to human biological endowment including genetics. Contemporary psychologists know full well that the theoretical constructs of nature and nurture are never disentangled in the real world. Even solidly biological drives, such as for food, that might appear paradigmatic cases of natural features of humans are impacted by environmental (nurture) factors from biochemical environments in which human bodies develop and function to the variable environmental conditions that channel these drives into specific behaviors.

Nature (as in “human nature”) may also refer to those features of human thought and behavior

that are cross-culturally recurrent and do not tend to depend heavily upon any specific environmental conditions – physical, ecological, or social. For instance, upright, bipedal walking is a human universal (barring developmental disorders or environmental insults) that is not dependent upon special environmental or social conditions. As such, walking is part of human nature and might be termed “natural.” Similarly, though spoken languages vary across cultures, the ability to use spoken language is cross-culturally recurrent, appearing to only require general human biological endowment plus ordinary human environmental conditions. Thus, spoken language, too, is part of human nature. This broader sense of “nature” accepts environmental conditions as inextricable factors contributing to human thought and behavior and includes environmental regularities as part of the natural condition for humans.

A third sense of “nature” or “natural” used in psychology concerns the fluency of information processing or automaticity of behavior. Those capacities for thought and behavior that require little conscious effort or deliberation are said to be more natural than those that require more effort. To illustrate, from birth, people readily and automatically discriminate human faces in their environments and (barring developmental disorders or environmental insults) continue to show fine-grained facial discrimination throughout life. The ease with which humans process information about human faces is evidence of its relative naturalness. With much practice, other processing fluency may occur as in many forms of expertise. Chess masters, for instance, can automatically process relative positions of chess pieces much faster and easier than novices. For these experts, this specific kind of information processing has become “natural.”

The concept *world* does not feature prominently in psychology. “The world” could refer to the entire human population as when saying that a highly recurrent human trait is common “everywhere in the world.” “The world” could also be used to indicate the external environment of humans as when psychologists talk about how people try to understand the world they live in.

In this context, “the world” can be synonymous with *nurture* and antonymous of *nature*.

Human Being

For the psychological scientist, human beings are to be studied as natural objects, members of a particular species. Thus, the psychological study of humans and that of animals (which often falls under the scope of cognitive ethology or behavioral ecology) are assumed to require the same methodological tools. How human beings differ from other animals is an ongoing area of contention with some psychologists emphasizing what appear to be radically different sets of capacities that humans possess as compared with other species (such generation of language and ability to abstractly and reflectively reason). Others emphasize the continuity of humans with other animals, suggesting that human beings differ from other animals primarily in degree of cognitive capacity (such as intelligence, conscious reflection, self-awareness, ability to use symbols and tools, and so forth).

Life and Death

Psychologists are not concerned with the origins of life generally. They typically consider individual life to begin with birth, but developmental psychologists sometimes use conception as the start-point for life especially when studying neonates that might have been born at different lengths of gestation. Psychologists generally see death as the endpoint of human development. Psychologists may, however, study conceptions of life, living things, and death and what happens after it.

Reality, Knowledge, Truth, Perception

These four concepts are interrelated in modern psychology. Generally, psychological science rests on realist epistemological foundations. Psychologists typically assume that human cognitive systems are such that they normally produce accurate knowledge about reality. They see perception as the principal process through which humans come to know reality through the senses. Though generally reliable, perception is not thought by psychologists to be error-free; on the contrary, much research in psychology describes

the biases that affect perception and the resulting disconnect between mistaken perception and reality or what is false and what is true. Similarly, conceptual biases and heuristics may lead to distortions regarding what is true and real (Gilovich 1991). Psychologists regard scientific methods and reason as tools for overcoming error and discerning truth.

Time

The concept of historical time is not important to psychologists. Psychological faculties are not assumed to have changed in significant ways through history. If, however, time is taken to mean duration, it becomes relevant to psychology. Reaction time, for example, is a commonly used indirect measure of the nature and complexity of cognitive processing.

Consciousness

Philosophers are more concerned than psychologists with the task of tracing the borders of the conscious and unconscious. Psychologists tend to use fairly commonsense understanding of these terms, often labeling “conscious” only those processes of which one has either awareness or which one can verbalize. For example, studies that involve priming, whereby a stimulus is shown to affect a response even when one has no awareness of it doing so, are often taken to be showing unconscious influences on behavior.

Rationality/Reason

Psychologists generally focus on how people do think and reason rather than whether they are rational or the nature of rationality. Nevertheless, psychologists do frequently contrast formal models of rational thought with actual practice. For instance, the work of a number of cognitive psychologists, including Nobel Prize winner Daniel Kahneman and Amos Tversky, has shown that humans do not always make decisions in accordance to rational economic principles, such as that of utility maximization (Kahneman and Tversky 1979). For example, people have often been shown to use heuristics, or rules of thumb, rather than rational analysis; to be influenced by irrelevant aspects of how problems

are framed; and to follow others’ behavior rather than assessing its appropriateness and utility.

Mystery

Scientific psychology attempts to eliminate mystery whenever possible, recasting mysterious phenomena as psychological problems that might be addressed empirically.

Relevant Themes

Perception

Cognitive psychology and related areas of cognitive science in part concern how people process information about their environment (or about their internal sensations) in order to understand what it is they are experiencing – the process of perception. Inasmuch as religious experiences require the representation and interpretation of either external or internal stimuli, the study of religious experience may be impacted by psychological understandings of perception generally.

Information Learning

One subarea of psychological science is how people acquire ideas and information – both from perceptual data and from communication. The dynamics of how ideas can be effectively shared bears upon religious education and communication. Further, when considering religious thought or practice, generally we are considering culturally shared thoughts or practices. The dynamics of how ideas are transmitted, and whether our cognitive systems are more or less receptive to certain kinds of information learning over others, may importantly shape which ideas spread widely and become adopted as religious (Boyer 2001). Applying such a cognitive perspective to the study of religion is a major emphasis of the area known as cognitive science of religion.

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Cognitive Therapy (CT)

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Cognitive therapy seeks to help patients overcome mental difficulties by identifying and changing dysfunctional thinking, behavior, and emotional responses.

Coherentism

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Related Terms

[Epistemology](#); [Truth](#)

Description

Coherentism comes in alethic and epistemic versions. As an alethic doctrine (the coherence theory

of truth), coherentism is an account of what it is for a proposition to be true. In this sense, coherentism is the theory that a proposition is true when it coheres with a system of beliefs. As an epistemic position (the coherence theory of justification), coherentism is a theory of what it is for a proposition to be justified. Coherentism in this sense is the view that one is justified in believing a proposition when it coheres with a system of beliefs. The two types of coherentism are often closely related since epistemic coherentism can be used to argue for a coherence theory of truth.

Epistemic Coherentism

Epistemic coherentism is the view that a proposition is justified by coherence with a system of beliefs (i.e., propositions held to be true), each of which is also justified by coherence with other beliefs in a system. In some versions of epistemic coherentism, justified beliefs cohere with the beliefs of some individual. In other versions, beliefs are justified by coherence with the beliefs of some community. Notable defenses of epistemic coherentism include BonJour (1985), Lehrer (1974) and Lehrer (2000). For a discussion see Kvanvig (2011).

One can be an epistemic coherentist about all propositions or only propositions in certain classes. A partial epistemic coherentist could hold, for example, that religious beliefs are justified by coherence with other religious beliefs (of some individual or community) without adopting a global coherentist account of how beliefs in general are justified. For a discussion of coherentism and religious belief see Plantinga (1986). Similarly, one can be an epistemic coherentist about moral beliefs without being a coherentist about other sorts of beliefs. Coherentism about moral beliefs is related to Rawls's view that a moral belief is justified when it stands in "wide reflective equilibrium" with other moral beliefs (Rawls 1971).

According to epistemic coherentism, justification is the result of a relationship among beliefs. This relationship may be described as mutual

inferential support. One belief in a system receives deductive or inductive inferential support from other beliefs and is consequently justified. These other beliefs can be inferred from still other beliefs and are justified. Eventually, all beliefs are supported by the others in a system.

Epistemic coherentism is motivated by a rejection of both foundationalism and skepticism. Epistemic coherentists believe that propositions can be justified, and consequently they reject skepticism. At the same time they reject foundationalism. Foundationalism is the view that beliefs can be identified which do not require justification because they are self-evident. These propositions are the foundation on which all other justified beliefs rest, that is, all other propositions are justified by reference to foundational propositions. In modern epistemology, the foundational beliefs have usually been thought to be beliefs about current experience. Coherentists believe that all propositions are in need of justification. In particular, they hold that beliefs about what is currently observed are in need of justification.

Contemporary epistemic coherentism emerged as a result of two failures of logical empiricism. The first was the failure of the logical empiricists to identify a class of observation (or “protocol”) sentences (propositions) that are not in need of justification. Neurath (1983) held that any proposition, even an observation sentence, can be rejected on the grounds that it is inconsistent with other propositions that are held to be true. The second was the failure of logical empiricists to show how all propositions, including universal generalizations (which are common in science) and propositions about the past and future, can be justified by appeal to foundational beliefs about what is currently observed. Neurath used his image of rebuilding a ship while it is at sea to illustrate his view that the justification of any belief is provided by other beliefs. Any belief can be part of the ship (i.e., the system of beliefs) or excluded from it, so long as adjustments are made elsewhere in the ship that enables it to remain afloat (i.e., it enables people to navigate the

world). A similar position was adopted by Quine. See Quine (1960) and Quine and Ullian (1970).

Some epistemologists have developed theories that are designed to combine features of foundationalism and coherentism. See, for example, the foundherentism of Haack (1993). Haack believes that a satisfactory epistemology must have a place for the justification of empirical beliefs by experience (as does experiential foundationalism). She also holds that justification often takes the form of beliefs mutually supporting each other.

Alethic Coherentism

The coherence theory of truth provides an alternative to the correspondence theory of truth, the pragmatic theory of truth, and the various deflationary theories of truth. Coherentism in this sense is, like the correspondence and pragmatic theories of truth and unlike deflationary theories, a substantive theory of truth. As a substantive, non-deflationary theory of truth, alethic coherentism states that truth is a property of propositions. In particular, it is the property of being true when it stands in the relation of coherence to a system of beliefs.

Several accounts can be given of system of beliefs with which true propositions cohere. On one account, true propositions are those which cohere with some actual system of beliefs. On another account, true propositions cohere with some ideal system of beliefs. This ideal system could be the system of beliefs adopted, at some ideal limit of inquiry, by being with the cognitive capacities of humans. Alternatively, the ideal system could be that of a being or beings with greater cognitive capacities than humans. In particular, the ideal system of beliefs could be that of an omniscient being, that is, God.

Two sorts of consideration have led philosophers to adopt a coherence theory of truth. In the first instance, some philosophers have been attracted to alethic coherentism by metaphysical considerations. A correspondence theory of truth depends on a distinction between beliefs

(i.e., propositions held to be true) and what makes beliefs true. Certain forms of idealism suggest that only beliefs exist. This leads to the view that truth must be the result of a relationship among beliefs. Walker (1989) attributes a coherence theory of truth to Spinoza, Kant, Fichte, and Hegel. Some British Idealists adopted alethic coherentism in the last years of the nineteenth century and the first decades of the twentieth. See, for example, F.H. Bradley (1914).

Epistemological considerations have also motivated philosophers to adopt a coherence theory of truth. Blanshard (1939) believed that a coherence theory of truth follows from a coherence theory of justification. He takes epistemic coherentism to be correct and the coherence of a proposition with a system of beliefs to be a reliable test of its truth. However, Blanshard suggests, if truth consists in correspondence to reality, there is no reason for coherence with a system of beliefs to be a reliable test of truth. He concludes that the truth of a proposition consists in its coherence with a system of beliefs. Rescher (1973) holds that this argument only succeeds if coherence with a system of beliefs is an infallible test of truth (which he denies). Otherwise, a belief could be justified but not true.

The alethic coherentist needs to provide an argument for believing that a proposition is true when it is justified by coherence with a system of beliefs. Anti-realism of the sort defended by Dummett (1978) can be used to defend the conclusion that truth is to be identified with what is justified (or warrantably assertable, as Dummett says). This argument would start from the premise that the meaning of a proposition consists in its truth conditions. Suppose then, for the sort of reasons Dummett advances, that the meaning of any proposition consists in the conditions under which it is warrantably assertable (or justified). It follows that the truth conditions of any proposition are the conditions under which it is justified. If the conditions under which a proposition is justified are the conditions under which it coheres with a system of beliefs, and the conditions under which a proposition is true are the conditions under which it is justified, alethic coherentism

ensues. For this sort of argument see Young (1995). In that the coherence theory of truth links the concept of truth to the concept of what can be justified (or warrantably assertable), and alethic coherentism has an epistemic conception of truth.

The relation of coherence, as employed in the coherence theory of truth, is closely related to the relation of coherence employed by epistemic coherentism. That is, according to the alethic coherentist, a proposition coheres with a system of beliefs (and is true) when the proposition can be deductively or inductively inferred from beliefs in the system.

Once the coherence theory of truth is stated in these terms, it becomes vulnerable to two standard objections. The first of these may be called the specification problem, which can be traced to Russell (1907). The specification problem challenges the alethic coherentist to specify the system of beliefs with which true propositions cohere without presupposing a non-coherentist conception of truth. Initially the problem is that there is any number of equally consistent sets of propositions. Many propositions will cohere with one of these systems without being true. For example, the proposition that Alice slew the Jabberwocky coheres with a possible set of propositions, but is not true. The alethic coherentist can respond that the system of propositions with which true propositions cohere is a set of propositions which is believed. If coherentist adopts this position, the specification problem reemerges in another form. Walker (1989) argues that the proposition that some set of propositions is the one that is believed can only be true because, as a matter of fact, people believe it. But then there is a proposition (namely, the proposition that a specified set of propositions is believed) which is true because of a relation to matter of fact, not as a result of a relation among propositions. This is contrary to the coherence theory of truth.

The second standard objection to the coherence theory of truth may be called the transcendence problem. According to this objection, truth transcends what coheres with any system of

beliefs. This position can be motivated by considering examples of propositions which are apparently true but which do not cohere with any actual system of beliefs. Consider the proposition that there is an even number of stars in the universe. Either it or its negation, by the law of excluded middle, is true. Nevertheless, neither the proposition nor its negation coheres with any system of beliefs. Proponents of the transcendence problem conclude that a proposition can be true even though it does not cohere with a system of beliefs.

Some versions of alethic coherentism are immune to the transcendence problem. If truth is coherence with the beliefs of an omniscient being, the objection fails since every truth coheres with the set of beliefs of an omniscient being. However, some versions of alethic coherentism hold that the truth of a proposition consists in coherence with a system of beliefs which finite knowers hold or could hold. These versions of the theory must cope with the transcendence problem. Alethic coherentists can defend their position against the transcendence objection by maintaining that the objection begs the question. Those who present the objection assume that it is possible that some proposition be true even though it does not cohere with any set of beliefs. This is precisely what advocates of the coherence theory of truth deny. Coherence theorists have arguments for believing that truth cannot transcend what coheres with some set of beliefs. Their opponents need to take issue with these arguments rather than simply assert that truth can transcend what coheres with a specified system.

Both epistemic and alethic coherentism continue to find defenders among contemporary philosophers. Epistemic coherentism is more widely held, but the coherence theory of truth also has advocates.

- [Philosophy of Language](#)
- [Positivism/Neopositivism](#)
- [Truth](#)

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Cross-References

- [Epistemology](#)
- [Metaphysics](#)

Collective Action

- [Collective Behavior](#)

Collective Behavior

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Related Terms

[Collective action](#); [Collective interests](#); [Crowd](#);
[Social movements](#)

Description

(1) A complex concept. (2) Theories. (3) Analytical approaches. (4) Social Movements. (5) Dynamics. (6) Future perspectives.

A Complex Concept

Collective Behavior, unlike other concepts in social science, is very wide, complex, and difficult to define. It includes different behaviors, structures, processes, and contexts. Many areas of sociology and psychology, as well as economics and political science, involve the study of Collective Behavior, often restricting the focus to particular types of it such as religious, political, deviant behavior, and others.

The concept of Collective Behavior does not define a group of social phenomena which can be objectively verifiable, but can be intended as a reference to understand different sociological orientations, which sometimes converge, and sometimes contrast.

Originally called “mob behavior” or “mass hysteria,” Collective Behavior was believed to occur when people lose their ability to reason, and become temporarily insane. The perception of Collective Behavior has changed, and researchers today are aware of the fact that it concerns many types of social events which include fads and rumors, millennial movements, social movements, miracles and religious sightings, and other occurrences, not necessarily related to violence or brutality.

Collective Behavior is a fascinating social phenomenon that cannot be restricted to a specific type of social, political, psychological, economic process or behavior, because it is wider, multifaceted, and inclusive. Concisely, the concept of Collective Behavior can be defined as a response to problematic situations and circumstances.

The studies on Collective Behavior focus on the motivations, the modalities, and the dynamics that characterize the evolution of this response, and refer to the spontaneous manifestation of behavioral patterns as well as to organized social movements. Among all these modalities, there are riots, lynching, responses to natural disasters, panic, rumors, revolutions, and rebellions, a very wide range of situations and responses, that render Collective Behavior a term that covers a field without definite borders. While this constitutes its limits on the one hand, it is also a resource and an ongoing challenge on the other, because it leads to continuous redefinition and update.

The concept of Collective Behavior has changed and adjusted to the evolution of society, because being related to social rules and expectations, when these change, it also changes. Moreover, the concept has broadened, because the advancements in technology and its diffused use, make Collective Behavior more incisive – it can even acquire a global dimension through social networks, for instance- and varied in its forms. Research on Collective Behavior has also changed and broadened, giving new impulse to its conceptualization – for instance on the crucial issue of what makes it different from other forms of group behavior – because there are new methodologies which allow a wider gathering of data, interdisciplinary approaches, equal application of both qualitative and quantitative methods, recognizing the fundamental contribution of both.

Collective Behavior’s great interest lies in its high cultural value, as it can explain important social phenomena, and because of its high concrete and practical value; studies on the dynamics of Collective Behavior can help prevent unrest, and violence; it can also help to plan and suggest strategies as to prevent and to react to natural disasters and human security consequences.

Theories

Gustave Le Bon in *The Crowd: A study of the Popular Mind* (1895) can be considered the initiator of the studies on Collective Behavior, as the earliest formulations of this concept are to be found in crowd psychology. He affirms that the crowd is a reality *sui generis*, which “forms a single mind and is subjected to the law of the mental unity of the crowds” sustaining that all individual responses are lost in crowds. His theory is known as “Contagion Theory,” and is based on the idea that episodes of violence are driven by animal-like instincts that spread through a “maddening crowd” like an infection.

Le Bon has strongly influenced Sigmund Freud, who in *Mass Psychology and the analysis of the Ego* (1921), integrates his theory with the idea that suggestibility does not constitute an explication in itself, but needs instead to be explained. He also affirms that the role of the leader within the crowd, and the relationship between the followers and the leader must not be underestimated, as he thinks Le Bon does. Freud explains group participation by applying psychoanalytic theories of the instinct-object relationships in the individual and of the primal horde.

The post First World War period inspired many European theorists at that time, as the restoration of peace had not produced a climate of social and political serenity. The events occurred in Russia, with the Bolshevik Revolution, for instance, reinforced the workers’ movement, but at the same time increased the fear of a potential affirmation of socialism in the rest of Europe. In the 1930s, many social movements of different orientations emerged, eventually leading to the advent of totalitarian regimes. The crowds became “organized masses”. The studies follow the evolution of these historical events, and focus on the explanation of the instinct that guides the masses and influences the situation in Europe. Studies, such as *The revolt of the Masses* by José Ortega y Gasset (1930), *The Mass Psychology of Fascism* by Wilhelm Reich (1933), and *The rape of the Masses* by Serghej Ciacotin (1938), express this profound need of understanding the new social reality.

During this time, in the United States, the behaviorist theories became very successful, with a consequent growing need to study social phenomena with a more concrete and less theoretic approach. The first result of this new trend is that the issues related to these fields of studies became fragmented into different fields, which advance in parallel, among which emerged the new sociological field that will eventually be recognized as Collective Behavior.

The Chicago School distances itself from the rigid stimulus–response mechanism, stressing instead the mutual influence and the continuous exchange between individual and social environment. Robert Park, along with Ernest Burgess redefines the “Contagion Theory.” In *Introduction to the Science of Sociology* (1921), Park uses the expression “Collective Behavior” for the first time. Collective Behavior is defined as the behavior of individuals under the influence of a common impulse, which is the result of social interaction. Social unrest, sects, social contagion, mass movements, propaganda, fashion, and crowd mind are defined as Collective Behavior. This theory has constituted the main reference for decades, as the studies on this concept are few and have been carried out by almost exclusively those who studied under Park. Amongst them, Herbert Blumer (1951) has studied social processes and events saying that they do not reflect an existing social structure but emerge in a spontaneous way. He has developed the theory of the “acting crowd,” that is an excited group animated by a common goal. Blumer identifies five steps that turn a group of individuals into an acting crowd: social unrest, exciting event, milling, common object of attention, and common impulses.

In the 1950s, a process starts that will lead in the following decades to a progressive reinterpretation of these kinds of social phenomena, considering them less abnormal, not all motivated by irrational, violent, or hysterical behavior. The process has contributed to individuate and underline the similarities between collective and institutionalized behaviors. The “Contagion Theory” could not explain mild expressions of Collective Behavior and events, such as those related to

fashion, for instance. New theories and interpretations were needed.

Within the interactionist tradition – as in *Collective Behavior*, a study by R. H. Turner and L. M. Killian (1957) – great importance is given to social typing and to the way in which role models are created and diffused in society. Turner and Killian elaborate the concept of “Emergent Norm Perspective,” which is a process: When people find themselves in a new and unknown situation, they must create new norms to adjust to the situation. The process is rational and logical, and explains that once everyone recognizes which behavior is appropriate to the situation, they adopt the behavior. Nevertheless, not all behaviors within a Collective Behavior episode are the same. Turner and Killian elaborate a classification schema in which participants are placed according to the motivations at the basis of their decision to take part in a collective event: They could be insecure, ego-involved, concerned, curious spectators, or exploiters. Each of these motivations is neither irrational nor insane. Whichever category the participant belongs to, his/her behavior will be rational as long as the individual will remain in that situation.

Neil Smelser has offered another sociological approach in *Theory of Collective Behaviour* (1963). His “value-added schema” suggests that the determinants of Collective Behavior are given by a sequence of events and elements: structural conduciveness; structural strain; growth and the spread of a generalized belief; precipitating factors; mobilization of the participants for action; operation of social control. The latter, Smelser sustains, is particularly important because it determines the duration and the severity of the episode of Collective Behavior. Smelser defines Collective Behavior as “a mobilization on the basis of a belief which redefines social action” (Smelser 1963: 8) and views it as episodes of group behavior that relieve some social strain.

Since the end of the 1970s, sociologists have tried to overcome the distinction between conventional behavior and Collective Behavior, aiming to identify convergences and divergences

between social behaviors within the same conceptual and theoretical structure.

The categories defined by nineteenth century theorists, who identify different aspects of Collective Behavior (crowd is a type of group; panic is an individual psychological state; etc.) have shown that the field of Collective Behavior is difficult to define because it pertains to different fields and subjects that find convergences only by chance or tradition. According to Marx and McAdam (1994), the theorists of the twentieth century have perpetuated very similar approaches in a rather uncritical way, not distancing themselves much from the original theories, with little innovation. In this way, the field can be seen as a residual category which is used to fill gaps in social analysis when an event cannot be studied as social structure or other. Marx and McAdam suggest that the “Social Movement” theory has moved too far in the direction of the “Collective Action” theory and too far away from the “Collective Behavior” theory.

It is interesting to note also that there are differences between the European and the American approaches to Collective Behavior, although the following general definitions must not be intended as definite categories. Post second World War American sociology has been dominated mainly by functionalism (the concept of “institution,” “integration,” “socialization”) and therefore, the concept of Collective Behavior – linked to that of “social movements” – has been introduced and acquired only with the emergence of the protests and organized movements which developed in the 1960s in the United States: the student movement, the Civil Rights movement, the protests against the Vietnam war, and others. The fact that these movements were characterized by the refusal of dominant values, and often recurred to violence, indicated, somehow unpredictably, that the mechanisms of social and cultural integration were weak and not responding to the new demands and needs.

Europe, on the contrary, has been influenced strongly by a Marxist interpretation of society according to which the social organization is

based on a conflict or on a relationship of subordination.

In the United States, Collective Behavior is interpreted as marginal and as the result of malfunctioning social integration mechanisms; in Europe, the Marxist interpretation tends to focus the analysis on opposite Collective Behaviors, which end up by depicting a dramatic image of history.

The different interpretations of the concept of Collective Behavior all share the idea that they are the expression of general dissatisfaction regarding a purely liberal vision of social life, which reduces society merely to market interactions. In fact, the specific feature of a market, above all when its mechanisms are not altered by coalitions, is that it favors a rational quest for individual interest. An "open" society would then be made entirely by individual stories, which could only be linked in statistical groupings. Stratification in these open societies can be relevant; nevertheless, it does not necessarily mean that individuals who belong to the same stratum would be able to organize Collective Behaviors. It is more probable, however, that they will share similar or common behaviors with regard to opinions, consumerism trends, and social mobility. This is the principle at the basis of opinion polls, which explains why they are largely diffused in western societies: They are considered able to propose a reliable model of individualized behaviors, which are then statistically categorized according to preferences.

All this suggests that there can be Collective Behavior only in societies which are not entirely open, or, as most theorists affirm, societies which are dominated by power, therefore operating according to the logic of domination.

Two opposite positions emerge from the studies: On the one hand, the most liberal interpretation, and the theory called "Methodological Individualism," underlines the limits of all the attempts to analyze Collective Behavior; on the other hand, all those who refer to Collective Behavior agree that a merely utilitarian and individualistic analysis of social behavior is not sufficient.

Analytical Approaches

There are various analytical approaches to Collective Behavior, which derive from the conceptual frameworks of the protection of interests, reform movements, and social movements.

The first approach is related to the individual self-interest. A traditional assumption in economic models of human behavior is that people behave exclusively in accord with their own self-interest. However, there is a growing appreciation that people are inherently social creatures, and that people often intrinsically care about the welfare not only of each other as individuals but also of the groups to which they belong.

The main analytical question regards how the protection of individual interests can lead to Collective Behavior. The answer can be found in the famous free-rider paradox by Olson (1965: 2): "(...) the individual in any large group with a common interest will reap only a minute share of the gains from whatever sacrifices the individual makes to achieve this common interest. Since any gain goes to everyone in the group, those who contribute nothing to the effort will get just as much as those who made a contribution (...) large groups, at least if they are composed of rational individuals, will not act in their group interest." Olson has observed, being a prominent representative of methodological individualism, that if individual interest is well understood, it must lead individuals to nonparticipation, rather than to participation in collective action. It would be more rational to let others take the responsibility and the costs of collective action (for instance, a demonstration, a strike) and then profit from the result without any involvement. Olson affirms that particularly in labor unions, this leads to the creation of very small negotiation units because this allows each individual to better understand which interest there would be in taking part in a collective action.

How do interest groups and collective actions develop? Olson finds the roots of this social phenomenon in the moment in history in which the unions and the mass political parties were formed in Europe at the end of the nineteenth century. Robert Michels, in his writings, explains this

clearly when he affirms that mass actions develop because they favor their leaders. Any political system evolves into an oligarchy that regulates all big organizations, even when they are defined as democratic, because they function in the interest of what is often defined as their techno-structure. Nevertheless, the leaders do not act as individuals on a market. They are positioned within a more circumscribed and organized world, the world of political leaders, in which they develop a power strategy which must assure the leader him/herself, that his strategy will convince his/her own supporters to believe it is specifically intended to favor their needs. This is why they recur to symbolic discourse and actions aimed at reassuring their supporters, although this might not be coherent with their actual behaviors.

This introduces the "Resource Mobilization" theory, which opposes the utilitarian approach by underlining the limits of interpreting Collective Behavior as only aimed at the protection of interests. This theory focuses on the ability of any social movement organization to successfully manage and acquire resources that could be constituted by anything that could favor or hinder the success of the movement (votes, media coverage and other). Leaders' actions show that between the demands of individuals and the responses, there are power relations, which means that it is not possible to oppose individual interests to the collective character of action: The goods the individual is aiming at are not on the market but depend upon the power centers, whether governments or enterprises. Very few social actors are able to fulfill their goals without forming alliances or coalitions and orient their victory toward more symbolic than material gains. This kind of analysis is very relevant, in particular when applied to specific issues such as labor unions activities.

Another approach is inspired by the hypothesis developed by functionalist sociologists based on the fact that they see the formation of Collective Behavior as the expression of malfunctioning institutional mechanisms. Collective Behavior would then be the opposite of

individual behavior based on the conformity to dominant norms which have been interiorized. In this sense, the most important Collective Behaviors are conformist, for instance, movements that are inspired by the dominant values in a given society.

Protest movements are present in all democratic states. They denounce injustice, the nonrecognition of the right of expression and action of specific groups. It is in fact the concept of "minority" that in the United States has given the most help to groups which were able to mobilize in the name of universal principles, of human rights. Modernization movements, for instance, are inspired by the idea of a natural evolution of history that requires that societies constantly reconsider the principles and the institutions on which they are based. These movements imply that reforms are believed to be possible and even probable. Otherwise, the mobilization loses its sense and violence can spread. Peace movements, civil rights movements, and many others have achieved important goals in fostering reforms. Reforms and the diffusion of democracy have been the central theme of the social-democratic regimes in Europe and of the British Laborism. The British are the first to have elaborated the concept of industrial democracy and of social pact, allowing for great collective agreements on social issues, in line with the shared principles in the political society.

It must be underlined that power relations, however, cannot explain all social collective reactions systematically, as the affirmation of the dictatorships in the twentieth century and its ruinous consequences demonstrate. Collective Behavior can be in fact strongly influenced by leaders who are gifted by an undefinable charisma, as Weber defines it, which legitimates their power. These leaders are able to persuade vast masses of people with a political discourse whose content – either in favor or against the mass – is disguised in a highly symbolic narrative that renders individuals acritical and inclined to be convinced.

Some of questions that these phenomena raise are still to be answered.

Social Movements

Another analytical approach to Collective Behavior is constituted by social movements. They are defined as an organized effort by a significant number of people to change (or resist change in) some major aspects of society.

While social movements are considered a form of Collective Behavior by many researchers, others affirm that they must be distinguished from it, because social movements are organized and structured, while Collective Behavior is random and chaotic. Nevertheless, they have become an important field of study on itself.

The Collective Behavior theories above mentioned can be applied to the analysis of social movements. Social movements are organized, are able to produce changes in society and to last for a long period of time. In *The Politics of Mass Society* (1959), Kornhauser sustains that social movements attract individuals who are socially isolated and perceive themselves as socially insignificant. Social movements give a sense of meaning to individuals, which renders them more social than political. The “Mass Society” theory of Kornhauser suggests that social movements mobilize more easily people with weak social ties, and are led by individuals who pursue their own social interest.

The analysis of social movements has also inspired the “Relative Deprivation” theory which is based on the assumption that social movements form when a group of people feels deprived of what they think is their right to have. Denton Morrison in *Some Notes Toward Theory of Relative Deprivation, Social Movements and Social Change* (1978) has applied this concept, originally elaborated by Stouffer in *Studies in social psychology in World War II* (1949). Morrison argues that when people are dissatisfied, believe to have a right to their goals, and believe that they will not be able to do so through conventional means, they will form a social movement to achieve those goals. The sense of unjust deprivation is a strong motivation.

Although the term “social movements” is widely used in sociology, it would be better defined in this context – to be used as an

analytical tool – as those Collective Behaviors that question, through a social conflict, the way in which a given society makes use of its resources and its cultural model. In this way, social movements in connection with Collective Behavior seem to privilege the conflict aspect, in direct connection with the concepts of protection of interests and interaction between individuals.

This analytical approach to Collective Behavior is quite demanding as it implies that there exists an underlying central conflict in a given society. Many studies have in fact stressed the existence of a fundamental conflict behind the apparent variety of social behaviors, proposing new forms of class division and class conflict.

The approaches to Collective Behavior above mentioned are not equally relevant. According to Alain Touraine, as he writes in *Le retour de l'acteur* (1984), the concept of social movements is to be put at the highest level. This level, that he calls *historicité*, is also the most difficult to reach, as it constitutes the social realization of the great cultural patterns through which a society builds up its relations with its environment. On the contrary, interest conflicts must be positioned at the level of the social organization and also at the level of what sociologists call “organizations.” Reform movements must be positioned between the two levels, together with institutions and political mechanisms, which produce a range of mediations able to lead social power relations to forms of professional or technical organizations.

Social movements, the highest level of Collective Behavior, can be formed only when the two other types of Collective Behavior – protection of interests and reform movements – which are positioned at social organization or at political level have been overcome. It is very important to take into account in the analysis that social behaviors must be identified and positioned at the right level of the social reality in which they act. The analysis of Collective Behavior through the social movements approach offers the advantage, by which it allows to stress this diversity, while often utilitarian analysis tends to refuse the existence of other types of Collective Behavior and thus refuses other kinds of analysis.

Dynamics

All social behaviors are based on common meanings and shared imagery, which allow for a collective definition of a situation. Individuals or groups decide to support new and disjunctive behavior in situations that are inherently unstable, where there is an element of choice, some novelty, a crisis, attrition, conflict, competitiveness which create a problem. These situations allow the development of Collective Behavior, which is dependent upon the feelings and experiences of the participants.

Choice implies the existence of alternatives and the opportunity to select them freely, but does not provide generally accepted criteria on which the selection can be based.

Novelty is created by situations that have not been experienced before by the participants. Crisis emerges in extraordinary situations, and in emergencies, which create new demands that constitute a test for organized groups or favors the creation of new ones. Attrition develops in the presence of a difficulty that weakens the collective effort. Competitiveness emerges when a rewarding structure – that could favor individual rather than collective solutions – influences a cooperative solution. Regarding conflict, it implies a power relation of dominion, with a party trying to impose a claim, while its legitimacy is challenged by another party.

In all these situations, imagery and meaning lose their collective dimension and can be questioned. In many problematic situations, different elements are present at the same time, each with its own dynamic which produces an episode definable as Collective Behavior.

One hypothesis is that groups of people create emergent patterns that have integrity of their own, and as a consequence that there are strong individual differences across different groups. Although it is possible to draw many convergences in the general patterns formed by people, it is important to stress the critical dimensions of variations.

The first element to analyze is the primary motivation of individuals. Given that individuals are not only moved by self-interest, but can care for the more general welfare, the interaction

among individuals determines the pattern of emergent groups. Forms of dialectical interaction include competition and cooperation, as well as a number of behaviors that are contingent upon the behavior of their peers. They imitate those behaviors or differentiate from them. Imitation is very important in diffusing innovation within a community, which is then assimilated. The choice between imitation and differentiation is often dynamic and depends upon the situation, and as with cooperation and competition, it implies elements of both, imitation and differentiation. The base motivations in the choice of the individual to take part in Collective Behavior or not are also related to the fact that the individual does not need to predict group level outcomes, as successful groups can emerge from individuals who are strongly motivated by self-interest.

Current research focusing on modeling Collective Behavior aims at systematizing the development of more effective ways not only to predict but to control collective outcomes. Even without instituting physical or abstract barriers, it may be possible to indirectly control Collective Behavior with substantial efficacy. According to this view, Collective Behavior is more controllable than the behavior of isolated individuals because of the strong influences among the individuals' behavior. This concept is at the basis of a new approach that intends to support effective collective organization, with the aim of allowing the formation of self-organized patterns rather than dictating high level structures in a system of top-down control. As Goldstone and Gureckis sustain (2009: 418): "this conceptualization of design planning as facilitating self-organization rather than dictating final form may have an important moral for social systems in general."

Future Perspectives

There has been in recent years a renewed interest in Collective Behavior, the reasons being many. First of all, the fact that there have been interesting developments in the formal modeling of Collective Behavior, which are playing an important role in sociology – as Macy and Willer (2002) and Cipriani (2005) stress – as well as in economics, psychology, and anthropology, has

increased interest in Collective Behavior. Second of all, research can now count on new empirical tools that have changed the way scientists approach the issue of Collective Behavior, as regards dynamics and patterns. They can now be measured and analyzed in new ways. For instance, the internet, mobile phones, specific software, and others allow the observation of large groups of people, and the formation of collective dynamics within them. Technology is playing a significant role in research as it allows the recording of the evolution of collective decision-making moments away, as in the Arab Spring where the web played a crucial role. Data can be gathered online from blogs, social networks, and others. Third of all, globalization has played a significant role, as it implies more and more connectedness, with consequent phenomena such as de-territorialization and others, among which, for example, the World Wide Web, that has been the object of many studies on nonlinear group dynamics.

These innovations seem to promise that Collective Behavior, in a world of collective ambitions, will be studied and observed more and more.

How Collective Behaviors will develop is difficult to predict, although some elements of the recent changes can be identified. First of all, Collective Behaviors are less directed to the political and cultural centers of power and are more focused on the defense of the autonomous actions of the actors, either in relation with the others, in relation to central powers, or in relation to external challenges and risks. Collective Actions in this sense require that the participation of their members is more responsible and individualized. Second of all, Collective Behaviors mobilize their actors completely, at all levels, with the consequence that there is a passage from actions increasingly instrumental to actions which are also increasingly demonstrative.

Collective Behaviors are now so pervasive that they appeal to private life, to aspects such as personality and culture, and not only to institutionalized forms of political life.

The actors and their relations have become the most important elements of analysis, having

powerfully imposed themselves, through the new media and other forms of participation, in the social arena. The changes in society put Collective Behavior at the center of the analysis, even replacing institutions, which are relegated to a specific position.

Never before have Collective Behaviors been as fascinating, dynamic social phenomena as they are today.

Cross-References

- ▶ [Empathy](#)
- ▶ [Emotion](#)
- ▶ [Popular Culture and the Mass Media, Sociology of](#)
- ▶ [Ritual](#)
- ▶ [Social Psychology](#)
- ▶ [Violence](#)

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Collective Interests

► Collective Behavior

Colonization

► Latino Studies

Combinatorial Explosion

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A combinatorial explosion is a condition where the numbers involved in a problem rapidly increase until they are either unmanageable or cannot be computed within our lifetimes.

For example, suppose that we have a team of n members, and we want to find the total number of possible meetings that can be held, assuming that we need two or more members to hold a meeting. For example, if there are 3 members in the team, only 4 types of meetings can occur; however, for 5 members, the number increases rapidly to 1013, and it is actually about 11 million billion or 11 quadrillion possible types of meetings among a team with 50 members.

Combinatorics

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Combinatorics is a subdiscipline of mathematics. Basic topics in combinatorics are permutations and combinations.

A permutation of a collection of items is a listing of the items in one possible order. For example, consider a team of three students named Cindy, Allen, and Betty. The number of permutations of this collection is $3! = 3 \times 2 \times 1 = 6$. In other words, there are three ways to select the first name; two ways to select the second name, and then only one name remains. The general formula is $n! = n \times (n-1) \times (n-2) \times \dots \times 3 \times 2 \times 1$.

A combination is a collection of items where order does not matter. For example, suppose a student team consists of the same three people named above. The number of meetings that a team can hold, where a meeting must have at least two members attending, is ${}_3C_3 + {}_3C_2$ or $1 + 3 = 4$ meetings. In other words, there are two kinds of meetings: 1) everyone attends and 2) two people attend, that is, one person is not present.

The general formula for a combination follows:

$${}_nC_k = n!/[k!(n-k)!].$$

Commodification of Religion

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Commodification of religion refers to religious symbols becoming commodities, objects of consumption readily available in the “supermarket of religion,” in economic life, and the media landscape. It is a process of recontextualization of religious symbols, language, and ideas from their original religious context to the media and consumer culture. In this process, religious symbols become commodities, objects of consumption readily available in the “supermarket of religion” and the media landscape. The commodification of religion works on several levels. The two most obvious are the (often commercial) offers of blessings, prayers, etc.,

through the purchase of religious artifacts, books, figures, etc. The second important – and obvious – level is the attachment of religious values through a religious aesthetic to consumer products. Often, the commodification of religion is related to a loss of power to shape religious practices.

Communication

► [Speech](#)

Communities

► [Ecological Psychology](#)

Comparative Neuroscience

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Description

Comparative Neuroscience studies the nervous and sensory systems of animals widely differing in regard to their position in the phylogenetic system and ranging from those at the basis of metazoan evolution (coelenterates) to those most highly developed (vertebrates) (Bullock and Horridge 1965). Taking evolution for granted, *Comparative Neuroscience* is interested in the structures and general principles underlying nervous processes and functions throughout the animal kingdom (Kandel et al. 2012). It is likewise interested in the particularities and diversity of animal species and taxa adapted to vastly differing life styles and habitats.

Comparative Neuroscience is devoted to basic research and has always been a domain of

zoology. Most basic mechanisms and structures at work in nervous systems have been first described in invertebrate and lower vertebrate animals like earthworms, squids, snails, horse-shoe crabs, crayfish, and rays. Considering the limitations of experimental work on humans, the medical neurosciences (neurology) have always had an interest in animal work as well (FENS).

Modern *Comparative Neuroscience* has amply shown that there is a wealth of fascinating adaptations of animal nervous and sensory systems to their specific needs. These often are very different from our human needs. On the other hand, it also has been learned that the same basic principles have been at work since early evolutionary times and that brain functions, previously associated with the human brain only, do have parallels and precursors even in the so-called lower animals (Prete 2004).

A particular feature of *Comparative Neuroscience* like that of the Neurosciences in general is its openness for other disciplines such as genetics, informatics, physics, mathematics, chemistry, engineering, psychology, and others which has been a major source of its success and is also evident from its diversification into numerous subdisciplines.

Self-Identification

Comparative Neuroscience is part of the natural sciences, applying a rigorous experimental approach to test the validity of hypotheses and their likelihood of being correct or wrong. Its subdisciplines differ in regard to the methods/technologies they apply. These include neuroanatomy, neuroethology, neurogenetics, cytochemistry, electrophysiology, mathematical modeling, and others. Clearly, *Comparative Neuroscience* is not a religion.

Characteristics

Comparative Neuroscience has a basic interest in the diversity and in the adaptations of nervous and sensory systems of particular animals and

animal groups living in different habitats and showing different behavior and lifestyle. Obviously, then, it is closely related and associated with zoology. Apart from its interest in the diversity per se, *Comparative Neuroscience* uses its knowledge of this diversity in search of overarching principles ([Journal of Comparative Neurology](#); [Journal of Comparative Physiology A](#)).

Relevance to Science and Religion

The discourse between “Science” and “Religion” has been dominated on the religion/humanities side by the belief in an explicitly unique position of man in nature. Along these lines of thought the insistence on the uniqueness of the properties of the human brain has been prevailing. While the human brain indeed is likely to be the most complex of all brains, modern *Comparative Neuroscience* has amply demonstrated that so-called simple central nervous systems are capable of amazingly complex operations and there are justified doubts as to whether there are really any unique features of the human brain not found (not even in a more simple form) in animals. A huge amount of evidence has accumulated demonstrating how far even small-brained animals like flies and bees or a cephalopod mollusk are from being simple reflex machines and showing that their sensory and nervous systems represent their worlds in a surprisingly complex and rich way. As a consequence *Comparative Neuroscience* strongly suggests the importance of a less anthropocentric attitude than hitherto often seen on the side of the humanities.

Sources of Authority

The most important sources of authority are internationally recognized, peer-reviewed scientific journals, books, and review articles summarizing previously published original results, which have gone through a process of rigorous evaluation by experts in the corresponding fields of specialization.

Ethical Principles

The ethical principles are those of any natural science. There are guidelines published by various agencies for proper scientific conduct mainly aiming toward the prevention of scientific fraud. Importantly, in *Comparative Neuroscience*, animal care is a serious issue and in many countries there are strict regulations regarding the use of animals for experiments.

Key Values

The key value is the gain of knowledge and understanding of structures and functions in nervous and sensory systems, their evolution, adaptability, and role in behavior. In view of the evolution of life and the many commonalities in all nervous systems, *Comparative Neuroscience* also contributes substantially to the understanding of the human nervous system and senses, to cognitive processes, and their pathologic conditions.

Conceptualization

Nature/World

These terms have been defined in many different ways. From the point of view of a natural science, the shortest definition is, the material world and its phenomena, or the natural physical world, including abiotic and biotic nature and of course man.

Human Being

Human beings are biological beings and the product of evolution like all other animals. Speech and abstract thinking are particularly well developed but not basically unique capacities of the human brain.

Life and Death

Life evolved from simple abiotic origins about three billions of years ago and now manifests itself in organisms as diverse as bacteria, plants, fungi, and animals (which include the

vertebrates, mammals, and man). Life follows the laws of physics and chemistry and depends on physical and chemical processes. It always has an important historical aspect to be considered (ontogenetic and phylogenetic development/evolution). The question what life is must be considered a metaphysical question and not within the scope of *Comparative Neuroscience*. Like other biological disciplines *Comparative Neuroscience* studies the structure of living organisms and what they do, how they do it, and what the prerequisites and conditions for their existence are. Death is the cessation of the functions typical of living organisms (acquisition and assimilation of energy, metabolism, locomotion, etc.) and the recycling of the elements they are made of into a global ecological system. Death is a condition for the process of evolution.

Reality

Reality is the physical world around us including the rules governing it. *Comparative Neuroscience* as a subdiscipline of biology acknowledges the existence of a real world independent of our experience in which all life evolved and to which living organisms had to adapt in a way favoring fitness, which is their survival and reproduction.

Knowledge

Like in all other natural sciences, knowledge in *Comparative Neuroscience* is supposed to have an objective quality and be valid by virtue of the repeatability of experimental research results. Assuming that hypotheses can be disproved and falsified but never and entirely proved, much of the knowledge accumulated by science has to be considered preliminary and subject to change.

Truth

Truth is not a concept or subject in *Comparative Neuroscience* where facts and rules of reality are the main interest. Saying that something is true in *Comparative Neuroscience* would point to the agreement with fact and reality.

Perception

Perception and consciousness unfortunately have often been conflated. Modern research provided

evidence for access to knowledge without awareness. This finding asks for a revision of the assumption that perception and consciousness of perception are always inseparable. From the viewpoint of *Comparative Neuroscience*, information on the inside and outside world is a necessary condition for the existence of all living beings. Not surprisingly then we find sensory mechanisms of high refinement already in bacteria and unicellular protozoans, that is, in organisms without any neurons and nervous systems.

There is a rich diversity of sense organs and of sensory capabilities in the animal kingdom including many which are superior and alien to our own human experiences. Sense organs are often called the windows of the brain to the outside world. Likewise, they are the interfaces between an organism's environment and its behavior. However, these windows (and the processing/integration of the data provided by them) are all highly specialized, selective, and far from being fully transparent. Sensory systems rather provide the individual with information on small fractions of the physical world only, which are the biologically relevant ones (serving fitness). Man is no exception to this. Our brain is actively involved in constructing perceptions not only on the basis of actual sensory data but also on the basis of inherited concepts like time and space (constructed during developmental stages), individual experience, memory, attention, intentions, etc., to which consciousness and introspection have no access. In other words, what is perceived is not raw sensory data but abstractions from these.

The sensory worlds of animals and man are highly filtered and species-specific "biological" worlds. Clearly, a particular feature of humans is their ability to enormously expand their sensory range by the development and application of sophisticated instruments and scientific inquiry.

Time

The concept of time is most important in biology and thus also in *Comparative Neuroscience*. Living organisms are never static but characterized by their dynamics – by a permanent change

through time from individual development (ontogeny), adolescence, adulthood, aging, and death. Likewise, evolution cannot be thought without the time axis.

From a more neuroscientific point of view, time is of prime importance in the way information is handled by neurons and nervous systems. One example is the modulation of nervous signal (action potential) frequency serving as an ubiquitous code in all nervous systems. Another example is the temporal synchronization of the oscillatory activity of spatially separated assemblies of neurons in the mammalian brain and its assumed involvement in the coordination needed for higher cognitive functions. Memory as a road into the past (both conscious and unconscious), imprinting and action plans as a prospect of the future are central issues in the neurosciences as well and intrinsically a function of time.

Consciousness

See also under “[Perception](#).” Consciousness is a concept not well/fully understood in terms of *Comparative Neuroscience* and not even in terms of research on the human brain and of psychology. Its function is not clear yet. We are not aware of most operations of the brain and central nervous system. This not only refers to the simple and automatic operations but also to complex cognitive operations. Unconscious perception is a topic receiving increasing attention.

Rationality/Reason

Rationality and reason are foundations of the natural sciences and thus of *Comparative Neuroscience* as well. The most important tool on which rationality and the increase and understanding are based in the natural sciences is the experiment.

Mystery

Mystery refers to something secret or unexplainable and beyond the reach of human comprehension. In *Comparative Neuroscience*, there is a lot still to be explained. However, this is not equivalent to saying that there are mysteries which are unsolvable in principle and will not be explainable in a rational, reasonable, and

logically valid way forever. Like all science, *Comparative Neuroscience* has turned lots of “mysteries” into marvels. The question of how minds with deep insights into the nature of matter and life and abstract mathematics could evolve from lifeless and mindless beginnings will still keep *Comparative Neuroscience* busy for a long time to come.

Relevant Themes

Comparative Neuroscience has revealed many achievements of animal brains hitherto attributed to humans exclusively. For the Science-Religion debate it seems appropriate to look upon mankind as one among many parts forming a complexly ordered world where a less anthropocentric, more rational, systems-oriented attitude in regard to what we are and are entitled to do is more appropriate than naïve and devastating arrogance.

Cross-References

- ▶ [Anthropomorphism](#)
- ▶ [Bioinformatics, Computational](#)
- ▶ [Cognitive Neuroscience](#)
- ▶ [Consciousness](#)
- ▶ [Evolution](#)
- ▶ [Neuroethology](#)
- ▶ [Neuroscience](#)
- ▶ [Perception](#)

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Comparisons

- [Cross-Cultural Psychology](#)

Compatibilism and Incompatibilism

- [Determinism and Indeterminism](#)

Competitive Coherence

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Biological systems on all scales are confronted with the challenge of obtaining a future state that is coherent with environmental conditions and with previous states. These states are created by the active functioning of a set of constituents of the system. This *active* set is selected from the larger set available to the system. Many social organizations are constrained by the need to reconcile coherence with their present environment and coherence with their past environments. To grow and survive, research laboratories, for example, have to select an active set of workers in response to new discoveries and to new funding initiatives but must reconcile this selection with the research history of the laboratory and, in particular, with its skills, experience, and interests. To grow and survive, bacteria must also select an active set of macromolecules in response to external and internal conditions. Such responses entail both the generation of a coherent cell state, in which the cell's contents

work together efficiently and harmoniously, and the generation of a coherent sequence of cell states. Contradiction and incoherence are punished since a cell that simultaneously induces the expression of genes for growth at high temperature and at low temperature is likely to be out-competed by rival cells that induce each set of genes only when needed. A cell that proceeded from one cell state to another very different one (without good environmental reason) would be wasting precious resources. A strong selective pressure, therefore, exists to generate active sets of constituents to provide both coherent cell states and a coherent sequence of such states. We have proposed that *competitive coherence* is responsible for generating these active sets (Norris and Norris 1998). This concept is based on the way a system must maintain both the continuity of the composition of its active set via a *Next* process and the coherence of this active set (with respect to the inside and outside world) via a *Now* process. In one *in silico* implementation of this concept, the state of a system at time $n + 1$ is determined by a competition between the Next process, which is based on its state at time n , and the Now process, which is based on the developing $n + 1$ state itself (Norris et al. 2012). In the case of amateur football, consider the problem of selecting the team (the active set) each week from a larger group of potential players. A Next process might be the tendency for someone who plays this week to be someone who plays next week (it is, for example, easier to arrange shared travel with those already present). A Now process might be the coherence of the team with respect to itself (the team must have a goalkeeper, defenders, and attackers) and with respect to its opponents (who might be particularly brutal). As the new team is being chosen, the Next process gives way in importance to the Now process. *Competitive coherence* also operates at the higher level of the football league itself: a Next process results in teams that are in the league in one season being likely to be in it the next season, while a Now process results in a coherent league with teams of the same level dispersed over a certain geographical region.

In the case of bacterial organization, competitive coherence selects a particular *hyperstructure* (Norris et al. 1999) within a bacterium (such hyperstructures include multi-macromolecule assemblies responsible for ribosome synthesis, chemotaxis, sugar metabolism, etc.); a Next process allows those genes that are already expressed as part of a hyperstructure to help determine which genes are expressed next in a hyperstructure; a Now process then allows those genes that are starting to be expressed together in a hyperstructure to recruit related genes to the hyperstructure. *Competitive coherence* also operates at the higher level of the bacterial cell itself such that the state of a cell at any one time corresponds to the set of hyperstructures present within it. A new cell state is the result of (1) a Next process whereby the current active set of hyperstructures in the cell determines the next active set and (2) a Now process whereby the developing set of hyperstructures progressively recruits, maintains, or dismisses hyperstructures. Competition between these two processes ensures a sequence of sets of hyperstructures (cell states) that optimize growth and/or survival.

Emergent properties resist attempts to predict or deduce them (Van Regenmortel 2004). In the framework of *competitive coherence*, emergence is related to the selection of the subset of constituents that are active together (Norris et al. 2005). Suppose each constituent has a large number of characteristics (as in the case of macromolecules, such as mRNA and proteins, which contain a large number of sites that can bind water, ions, molecules, and other macromolecules). As proteins are being chosen via competitive coherence to work together, suppose that the first ones to be chosen just happen to contain a binding site to the same molecule. Suppose that, in some environments, this combination of proteins proves useful. Suppose too that this molecule becomes available, perhaps for the first time. The presence of this binding site could then become an important factor in the coherence process which dominates the choice of the rest of the proteins to work together in the active set. In other words, the environment acts via the coherence process to lend importance to one out of many sites.

The result is the selection of this site (plus the molecule that binds to it) as a determinant of the cell's response to a particular environment. More specifically, consider, for example, that (1) this binding site is for a particular phospholipid with long, saturated acyl chains and (2) the proteins with this site bind to the phospholipid to form a domain in which they are juxtaposed and in which their activities complement one another. There might then be a selection for this binding site in other complementary proteins. In the language of *competitive coherence*, binding to this phospholipid would become a type of connectivity to determine membership of an active set, and this active set would take on the physical form of a proteolipid domain responsible for a particular function. Hence, emergence in the context of *competitive coherence* can be understood in terms of a new criterion for membership of the active set.

Competitive coherence is a scale-free concept that is thought to operate at levels ranging from macromolecular assemblies to social groups. The nature of the Next and Now processes varies with the level. At the level of bacteria, these processes take the form of site-binding, DNA supercoiling, transcription factors, ion condensation, etc. At the level of human groups, these processes include the *mafia* and *status quo* pressures that are familiar to us all. Could *competitive coherence* operate at higher levels still? And if it were to operate, what form would the Now and Next processes take and what would be the consequences? One exotic candidate is subjective experience, the role of which remains controversial. A role for subjective experience in Now and Next processes at the level of ecosystems might be of general interest. Indeed, such a role would underpin speculations that our world itself is "conscious" (Norris 1998).

Cross-References

- [Artificial Intelligence, General](#)
- [Biological Hierarchies](#)
- [Biology, Theoretical](#)
- [Brains, Artificial and Computational](#)

- [Cognitive Psychology](#)
- [Competitive Coherence](#)
- [Complex Systems](#)
- [Computational Memories](#)
- [Computer Science in Human Learning](#)
- [Conditioning and Learning](#)
- [Emergence, Theories of](#)
- [Hyperstructures](#)

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Completeness

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Gödel completeness theorem claims that formal deduction in first-order logic coincides with semantic consequence. It may be taken as proving the purely analytical character of (first-order) universal truths and the possibility of reaching them in a purely mechanical way. It bears also on the existence of non-self contradictory objects. Its original form says that the formal consistency of a (countable) first-order theory

grants the existence of a (countable) mathematical structure realizing whatever the theory describes. Actual completeness and other key model theoretical properties of first-order logic like compactness, and the Löwenheim-Skolem theorem (shown originally by Löwenheim 1915) follow immediately. Uncountable versions of these results were obtained independently by A. Malcev (1941), A. Robinson (1948), and L. Henkin (1949). Their fruitfulness and the fact that these results failed for higher-order logics determined the primacy of first-order logic in further development of the model theory.

Complex Systems

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Related Terms

[Computer science](#); [Dynamical system](#)

A *dynamical system* is characterized by its *elements* and the *time-depending* development of their *states*. A dynamical system is called *complex* if many (more than two) elements interact in causal feedback loops generating unstable states, chaos, or other kinds of attractors. The states can refer to moving planets, molecules in a gas, gene expressions of proteins in cells, excitation of neurons in a neural net, nutrition of populations in an ecological system, or products in a market system (Mainzer 2007). The *dynamics* of a system, that is, the change of system states depending on time, is mathematically described, for example, by *differential equations*. A *conservative* (Hamiltonian) system, for example, an ideal pendulum, is determined by the reversibility of time direction and conservation of energy. *Dissipative systems*, for example, a real pendulum with friction, are irreversible.

In classical physics, the dynamics of a system is considered a *continuous process*.

But, continuity is only a mathematical idealization. Actually, a scientist has single observations or measurements at discrete-time points, which are chosen equidistant or defined by other measurement devices. In discrete processes, there are finite differences between the measured states and no infinitely small differences (differentials) which are assumed in a continuous process. Thus, discrete processes are mathematically described by *difference equations* or data given in *time series*.

Random events (e.g., Brownian motion in a fluid, mutation in evolution, innovations in economy) are represented by additional *fluctuation terms*. *Classical stochastic processes*, for example, the billions of unknown molecular states in a fluid, are defined by time-depending differential equations with distribution functions of probabilistic states (Scott 2005). In *quantum systems* of elementary particles, the dynamics of quantum states is defined by Schrödinger's equation with observables (e.g., position and momentum of a particle) depending on *Heisenberg's principle of uncertainty*, which allows only *probabilistic forecasts* of future states.

Historically, during the centuries of classical physics, the universe was considered a deterministic and conservative system. The astronomer and mathematician P.S. Laplace (1814), for example, assumed the total computability and predictability of nature if all natural laws and initial states of celestial bodies are well known. The *Laplacean spirit* expressed the belief of philosophers in determinism and computability of the world during the eighteenth and nineteenth centuries.

Laplace was right about *linear* and *conservative dynamical systems*. In general, a *linear relation* means that the rate of change in a system is proportional to its cause: Small changes cause small effects while large changes cause large effects. Changes of a dynamical system can be modeled in one dimension by changing values of a time-depending quantity along the time axis (*time series*). Mathematically, linear equations are completely computable. This is the deeper reason for Laplace's philosophical

assumption to be right for linear and conservative systems.

In systems theory, the *complete information* about a dynamical system at a certain time is determined by its *state* at that time. The state of a complex system is usually determined by more than two quantities. Then, a higher dimensional phase space is needed to study the dynamics of a system. The *phase space* of a system contains the *complete information of its past, present, and future behavior from all initial conditions*. From a methodological point of view, time series and phase spaces are important instruments to study systems dynamics. At the end of the nineteenth century, H. Poincaré (1892) discovered that celestial mechanics is not a completely computable clockwork, even if it is considered as a deterministic and conservative system. The mutual gravitational interactions of more than two celestial bodies ("Many-bodies-problem") can be represented by causal feedback loops corresponding to *nonlinear* and *non-integrable equations* with *instabilities* and *irregularities*. In a strict dynamical sense, the *degree of complexity* depends on the *degree of nonlinearity* of a dynamical system (Mainzer 2005). According to the Laplacean view, similar causes effectively determine similar effects. Thus, in the phase space, trajectories that start close to each other also remain close to each other during time evolution. By contrast, dynamical systems with *deterministic chaos* exhibit an exponential dependence on initial conditions for bounded orbits: the separation of trajectories with close initial states may increase exponentially.

Thus, tiny deviations of initial data may lead to exponentially increasing computational efforts for future data *limiting long-term predictions*, although the dynamics is in principle uniquely determined. This is known as the "*butterfly effect*": initial, small, and local causes may soon lead to unpredictable, large, and global effects. According to the famous *KAM-Theorem* of A.N. Kolmogorov (1954), V.I. Arnold (1963), and J. K. Moser (1967), trajectories in the phase space of classical mechanics are neither completely regular, nor completely irregular,

but depend sensitively on the chosen initial conditions.

Dynamical systems can be *classified* on the basis of the effects of the dynamics on a region of the phase space (Haken 1993). A *conservative system* is defined by the fact that, during time evolution, the volume of a region remains *constant*, although its shape may be transformed. In a *dissipative system*, dynamics causes a *volume contraction*.

An *attractor* is a region of a phase space into which all trajectories departing from a certain set of initial conditions, the so-called *basin of attraction*, will converge. There are different kinds of attractors. The simplest class of attractors contains the *fixed points*. In this case, all trajectories of adjacent regions converge to a point unchanged by the dynamics of the system. An example is a dissipative harmonic oscillator with friction: the oscillating system is gradually slowed down by frictional forces and finally come to a rest at an equilibrium point.

Conservative harmonic oscillators without friction belong to the second class of attractors with *limit cycles*, which can be classified as being periodic or quasiperiodic. A *periodic orbit* is a closed trajectory into which all trajectories departing from an adjacent region converge. For some simple dynamical system with only two degrees of freedom and continuous time, the only possible attractors are fixed points or periodic limit cycles. An example is a Van der Pol oscillator modeling a simple vacuum tube oscillator circuit.

In continuous systems with a phase space of dimension $n > 2$, more complex attractors are possible. Dynamical systems with *quasiperiodic limit cycles* show a time evolution, which can be decomposed into different periodic parts without a unique periodic regime. The corresponding time series consist of periodic parts of oscillation without a common structure. Nevertheless, closely starting trajectories remain close to each other during time evolution. The third class contains dynamical systems with *chaotic attractors* which are *non-periodic*, with an *exponential dependence on initial conditions* for *bounded*

orbits. A famous example is the chaotic attractor of a Lorenz system simulating the chaotic development of weather caused by local events, which cannot be forecast in the long run (*butterfly effect*).

Measurements are often contaminated by unwanted noise that must be separated from the signals of specific interest. Further on, in order to forecast the behavior of a system, the development of its future states must be reconstructed in a corresponding phase space from a finite sequence of measurements. Thus, *time series analysis* is an immense challenge in different fields of research from, for example, climatic data in meteorology, ECG-signals in cardiology, and EEG-data in brain research to economic data of economics and finance. Beyond the patterns of dynamical attractors, *randomness* of data must be classified by statistical distribution functions (Nakamura 1997).

Typical phenomena of our world, such as weather, climate, the economy, and daily life, are much too complex for a simple deterministic description to exist. Even if there is no doubt about the deterministic evolution of, for example, the atmosphere, the current state whose knowledge would be needed for a deterministic prediction, contains too many variables in order to be measurable with sufficient accuracy. Hence, our knowledge does not usually suffice for a deterministic model. Instead, very often a *stochastic approach* is more situated. Ignoring the unobservable details of a complex system, we accept a lack of knowledge. Depending on the unobserved details, the observable part may evolve in different ways. However, if we assume a given probability distribution for the unobserved details, then the different evolutions of the observables also appear with specific probabilities. Thus, the lack of knowledge about the system prevents us from deterministic predictions, but allows us to assign probabilities to the different possible future states. It is the task of a time series analysis to extract the necessary information from past data.

Complex models contain nonlinear feedback, and the solutions to these are usually obtained by

numerical methods. *Statistical complex models* are data driven and try to fit a given set of data using various distribution functions. There are also hybrids, coupling dynamic and statistical aspects, including deterministic and stochastic elements. *Simulations* are often based on computer programs, connecting input and output in nonlinear ways. In this case, models are calibrated by training the programs, in order to minimize the error between output and given test data.

In the simplest case of statistical distribution functions, a Gaussian distribution has exponential tails situated symmetrically to the far left and right of the peak value. *Extreme events* (e.g., disasters, pandemics, floods) occur in the tails of the probability distributions. Contrary to the Gaussian distribution, probabilistic functions $p(x)$ of heavy tails with extreme fluctuations are mathematically characterized by *power laws*, for example, $p(x) \sim x^{-\alpha}$ with $\alpha > 0$. Power laws possess scale invariance corresponding to the (at least statistical) *self-similarity* of their time series of data (Mandelbrot 1997). Mathematically, this property can be expressed as $p(bx) = b^{-\alpha}p(x)$ meaning that the change of variable x to bx results in a scaling factor independent of x while the shape of distribution p is conserved. So, power laws represent *scale-free complex systems*. The Gutenberg-Richter size distribution of earthquakes is a typical example of natural sciences. Historically, Pareto's distribution law of wealth was the first power law in the social sciences with a fraction of people presumably several times wealthier than the mass of a nation.

Cross-References

- [Algorithms, Computer](#)
- [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)
- [Emergence, Theories of](#)
- [Mathematics, Modern](#)
- [Quantum Theory](#)

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Computational Biology

- [Bioinformatics, Computational](#)

Computational Chemistry

- [Molecular Modeling](#)
- [Quantum Chemistry](#)

Computational Complexity

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Related Terms

[Algorithmic complexity](#); [Program complexity](#)

Computational complexity theory is a subdiscipline of computer science and mathematics that tries to classify computational problems and mathematical problems according to their difficulty. In this context, a computational

problem or mathematical problem is understood to be a task that could be amenable to being solved by a computer (which means that the problem can be stated by a set of mathematical instructions).

Cross-References

► [Algorithms, Computer](#)

Computational Memories

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Related Terms

[Biologically based computers](#); [Computer memories](#); [Electronic memories](#); [Magnetic storage](#)

Description

A computational memory is any device that allows for storage of data for later retrieval. Flash disks are common examples today. Like its counterparts in biology, the quality of a memory is measured by its capacity (how much data it holds), speed (how quickly data is recalled), reliability (how long data is retrieved with a consistent result), and meaningfulness (the correctness or relevance of retrieved information.)

Memory is frequently assumed to be equivalent with random access memory (RAM) in modern computers. However, memories definition more properly includes RAM as well as CDROMs, DVDs, floppy disks, USB drives, ZIP Drives, hard disks, and other types of conventional storage. That said, the definition of memory is also broad enough to include storage devices as simple as an abacus which uses beads to store information. In the past 50 years, computer systems have moved from ferromagnetic

cores (1940s), to tape drives (1950s–1970s), to magnetic disks (1980s), to optical disks (1990s), to ► [artificial neural networks](#) (1990s–2000s).

The most recent developments have been the exploration of information retrieval from memories conceived and implemented in entirely different ways. Hopfield memories, which are specialized artificial neural networks focused on pattern recognition and memory (Hopfield 1982) exhibit retrieval and error-correcting capabilities resembling characteristics of human memory and suggesting a plausible explanation of how these characteristics might be working inside the human brain. Associative memories and Baum memories further model human memory recall by using synthetic Deoxyribonucleic Acid (DNA) to implement associative recall akin to recall in human memory. The motivation for DNA is the real feasibility of creating a computational memory which simultaneously stores and processes data. Such computational memories are believed capable of solving problems considered extraordinarily difficult using conventional solutions which separate data storage and data processing. Computational memories were demonstrated by Adleman (1994) when he used DNA to solve the Hamiltonian path problem using DNA as both processors and storage. As a result of his work, it was believed that computational memories could be used to solve even routine tasks easily. The application of DNA as a computational memory for routine tasks has since shifted toward the use of DNA for special-purpose nanodevices for specific applications. Both the original and new visions still require memory systems for DNA computers capable of either sophisticated processing capabilities, such as self-assembly of DNA into useful molecular structures (Seeman 1999; Winfree et al. 1998), or capable of storing, in principle, large amounts of data (order of terabytes) for information retrieval (Baum 1995). Neel (2007) explored the issues and ultimately demonstrated a process for semantic retrieval from memories with speeds, reliability, and scalability exceeding the best conventional counterparts of the time.

Self-identification

Science

The science of computational memories is the study of how to build devices that store data for later retrieval, how to store data, and how to later retrieve that data in some useful and effective way. This discipline uses scientific methods to study every aspect and example of storage and retrieval available to us. For example, artificial neural networks have shown how the brain encodes information in the networks of relatively simply but massively parallel neuron-like units for later recognition and retrieval in a content-addressable way. Likewise, DNA is a natural memory that can be used to build a human body by decoding instructions stored in base chemical chains into complex mechanical, computational, and chemical systems. In the same way, memory technologies developed for stand-alone computers have been studied to help understand how large distributed computer systems could be built. These studies have led to new ways of thinking about text searches, image matching, automated question-answering, and other problems. They have also enabled us to amass an immeasurable amount of data in a highly distributed system called the Internet for recall from anywhere in the world.

Characteristics

The study of memories is unique because it frequently interfaces with a broad range of other disciplines before tying the result of that study into advancements in memory systems. For example, today's computer systems require electrical engineers to build the computer circuits for a random access memory or hard drive. These same memories require specialists to determine the best materials to use in each part. Again, these same systems require advanced mathematics to help detect errors, to identify the fastest method of memory recall, and to catalog massive amounts of data. Library scientists study methods of keeping records of the data stored in memories. Linguists and language specialists are necessary

to determine how to get the most useful information from massive data stores. Beyond the conventional computer, medical doctors, neurologists, psychologists, and chemists may get involved in understanding how the human brain works to recall data and transform it into information. Chemists and biologists must participate to help understand how the DNA stores and retrieves information to form a human body. Computer scientist must take ideas and models from each discipline to glue them together in ways that improve computer memories. Therefore, computer scientists very uniquely support other fields in producing new results while simultaneously consuming much of the product of that work.

Relevance to Science and Religion

Scholarly areas of science and religion study their particular discipline in order to produce new data and new information. Many of these disciplines have centuries of work behind them. Consequently, each discipline is in urgent need of memories capable of storing the full suite of data for that discipline and enabling quality retrieval and analyses of that data when properly queried. The use of computer memory in just the past 50 years alone have enabled incredible advancements in many existing fields and have even enabled new fields (such as bioinformatics, social computing, eCommerce) by allowing data to be stored for later and widespread use.

Sources of Authority

The primary authorities in computational memories are archives of scientific reports (proceedings and journal articles, technical conferences) describing and analyzing them in the scientific literature. Such papers are rigorously studied, challenged, and cross-validated by peer experts, and ultimately replicated if they do hold advancements over existing solutions, before they are accepted as valid, implemented, and/or taught in a scholarly setting.

Ethical Principles

The general ethical principles are those standards in science. They include giving credit where it is due, respect for others' intellectual property, while advancing the well-being of individuals and society at large. Because advances by the discipline usually make possible actions by humans that were previously impossible (e.g., the accumulation of information about millions of people under the control of a few individuals in social website repositories or genomic databanks), it has been necessary to develop what some consider a unique type of ethics studies, so-called cyber-ethics (see ► [Cyberethics](#)). Many important ethical notions (such as privacy, intellectual property, digital identity, and legal regulations) are being transformed as a result.

Key Values

The key values are speed, reliability, capacity, data density, and meaningful results in memory systems.

Conceptualization

Nature/World

The world is the sum of data and the devices that store the data (sometimes called cyberspace, the Internet, the web, etc.).

Human Being

In the world of memories, human beings are actors that bring life and death to the world by creating data, consuming or interacting with data through using it applications, tools, appliances, instruments, etc., and destroying data by removing it from the world. In addition to flesh-and-blood homo sapiens, robots, household appliances, and software should also be considered "actors". The semantic web is a good example of a memory (world) where information is frequently created or destroyed by the flesh-and-blood actors in the form of news, web

content, music, pictures, etc., and stored in vast quantity for later intelligent retrieval with the expectation of reliable and human-relevant recall from the memory. Data is increasingly consumed by a wider variety of actors such as robots, household appliances, and special purpose. These machines are endowed with some degree of intelligence and are capable of assisting humans in performing tasks or substituting for humans for some tasks while maintaining similar results (e.g., IBM's *Watson* and *DeepBlue*). Deep Blue is a supercomputer constructed by IBM to play the game of chess by comparing the moves of the opponent, the current state of the game, and a very large memory, sufficiently well to compete with the best human chess players.

Life and Death

In the world of "memory", the life of data begins when the data is created or introduced into the memory and death occurs when it is removed from the memory. Although the concepts of life and death of data do not appear to be related to the ordinary meaning of the terms, data within a memory can represent a living person. Therefore, a tight interconnection may be assumed to exist between the referent of the data (e.g., a person) and its data. Therefore, the data may indicate that a person is not legal deceased until well after the person has physically expired. Further, the data about a deceased person can live well beyond the person.

Reality

The reality of a memory system amounts to the set of data stored and the information that can be retrieved from the memory. Reality, thus, excludes data that is actually stored but cannot be retrieved and data that is stored with errors. Consequently, "reality" is defined strictly by the accessible data whether true or complete. For example, cyberspace is an online memory in which an individual can assume a number of personalities, or can present himself to be a very different person than he or she is in the physical world by simply creating or altering data in the memory.

Knowledge

Knowledge is the new information that can be learned by studying or mining the data stored in a computer's memory. It may also refer to the technical knowledge necessary to build computational memory systems, including computational models, analyses, manufacturing protocols, and quality control.

Truth

Truth is the data actually stored inside the memory. Therefore, it may or may not be complete or correspond to any facts in the real world.

Perception

Data is often represented differently in memories than how humans consume it. Perception is, therefore, the conversion of information from how it is stored in memory to a consumable format. This perception (of a famous person, for example) may thus be quite different from that obtained by actual interaction with the reference (the actual person) in the data.

Time

Time is generally limited to the moment of creation, the last modification, or the time of deletion of the data within the memory. The measure of time is usually taken from a computer system's internal clock. This clock is digital (i.e., only records discrete time events) and may or may not be accurate enough to the human notion of time.

Consciousness

Computational memories do not usually appear to be capable of consciousness in the way humans do. However, some may argue that some computational memories may exhibit some characteristics of consciousness (e.g., when purchasing an airline ticket, the system may inquire about a car or a hotel reservation in the semantic web). Thus, the "consciousness" of a computational memory is probably best thought of as the means (programs and software) by which the memory decides what data is best to retrieve and in what order it should be retrieved. Alternatively, some in the field use the term "consciousness" as a

measure of quality in order to better understand the capabilities of some computational memories by comparison of the memories to human capabilities.

Rationality/Reason

Rationality is the "why" behind the retrieval choices of memory systems. Thus, rationality in a machine ordinarily reflects the rationality placed in the computer memories by its designers and programmers. However, new generations of computer memories might be regarded as becoming increasingly "rational" because of their advanced capabilities to combine data from disparate sources, mine the resulting memory to extract correlations and feasible conclusions, and present results which are frequently far from evident, or even credible, to rational humans confronted with the result.

Relevant Themes

The key issues for memories today are data encoding, semantic (human-like) retrieval of information from memory, memory structures that make processing easier, and density of storage. As mentioned before, it is conceivable that computational memories may be produced in the near future that exhibit features that closely resemble human memories, and even exceed their capability. IBM's *Watson* is a pioneering example.

Cross-References

- [Biology, Theoretical](#)
- [Computer Science in Human Learning](#)
- [Intelligence](#)
- [Memory](#)
- [Semantics](#)

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programmers to decide which language to choose based on the type of program they are developing. Even though most programs are written in abstract human-readable languages, the code is still converted via a compiler or interpreter to a binary format that a computer can execute.

Computer Algorithms

- ▶ [Algorithms, Computer](#)

Computer Ethics

- ▶ [Cyberethics](#)

Computer Language

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Every modern computer is a binary system, and the very first computers were programmed directly in binary. However, binary is not intuitive for humans, and it can be very difficult and time consuming to write and debug. As a result, more abstract and human friendly computer languages were developed. The first of these languages was assembly, and it allowed a programmer to use character-based commands to program a computer. More languages were developed, and today a programmer has a wide array of languages to choose from. Each language has good and bad points, and it is up to the

Computer Memories

- ▶ [Computational Memories](#)

Computer Programs

- ▶ [Algorithms, Computer](#)

Computer Quantum

- ▶ [Quantum Computing](#)

Computer Science

- ▶ [Affective/emotional Computing](#)
- ▶ [Algorithms, computer](#)
- ▶ [Artificial Intelligence, General](#)
- ▶ [Automation, Electronic](#)
- ▶ [Brains, Artificial and Computational](#)
- ▶ [Complex Systems](#)
- ▶ [Computational Memories](#)
- ▶ [Computer Science in Human Learning](#)
- ▶ [Cyberethics](#)
- ▶ [Cyborgs](#)
- ▶ [Games, Computer](#)
- ▶ [Information Security](#)
- ▶ [Intelligence, Swarm](#)
- ▶ [Quantum Computing](#)
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- ▶ [Robotics and Religion](#)
- ▶ [Software Engineering](#)

Computer Science Education

► Computer Science in Human Learning

Computer Science in Human Learning

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Related Terms

Computer science; Computer science education

Description

Computer science (CS) education encompasses the teaching of computation from kindergarten through graduate school. To help prepare high school students who want to study computer science in college, many schools offer advanced placement (AP) courses in computer science. Students enrolled in these courses are then eligible to take corresponding exams offered by the Educational Testing Service (ETS). If their scores are high enough, universities may grant the students college credit for one or more courses. For example, the Computer Science A exam currently corresponds to a first-semester college course in object-oriented programming, where students learn problem-solving skills such as abstraction and ► [algorithm](#) development and are introduced to basic abstract data types. An abstract data type (ADT) is a built-in or userdefined type (kind of information) where the data has an associated collection of operations. Meanwhile, the Computer Science AB exam requires a knowledge of all the topics on the A exam plus a more advanced coverage of data structures (e.g., binary search trees, which require ► [recursion](#)). Although the AP College Board provides materials for computer science

courses, college enrollments in computer science saw drastic declines nationwide from 2002 through 2007. Even though this trend seems to be ending due to student interest in technology such as cell phones and iPods, the last year for the AB exam was in 2009.

Some of the recent changes in computer science education directly reflect declining enrollments. For example, because many middle- and high school students spend much of their leisure time playing computer games, several researchers developed curriculum materials targeting this interest. One of the most successful projects was the development of the software *Alice* (<http://www.alice.org>), which is offered freely by Carnegie Mellon University. *Alice*, which has been used in both high school and college settings, allows students to create 3D environments while learning ► [basic programming concepts](#). A more recent version called *Storytelling Alice* was designed especially for middle-school girls. Another notable tool for young students has been *AgentSheets* (<http://www.agentsheets.com>), which is best described as 2D game-authoring and simulation software. An interesting note about *AgentSheets* is that it has been used by middle-school students as well as NASA astronauts to build simulations. One of the most successful projects involving *AgentSheets* was Tri-P-LETS (Three P Learning Environment for Teachers and Students). In this project, funded by the National Science Foundation (NSF), the investigators and graduate students created curriculum modules to enhance the first- and second-year programming classes in public high schools in the Memphis area. A variety of simulations were assigned to students in order for the students to appreciate the breadth of the field and the types of courses that they would encounter if they selected CS as a major. For example, simulations were used to teach ► [combinatorics](#) (Sherrell et al. 2005), cellular automata (a theoretical computer where the world is represented as an infinite grid of cells. A cell has an associated state (alive or dead) and a set of rules associated with it), (Thomas et al. 2006), the hydrology life cycle, and DNA sequences. In addition, students followed an

adapted ► [waterfall model](#) with incremental coding and testing. Students were provided templates especially designed for *AgentSheets* projects in order to storyboard their simulation, record its requirements, document the logic, and track bugs (faults). Students were especially appreciative of the need for process when they designed large games and competed in the annual University of Memphis Programming Challenge, a competition where high school students work in teams for 6–7 weeks to develop an educational or adventure game.

There is an interesting, ongoing debate in computer science education concerning how one should teach the first programming course. In other words, should the instructor emphasize basic control structures and algorithm development or should he/she immediately introduce the concepts of a class and an object, which are required in object-oriented programming languages? The controversy reflects the two major pedagogical viewpoints known as objects-late versus objects-first. A popular objects-first approach appears in the textbooks authored by the creators of the interactive development environment BlueJ (<http://www.bluej.org>). However, some instructors prefer a declarative language (e.g., a functional programming language such as Scheme) or a scripting language as the first language.

Self-Identification

Science

This discipline/subdiscipline self-identifies itself as a science. Computer science educators make observations and collect data to better understand how students learn.

Characteristics

Computer science education differs from the other disciplines/subdisciplines in that it is relatively new. For example, the Association for Computing Machinery celebrated its 60th anniversary in 2007, and its associated journal

(*Communications of the ACM*) celebrated its 50th anniversary in 2008, whereas computer science education journals and associations are much younger.

Relevance to Science and Religion

For the majority of computer science educators, there is little interest in “science and religion.” However, for those teaching artificial intelligence, questions such as the following are of interest: How do mammals, insects, birds, and other members of the animal kingdom learn? Are there things about how animals learn that we can use to help us construct robots?

Sources of Authority

Conference and journal articles are the major sources of authority for this discipline/subdiscipline. The two most respected conferences for computer science education are sponsored by the Special Interest Group on Computer Science Education (SIGCSE) of the ACM. These conferences are *SIGCSE: Technical Symposium on Computer Science Education* and *ITiCSE: Innovations and Technology in Computer Science Education*.

Furthermore, the Computing Sciences Accreditation Board (CSAB) determines if existing undergraduate programs meet a set of standards. Even if CS departments do not seek accreditation, they may still refer to the CSAB standards to assess their programs. Another source of authority is *Computing Curricula*. The individuals who compose these guidelines for undergraduate programs are prominent individuals from industry and academia.

Ethical Principles

There are ten directives in the IEEE Code of Ethics (2006), whereas the ACM Code (1992) lists eight general imperatives. Those principles that are most similar are the following: Members

of these organizations should think of society and the public when making their decisions; be honest; not discriminate against people of other races, gender, disability, income, or age; and give credit to other individuals for their contributions.

Key Values

In both codes, specific professional responsibilities appear. By following these responsibilities, a member has accepted the values of the profession. An example value from the ACM Code is that members should strive to achieve the highest quality in their work. Note that the ACM Code lists eight professional values, six leadership values, and, finally, two imperatives that have to do with compliance to the code. Similar to the ACM imperatives, the last imperative of the IEEE Code states that members should support each other in following its established code of ethics.

Conceptualization

Nature/World

The nature of computer science education is to teach computational thinking (Wing 2006) to all human beings in the world.

Human Being

The discipline of computer science education considers a human being to be a member of the human race or, in other words, a person (living or dead). However, the discipline of artificial intelligence is interested in what determines a human being (see the answer to Question 4 above).

Life and Death

Life is the beginning of existence for members of the plant or animal kingdoms, whereas death is the ending of this existence. However, the discipline of software engineering considers the concept of life as the time that a software application is viable. In other words, the traditional software development “life” cycle begins with the vision

of a project through requirements, design, implementation, coding, postdelivery maintenance, and finally retirement (death). Testing and documentation are a part of each phase.

Reality

Reality refers to living or nonliving items that actually exist. Computer scientists are interested in “virtual reality” systems. These systems are simulations of imaginary worlds.

Knowledge

Knowledge is information gained through study and reasoning. This term appears in the names of two important subdisciplines of computer science education, namely, knowledge management and knowledge engineering.

Truth

Truth is a fact that has been proven or, in other words, the opposite of a falsehood. Computer science educators teach “truth” tables in the introductory computer science class to help students to reason logically.

Perception

Perception is an individual’s interpretation of a situation or a concept by the use of his/her senses. This term is also associated with the discipline of neural networks.

Time

Computer science educators define time in relation to the period measured in seconds, minutes, days, and so forth that an activity requires to be completed. They are especially interested in the “run-time” of various algorithms.

Consciousness

Consciousness is an awareness of a problem or concept. Artificial consciousness is a subdiscipline of artificial intelligence.

Rationality/Reason

Rationality is the ability to make a decision, whereas reason is the action of considering alternatives. Rationality is related to logic.

Mystery

Mystery is an occurrence or phenomenon with no logical explanation.

Relevant Themes

The IEEE Computer Society and the Association for Computing Machinery sponsored an interim report in December 2008 to the *Computing Curricula Report* of 2001. The 14 knowledge areas are still Discrete Structures, Human-Computer Interaction, Programming Fundamentals, Graphics and Visual Computing, Algorithms and Complexity, Intelligent Systems, Architecture and Organization, Information Management, Operating Systems, Social and Professional Issues, Net-Centric Computing, Software Engineering, Programming Languages, and Computational Science. Feedback from industry included the need for an increased emphasis in security, quality issues, software engineering principles and techniques, and the reengineering of large, undocumented code (ACM 2008).

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Computer Security

- Information Security

Computer Software

- Algorithms, Computer

Computerization

- Automation, Electronic

Computing Machinery

- Algorithms, Computer
- Automation, Electronic
- Electronic circuits in Computers

Computing Quantum

- Quantum Computing

Concentration

- Attention

Concept of God in Contemporary Philosophy of Religion

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According to some definitions, the phenomenon of ► religion is characterized by the belief that

there is a God or several gods. Belief in the existence of God or gods is, according to such definitions, the distinctive feature of religion. Such definitions underline the importance of the concept of God within the phenomena that we call religions. The concept of God plays a central role – perhaps *the* central role – within a religious tradition. Therefore, philosophers of religion take an interest in analyzing the concept of God and its use in different religious traditions.

What one understands to be a philosophical problem in relation to the concept of God partly depends on what philosophical tradition one belongs to. Philosophical reflection on the concept of God, engaged in by contemporary philosophers of religion, can be described in relation to the various philosophical traditions that influence this work since those traditions impact on the formulation of philosophical problems relating to the concept of God as well as on the philosophical analysis of them. Philosophers of religion working within different philosophical traditions discern different philosophical problems when reflecting on the concept of God and our different ways of using that concept. They do not always agree on what problems are genuine philosophical problems worth working on, nor do they always agree on what a fruitful approach to those problems might mean.

In this chapter, I will highlight the concept of God in contemporary philosophy of religion by focusing on how philosophers of religion within four different philosophical traditions use and analyze the concept of God in their philosophical work. The four philosophical traditions that I will focus on are discussed under the following headings: *Metaphysical Philosophy of Religion*, *Wittgensteinian Philosophy of Religion*, *Feminist Philosophy of Religion*, and *A Non-metaphysical Realist Approach to the Philosophy of Religion*. These four philosophical traditions are part of contemporary philosophy of religion relating to the analytical philosophical tradition. I choose to focus on the analytical tradition since it is normally in relation to this tradition that philosophical questions concerning religions and the sciences are posed and treated. Personally, I recommend the non-metaphysical realist

approach since this approach takes advantage of insights reached within the other three traditions as well as recent developments within the philosophy of science. However, many philosophers of religion still prefer to work within the tradition of metaphysical philosophy of religion.

Metaphysical Philosophy of Religion

According to *Filosoflexikonet*, an often-used Swedish dictionary of philosophical terminology, the term “metaphysical philosophy of religion” can denote the traditional form of philosophy of religion that devotes itself to a philosophical investigation into questions touching upon the existence and properties of God. Metaphysical philosophy of religion can relate to religion in a positive way or it can facilitate a critical evaluation of religion and religious belief in general (*Filosoflexikonet* 1988, p. 468).

When Philip Quinn defines philosophy of religion in *The Cambridge Dictionary of Philosophy*, he defines it as metaphysical philosophy of religion. Quinn writes that philosophy of religion is the subfield of philosophy devoted to the study of religious truth claims, primarily the most important of these claims, namely, the truth claims of the theistic traditions that concern the existence, nature, and activities of God. Quinn states that the focal point in philosophy of religion is what has been described by philosophers as the theistic concept of God. It is the coherence of this concept and the possible existence of an entity denoted by this concept that interests the philosopher of religion, he argues (Quinn 1995, p. 607).

Metaphysical philosophers of religion develop and analyze different arguments for or against God’s existence. These arguments almost exclusively concern the theistic traditions. It is mainly God as God is understood within Christianity, Judaism, and Islam that is of interest to the metaphysical philosopher of religion. Within these theistic traditions, God is, according to the metaphysical philosopher of religion, understood in a similar way. Within the theistic traditions, God is understood to possess certain great-making properties such as omnipotence,

omniscience, perfect goodness, and necessary existence. It is the task of the metaphysical philosopher of religion to investigate whether or not such a being may be believed to exist by analyzing arguments for or against God's existence.

Some metaphysical philosophers of religion are atheists. They maintain that there is no God and argue for this position. Other metaphysical philosophers of religion are believers belonging to some religious tradition, in most cases the Christian tradition. They argue for the existence of the God they believe in. Metaphysical philosophers of religion often relate to scientific research results when they argue for or against God's existence. For example, they may reflect on whether Darwinian evolutionary theory is incompatible with the belief in a creator God or if quantum mechanics can be used in order to show that it is likely that there is a creator God behind the Big Bang.

Metaphysical philosophers of religion understand the concept of God as referring to an object or entity that, if God exists, exists independently of us human beings in our common reality. Both sciences and religions make truth claims about the same reality, our common reality, according to the metaphysical philosopher of religion. This means that religious truth claims cannot be true unless they cohere with scientific truth claims known to be true. Therefore, one important task for the metaphysical philosopher of religion is to investigate whether religious truth claims made within a certain religious tradition can be said to be in accordance with present-day scientific research results.

One influential metaphysical philosopher of religion is Richard Swinburne (born in 1934). He explains the interest that the metaphysical philosopher of religion takes in the concept of God by stating that by "God" a theist understands something like a bodiless person who is eternal, free, all-powerful, all-knowing, perfectly good, the proper object of human worship and obedience, and the creator and sustainer of the universe (Swinburne 1993, p. 1). The metaphysical philosopher of religion investigates whether or not this understanding of God is coherent. Her interest in the coherence of the theistic concept of God is

related to her interest in questions concerning God's existence and nature. The metaphysical philosopher of religion maintains that if the theistic concept of God is not coherent, we know at least that a being such as the God described by the theist cannot exist. Either such a God does not exist or if God exists, God does not have all the properties ascribed to God by the theist.

This understanding of God's existence characterizes the interest that the metaphysical philosopher of religion takes in the coherence of the concept of God and in the possibility of arguing for or against God's existence by using present-day scientific research results. It also characterizes the approach that the metaphysical philosopher of religion takes to religious pluralism. If two different truth claims concerning God, made within two different religious traditions, disagree with each other, the metaphysical philosopher of religion concludes that both truth claims cannot be true. At least one of them has to be false.

This approach to religious pluralism suggests that questions concerning what religious tradition contains the correct truth claims will be in the foreground. The Christian God is described as the only God and as Trinitarian. This means, according to the metaphysical philosopher of religion, that if the Christian God exists, the Hindu goddess Kali cannot exist and the Muslim understanding of God as non-Trinitarian must be wrong.

The way in which the metaphysical philosopher of religion understands God's existence characterizes her understanding of and her work on the concept of God. Her understanding of God's existence can be described in relation to the ongoing debates on ► [realism](#) in the field. Metaphysical philosophy of religion often presupposes the philosophical position that Hilary Putnam names metaphysical realism, a position that I will return to when describing the non-metaphysical realist approach to the philosophy of religion.

Putnam describes metaphysical realism as comprising three central theses (Putnam 1981, p. 49). Firstly, the metaphysical realist presupposes that reality consists of some fixed totality of

mind-independent objects that constitutes reality-in-itself. She believes that there may be objects or states of affairs in reality-in-itself which we cannot experience or describe. Secondly, the metaphysical realist presupposes that we might imagine there to be only one true and complete description of reality. This is so because the metaphysical realist believes in a God's-eye point of view, an externalist perspective in relation to us humans and to our possibilities of experiencing, knowing, or stating what things are really like in reality-in-itself. Thirdly, the metaphysical realist thinks that we speak the truth insofar as our utterances correspond in some way to the states of affairs in reality-in-itself. Different metaphysical realists describe this correspondence in different ways, but what they all agree on is that it is entirely possible that we do not know, and cannot know, that a true utterance is in fact true. "The most important consequence of metaphysical realism," Putnam summarizes, "is that *truth* is supposed to be *radically non-epistemic*" (Putnam 1978, p. 125). The metaphysical realist presupposes that what is true is independent of our abilities to find out whether it is true. What is true is not, according to the metaphysical realist, determined by us, from an internal linguistic perspective, but rather by reality-in-itself, from an external perspective.

This metaphysical realist position is questioned by philosophers of religion working within philosophical traditions other than metaphysical philosophy of religion. I will, in turn, describe three such alternative traditions. Two of them are influential within contemporary philosophy of religion, and the third one is my own preferred approach.

Wittgensteinian Philosophy of Religion

Wittgensteinian philosophy of religion is inspired by Ludwig Wittgenstein's later philosophy. Wittgensteinian philosophers of religion believe that metaphysical philosophy of religion is an expression of a huge misunderstanding. Religious language and religious truth claims do not

work in the ways that the metaphysical philosopher of religion assumes that they work. Wittgensteinian philosophers of religion want to set us free from the misunderstandings on which they believe metaphysical philosophy of religion to be built. In doing so, they set a different philosophical agenda.

When John Hyman describes Wittgensteinianism in *A Companion to Philosophy of Religion*, he emphasizes that the philosophy of the later Wittgenstein is centered on the insight that the meaning of a word is its use in the language. Words can be used for an indefinitely broad and heterogeneous range of purposes. The task of philosophy is not, according to the later Wittgenstein, logical analysis but the description of what Wittgenstein names different *language games*. Since speech and writing are part and parcel of human activities which take place and have significance only in the context of what Wittgenstein names different *forms of life*, the question of what an expression in a language means can only be answered by considering it in its context and by asking how it is used. The philosopher's task is to describe our network of concepts, what Wittgenstein calls *grammar*, in order to free us from the misunderstandings concerning the use of our words that give rise to confusion and philosophical problems. The philosopher should remind us of what we already know by knowing the use of our language: the proper use of our words according to the grammar which rules the language game in question in a certain form of life (Hyman 1997, pp.153–156).

Wittgensteinian philosophers of religion describe the grammar ruling different language games in contexts that we understand as religious contexts, as religious forms of life. What this means is not obvious; therefore, Wittgensteinian philosophers of religion also have to explain and defend their Wittgensteinian approach. How do we draw the line between one form of life or one language game and another? Is Hindu faith one form of life or several forms of life? Can Christian prayer be understood as a language game or should we understand Christian thanksgiving as one language game and Christian

prayers for forgiveness as another language game? The answer that Wittgensteinian philosophers of religion tend to give to this kind of question is that how we draw the line depends on what confusion the philosopher tries to free us from. Sometimes we can do away with our confusion by understanding Christian prayer as a language game, and sometimes we understand Christian thanksgiving as one language game and Christian prayers for forgiveness as another language game.

One prominent Wittgensteinian philosopher of religion is D.Z. Phillips (1934–2006). He argues that metaphysical philosophy of religion is built on conceptual confusions. These misunderstandings give rise to metaphysics. They make us draw the mistaken conclusion that religious faith is a theory involving the thesis that there exists an entity that we name “God” or several entities that we name “gods” and that it is the philosopher’s task to argue for or against this theory or this thesis. Religious faith is not a theory, according to Phillips, and it is not the philosopher’s task to argue for or against the metaphysical claims that the metaphysical philosopher of religion circles around. Instead, Phillips argues, it is the philosopher’s task to free us from the conceptual confusions that give rise to metaphysical philosophy of religion (Cf. Phillips 1988, pp. 195, 201, 209, 308).

Phillips underlines that the philosopher’s aim is not to persuade people to believe but to understand the character of their beliefs. The philosopher, it might be said, is the guardian of grammar. The theologian, by contrast, is the guardian of faith, the one interested in defending his or her faith in order to gain new followers. The difficulty that Wittgenstein’s work presents to the metaphysical philosopher of religion is that it stands outside the apologetic context. This might be difficult to appreciate if philosophy itself is conceived of as a way to assess religious belief *pro* and *contra* (Phillips 1988, pp. xvi–xvii, 113, 238).

In philosophy, we are not testing theories, according to the Wittgensteinian philosopher of religion, but struggling with confusions. Some of

these confusions concern our use of the concept of God. We tend, as the metaphysical philosopher of religion, to understand the concept of God as a concept referring to an object or an entity that we may or may not believe exists in a reality independent of us. To avoid this confusion, we must look to the forms of life in which talk of God has a role to see what application the notion of the independently real has there. This means that instead of asking how or if we can speak of God, we must begin by noting that we do speak of God (Phillips 1988, p. 264). There are many religious forms of life and religious language games within which people do speak of God. It is the philosopher’s task to describe the grammar ruling the use of the concept of God within these contexts.

Philosophers criticizing the Wittgensteinian philosophers of religion present them with the following choice: either the word “God” refers to an object or it is a metaphorical use of language. The Wittgensteinian philosophers of religion deny that the word “God” refers to an object. They also deny that the word “God” is a metaphorical use of language. They reject this simple choice. This is because they believe that no one account of what “agreement with reality” amounts to can be given since the meaning of what agreement with reality comes to is itself determined by the language games we play and the forms of life they enter into (Phillips 1988, pp. 55, 206, 317).

Phillips argues that by studying the grammar ruling the use of the concept of God, we will come to understand that the God in whom religious believers believe is one of whom it makes no sense to say that he may or may not exist. The dispute between belief and unbelief is, according to Phillips, not one in which evidence and probabilities are weighed within a common system. Instead, the gap between what the believer wants to say and what the unbeliever denies is a grammatical gap. To reject religion, or to come to God, is not to reject or embrace a hypothesis within a common way of looking at things but, rather, to reject or embrace a whole way of looking at things. Within the religious way of looking at things, it is not meaningful, according to Phillips, to say either that God may

exist or that God may not exist. Within the religious way of looking at things, God is not an object or entity that may or may not exist. If, per impossible, any object were said to correspond to the word “God,” one thing would be certain: that object would not be God (Phillips 1988, pp. 11–12, 80, 321).

Wittgensteinian philosophy of religion stresses the difference between religious belief and science. Religious faith and scientific hypotheses belong to different forms of life, and it is important not to confuse or blend language games from these different contexts with each other. If, for example, the religious believer or scientist tries to argue for or against God’s existence by using scientific results, a conceptual confusion is at hand. It is the philosopher’s task to deliver us from this conceptual confusion by reminding us that the grammar ruling our use of the concept of God states that belief in God is not a scientific hypothesis that we may argue for or against. To understand religious faith in such a way is to misunderstand it, according to the Wittgensteinian philosopher of religion.

When it comes to religious pluralism, the Wittgensteinian philosopher of religion emphasizes that in asking whether or not believers within different religious contexts mean the same when using the concept of God, we can get confused by thinking that speaking about God has anything in common with referring to the same object. The philosopher should not treat religious pluralism as a question concerning which religious theory, if any, might be the correct one. Instead, the philosopher of religion should describe the grammar ruling different language games within different religious contexts without judging those language games and without suggesting how they may be adjusted in order to accord with some other language game within another religious context. This means, among other things, that it is not the philosopher’s task to help religious people belonging to different religious contexts to come to an agreement concerning what core beliefs they ought to accept but to help them understand the character of their own beliefs as well as that of others.

Feminist Philosophy of Religion

When Grace Jantzen describes ► [feminist philosophy of religion](#) in *Companion Encyclopedia of Theology*, she stresses that feminist philosophers of religion pay attention to the fact that God, as God is described within the theistic traditions, is very often understood to be a male person since the properties ascribed to God often is understood as “masculinist” (Coakley 1997, pp. 601–606). Also, believers tend to refer to God by using male personal pronouns. When philosophers of religion summarize the most important properties that, according to them, are incorporated within the theistic concept of God, their lists very seldom include the property of being male even though philosophers of religion also tend to refer to God by using male personal pronouns. Is the use of male pronouns just an innocent linguistic practice with no severe consequences or is it the tip of an iceberg that ought to attract our attention not only to the male personal pronouns used when referring to God but to the whole cluster of properties incorporated in the theistic concept of God?

Feminist philosophers of religion maintain that not only the use of male personal pronouns when referring to God but the whole theistic concept of God ought to be analyzed from a feminist philosophical perspective. The great-making properties that philosophers of religion summarize in their lists describing the theistic concept of God often include properties that we associate with male gender. Being powerful and all-knowing are properties that dominating males who suppress women find valuable and therefore ascribe to God. Likewise, being without a body and being detached from the world are usually understood to be properties of the male gender, while women are traditionally thought to be corporeal and to have feelings of attachment. Feminist philosophers of religion therefore argue that the whole theistic concept of God that dominates influential religious traditions as well as mainstream philosophy of religion must be investigated from a feminist philosophical perspective. The detached interest in the logical coherence of

the theistic concept of God, characteristic of metaphysical philosophy of religion, must be questioned in the light of the more pressing issues concerning the oppressive consequences of this concept.

In her work on feminist philosophy of religion, Pamela Sue Anderson takes an interest in epistemological questions (Anderson 1988). In doing so, she poses the question: *Whose* philosophy is the philosophy of religion? Within the philosophy of religion, what feminists call the “generic male” (i.e., the privileged male subject posing as a sexless individual of universal instantiation) has become the norm (Coakley 1997, p. 601). This, they argue, characterizes the problems that philosophers of religion formulate and choose to work on, the strategies they understand to be acceptable within a philosophical discipline and the solutions that they recommend. The ideal reflecting, arguing, and knowing subject that produces sound philosophy of religion is a male subject.

By taking an interest in epistemological questions, feminist philosophers of religion draw attention to interrelations between our descriptions of the way the world is, our values, and our standpoint in the world. The fact that philosophy of religion is usually approached from a male perspective, a perspective that highly values what we humans understand to be male properties, inevitably affects the description of the world that the philosopher of religion presupposes in posing his problems and arguing for his solutions. There is no neutral description of the world, the feminist philosopher of religion argues. There is no God’s-eye point of view that we can strive for or imagine. We human beings are always situated in time and space. When we describe the world, we do so from some perspective. As human beings, we live on earth by having a certain body, located within a specific context, with certain values and certain linguistic assets. Our standpoint characterizes the description of the world that we formulate. Our description of the world, in turn, has consequences for how we live our lives and how we treat each other. We have to evaluate our descriptions of the world in

relation to our values in order to avoid descriptions of the world which are formulated by oppressors and which lead to further oppression.

This emphasis on the interrelation between our descriptions of the world, our values, and our standpoint in the world is something that the feminist philosopher of religion shares with the philosopher of religion who chooses a non-metaphysical realist approach.

A Non-metaphysical Realist Approach to the Philosophy of Religion

The philosopher of religion who chooses a non-metaphysical realist approach concurs with present-day philosophy of science in assuming that we can state things only if what we say is related to some idea about the circumstances under which we would be able, as human beings, to justify that statement. It must be possible for other people to discern this idea by studying the linguistic behavior in the speech community to which we as speakers belong. This does not mean that the individual speaker must be able to formulate an opinion about the circumstances under which we would be able to justify her statement. It is the philosophical observer of the speech behavior in the speech community that must be able to do that. Nor does it mean that, at present, we humans can actually, in practice, justify the statement in question. Perhaps only some future expert will be able to do that. However, it does mean that sentences cannot be statements unless they are connected to some idea about the circumstances under which we would be able to justify the sentence in question. For example, the metaphysical realist belief that there exists a reality-in-itself cannot be stated because we cannot per definition justify the existence of such a reality. If the existence of a reality-in-itself could be confirmed by us humans, it would not be a reality-in-itself. It would be a reality understood from a human perspective, a reality described by humans using certain linguistic devices and shown to exist by human beings presupposing certain

epistemological values. This means that, according to the philosopher of religion who chooses a non-metaphysical realist approach, the metaphysical realism that is presupposed within metaphysical philosophy of religion is a philosophically untenable position (Johannesson 2007, p. 245).

By assuming that the only utterances that can be statements are utterances related to some idea concerning sufficiently good conditions for justification, we can conclude that we humans are able to interpret all speech behavior that can be considered human language. This is so because it will always be possible to discern the ideas concerning justification that give our statements their content by studying the linguistic behavior within a speech community. When we know under what circumstances a speaker would make a certain statement, we can interpret that statement by stating its content using our own conceptual resources. The fact that different human speech communities using different conceptual resources will be inter-interpretable gives rise to a non-metaphysical realist position. Non-metaphysical realism is a philosophically tenable point of departure for the philosophy of religion. What this means can be explained by returning to Putnam and the three theses he ascribes to the metaphysical realist.

It is possible for us to understand all three theses attributed to the metaphysical realist in a non-metaphysical realist way. The world can be conceived of as consisting of that totality of mind-independent objects which we, with the help of our conceptual resources, can rightly state exists. The fact that we can rightly state that a specific object exists could mean that we think that, given sufficiently good conditions for the justification of such a statement, we would claim that this statement is an expression of correct linguistic behavior. This means that we conceive of this statement as true, as corresponding to reality. The one and only true description of reality could consist of all the statements about what does or does not exist which we would conceive of as corresponding to reality if sufficiently good conditions for justifying each statement were realized (Johannesson 2007, pp. 232–233).

This non-metaphysical realist reinterpretation of the three theses does not regard reality as a reality-in-itself but rather as a reality that relates to what we humans can state, what we can experience, and what we consider to be sufficiently good conditions for justification. In this sense, it is a reality described, not from a God's-eye point of view but from a human-eyes point of view. Just as the feminist philosopher of religion, the philosopher of religion who chooses a non-metaphysical realist approach stresses the interdependence between our linguistic resources (that determine what statements we are able to formulate), our values (including the epistemological values that decide what we understand to be sufficiently good conditions for the justification of a certain statement), our standpoint in the world, and our descriptions of reality.

It should be emphasized that it is hardly likely that we humans will ever be in such complete agreement about what objects we can rightly state exist or what constitutes sufficiently good conditions for justification that we will be able to formulate the one and only true and complete description of reality. This description of reality, and its consequent delimitation of the totality of mind-independent objects, is a hypothetical notion; however, unlike the metaphysical realist conception of a reality-in-itself, it is a hypothetical notion that it is possible for us to understand since it refers to a reality with which we interact.

The fact that the metaphysical realist and the non-metaphysical realist embrace the same three theses should not lead us to ignore the differences between these two perspectives. One important difference is that the non-metaphysical realist, just like the Wittgensteinian philosopher of religion, will have to maintain that all philosophical reflection has to be done in connection to some existing speech community whose linguistic behavior the philosopher studies. This is so because if the philosopher of religion does not study the linguistic behavior of some existing speech community, she will not be able to state under what circumstances the statements that she focuses on could be considered justified, and

therefore, she will not be able to understand what they mean.

It is important to note that the philosopher of religion who chooses a non-metaphysical realist approach can work with the questions concerning God's existence that have become the trademark of metaphysical philosophy of religion even if this work will be done in a different way. Before starting to discuss whether or not God exists, the philosopher of religion who chooses a non-metaphysical realist approach must clarify the meaning of the claim that God exists or the claim that God does not exist by stating some idea about the circumstances under which we would be justified in making one of those statements. This idea about conditions for justification must be explained in relation to the linguistic behavior in some existing speech community. The fact that the philosopher of religion will have to treat questions concerning the concept of God or God's existence in relation to some actually existing speech community will have consequences for the philosophical agenda. Some of the questions traditionally treated in philosophy of religion are rarely triggered by existing speech communities outside the philosophical discourse. The philosopher of religion who chooses a non-metaphysical realist approach might therefore find that other questions than the ones traditionally treated in the philosophy of religion are more interesting to study simply because some existing and influential speech community gives rise to them. This might mean that philosophers of religion become more interested in non-Christian religious traditions which gain influence in present-day society. It may also mean that the relation between religions and the sciences is seen from a different angle than the one given by metaphysical philosophy of religion.

Cross-References

- [Critical Realism in Theology and Science](#)
- [Faith and Belief](#)
- [Feminist Philosophy of Religion](#)
- [Meaning, the Concept of](#)

- [Natural Theology](#)
- [Ontology](#)
- [Philosophy of Religion](#)
- [Realisms in Philosophy of Religion](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)
- [Theism, Classical](#)

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Concept of Truth

- [Truth](#)

Conceptions of Truth

- [Truth](#)

Condensed Matter Physics

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Related Terms

Condensed matter physics; Semiconductor physics

Description

According to the temperature of the system, matter can be found in three different states: gas, liquid, and solid. Gas is the state where the individual constituents are free to move. In liquid state, the constituents are bound and their motion is restricted. In the solid state of matter, the constituents occupy fixed positions. Solids can exist in the crystalline or amorphous form. In the *crystalline* form, the atoms or ions are arranged in a periodic array, i.e., there is a long-range order in the system. In the *amorphous form*, there is no long-range order.

Solid-State Crystals

Crystals are formed by the infinite regular repetition in space of identical building blocks. The elementary building blocks are atoms or groups of atoms. In the simplest crystals such as copper, gold, silver, and alkali metals, the structural unit consists of a single atom. More generally, the structural units consist of several atoms or molecules. The structure of all crystals is described in terms of single periodic lattice, with a group of atoms attached to each lattice point or situated in each elementary parallelepiped. This group of atoms is called the *basis*. The basis is repeated in space to form the crystal: crystal structure = lattice + basis. A typical example of a simple crystal structures is the structure of *sodium chloride* – NaCl. The fundamental type of its lattice is face-centered cubic; the basis consists of one Na atom and one Cl atom.

Ionic crystals are made of positive and negative ions – i.e., atoms having some excess or lack of electrons which makes them behave as electrically charged objects. The ions are kept together by the Coulomb attraction between ions of opposite sign stronger than the Coulomb repulsion between ions of the same sign. The *ionic bond* is resulting from the electrostatic interaction between ions of opposite sign. The NaCl structure is an example of an ionic crystal structure.

Covalent crystals are made of neutral atoms held together by the so-called covalent bond, electron pair, or homopolar bond. For example, in the molecule H₂, the hydrogen atoms share the two electrons via covalent bonding. The covalent bond is as strong as the ionic bond and has strong directional properties – its strength depends on the angular relation between the atoms in a molecule. The covalent bond is usually formed from two electrons – one from each atom participating in the bond. The two atoms can be from different chemical elements but should have comparable electronegativity – a chemical property describing the ability of an atom to attract electrons. The electronegativity of an atom depends on its atomic weight, and the distance forms its valence (most external) electrons that reside in relation to the positively charged nucleus. The higher is the electronegativity, the larger is the degree of attraction of the electrons toward the atom.

Crystals of inert gases. The inert gases form the simplest crystals. The crystals are transparent insulators and are weakly bound with low melting temperature. The outermost electronic shells of the atoms are completely filled. In the crystal, the inert gas atoms are packed together as closely as possible. The typical crystal structures are all cubic close-packed. The inert gas crystals are held together by *van der Waals-London interactions*. This interaction is due to the fact that the electrical charge distribution on the atom is not rigid. The electrons are in motion around the nucleus even in the lowest electronic state, and at any instant of time, there is a nonvanishing electric dipole moment from the motion. An instantaneous dipole moment of one atom produces an electric field at the center of the second

at some distance R of the first atom. The field will induce an instantaneous dipole moment on the second atom. These two dipole moments will interact. This interaction is known as the van der Waals interaction, London interaction, or induced dipole-dipole interaction. It is the principal attractive interaction in crystals of inert gases.

Metal crystals. The main characteristic of metal crystals is a high electrical conductivity. A large number of electrons in a metal are free to move around, usually one or two per atom. The electrons available to move about are called conduction electrons. In some metals, the interaction of the conduction electrons with the ion core makes a large contribution to the binding energy. Alkali metal crystals may be considered as an array of positive charges embedded in a sea of negative charges. In the transition metals, there may be additional binding from inner electron shells. Transition metals have large d-electron shells and are characterized by high binding energies, caused in part by covalent binding and in part by van der Waals interaction of the cores.

Hydrogen-bonded crystals. A hydrogen bond is formed when two nonhydrogen atoms attract a hydrogen atom. The hydrogen bond is rather ionic in character; being formed only between the most electronegative atoms F – fluorine, O – oxygen, and N – nitrogen.

Semiconductor Crystals

A semiconductor is neither a good insulator nor a very good conductor of electrical current.

Introduction

Composition of Semiconductors Some of the most important semiconductor elements are silicon and germanium which are part of group IV of the periodic table of elements. Various forms of carbon also can be semiconductors. Other elements with semiconductor properties are selenium and tellurium of group VI. The list of binary semiconductor compounds is very large. It includes the compounds formed from group III and group V elements, from group II and group IV elements, and from group IV and group VI elements. There are also many ternary and organic semiconductor compounds.

Electronic Energy Bands To understand the basic properties of semiconductors, it is necessary to refer to the quantum concept of energy bands. For the free atoms, the energy levels are single quantum (or discrete) states. When the atoms are brought together in a crystal, the quantum rules do not allow for the atomic energy levels of the individual atoms to overlap and coincide. Thus, the individual atomic energy levels degenerate and form energy bands. In a periodic lattice of a crystal, the electrons move freely as if the ions are instantaneously at rest. The eigenstates of an electron moving in the periodic potential of a crystal are the so-called Bloch states. The energy of the Bloch states cannot take all possible values but are restricted to certain allowed regions or bands separated from one another by forbidden regions or band gaps.

In a pure semiconductor without defects and at the absolute temperature scale zero, 0 K, certain bands are completely full of electrons and the remaining bands are completely empty. This situation corresponds to an insulator. If the temperature of the crystal is raised, electrons will be excited from filled bands to empty bands, leading to partial occupancy of these bands. Under these conditions, the crystal becomes a semiconductor with a conductivity which increases rapidly with increasing temperature as more and more electrons are excited in the empty bands.

There is a gap between the top edge of the highest filled band and the bottom edge of the lowest empty band. This gap is called fundamental gap. The electrons in the highest filled bands are valence electrons, and the bands they occupy are the valence bands. The bands that are empty at 0 K are conduction bands. When an electron is promoted from the valence band to the conduction band, it becomes a conduction electron. The lack of the electron in the valence band is called hole. The holes which are left in the valence band are positively charged. Therefore, electrons in the conduction band are negative electric charge carriers and the holes in the valence band are positive charge carriers.

Amorphous Semiconductors In amorphous semiconductors, the atoms do not form

a periodic array, but are disordered. Nevertheless, a sufficient short-range order remains so that the electronic energy properties retain their basic features. Band edges however are smeared out, and band gaps are no longer clearly defined. States which are moved into what had been the forbidden gap may now have a distinctively localized character. Amorphous semiconductor alloys are frequently used in applications. In particular, amorphous Si-Ge alloys are useful in solar cells in view of the possibility to maximize performance by varying the composition.

α -Si:H (hydrogenated amorphous silicon) is one of the most common amorphous semiconductors. A silicon lattice is tetrahedrally bonded (a tetrahedron is a geometrical figure composed of four triangular faces, three of which meet at each of its four vertices). Creating disorder in the silicon lattice causes relaxation of the requirement for fourfold coordination of the nearest neighbors and produces the so-called dangling bonds – a type of bond that occurs when an atom is missing a neighbor to which it would be able to bind. These bonds need to be saturated and combine easily with monovalent atoms such as H to yield α -Si:H.

Impurity Effects Introduction of impurities in a semiconductor may have drastic effects on its properties and, in particular, on its electronic properties. Impurities can provide additional carriers such as conduction electrons or valence holes, and scattering centers, which perturbs the motion of the freely moving carriers.

If a group V element such as P is added to a group IV semiconductor like Si, it may enter substitutionally into the crystal by replacing Si atoms in the silicon diamond structure. Phosphorus contains five electrons behind closed shells of which four can be paired up with electrons on four neighboring Si atoms to form four electron-pair bonds. The fifth electron is bound to the P⁺ ion at sufficiently low temperature, but is thermally excited to the conduction band at higher temperatures and contributes to the conductivity. Phosphorous is called donor impurity because it donates electrons to the conduction band.

Silicon doped with P is known as n-type Si because the electric current carriers provided by P are negatively charged electrons in the conduction band.

Let us now consider an impurity from group III of the periodic table such as boron (B), which can also enter Si substitutionally. Boron contains three electrons behind closed shells and therefore lacks one electron needed to form electron-pair bonds with the nearest neighboring Si atoms. The missing electron on the B atom can be regarded as a hole. At sufficient low temperature, the hole bounds to the B atom. At high temperature, one electron from a far away electron-pair bond can transfer to the B atom and, together with the other three electrons, form four electron-pair bonds between the B atom and the four nearest neighbor Si atoms. The hole is thereby transferred from the B atom to the far away electron-pair bonds and is no longer bound to the B atom. The B atom in this process has become negatively charged. Boron is referred to as an acceptor impurity because it accepts electrons from elsewhere in the crystal. Si doped with B is known as p-type Si because the electric current carriers provided by B are positively charged holes.

Impurity Bands Impurity effects can be created and controlled by doping semiconductor crystals with appropriate foreign atoms in a way similar to the one that was described above. Such impurities or dopants introduce newly allowed electronic energy levels within the band gap. These energy levels are close to the conduction band for n-type and close to the valance band for the p-type semiconductors. At sufficiently high concentration, neighboring atoms are sufficiently close to produce sufficient perturbation of the impurity levels. The energy levels broaden out into a band called impurity band.

Lattice Vibrations An important source of deviation from the periodicity in a crystal is the displacement of an atom from its equilibrium position. These deviations arise naturally from the thermal energy of the atom. If the crystal is in a stable configuration, the displacement of an

atom leads to a force that tends to restore the atom to its equilibrium position. However, the kinetic energy of the atom causes it to overshoot the latter. As a result, the atom vibrates about its equilibrium position. The forces of interaction between atoms couple the atomic vibration together, giving rise to lattice vibrations. When an atom of the pure crystal is substitutionally replaced by an impurity atom, the mass of the atom and the force constants coupling it to its neighbors are changed and a localized vibrational mode arises in which the amplitude of vibration is large at the impurity site and decreases exponentially going away from the site.

Semiconductor Properties

Electrical Properties The electrical resistivity of semiconductors generally decreases strongly with increasing temperature, whereas the resistivity of a metal generally increases weakly with increasing temperature. In fact, solid materials are usually classified into three categories based on their electrical resistivity: insulators when the resistivity is very high, metals when the resistivity is very low, and semiconductors for which the resistivity is intermediate and is highly dependent on the temperature. The temperature dependences of the resistivities of metals and semiconductors are quite different. For metals, the temperature dependence is rather weak and the resistivity increases with increasing temperature. For semiconductors, the opposite is typically the case. The temperature dependence is rather strong, and the resistivity decreases with increasing temperature.

Dielectric Properties Certain crystals exhibit a dipole moment in the presence of an electric field E . The polarization P in such crystals is defined as the dipole moment per unit volume of a crystal cell. The dielectric susceptibility of an isotropic or cubic medium is defined as $\chi = P/E$.

Piezoelectric Effects Some crystals have the property that if the crystal is strained, an electric dipole moment and an associated electric field develop. This phenomenon is called

piezoelectricity and can be explained by the compositional asymmetry of the basic structural elements of the crystals (only crystals without center of inversion can exhibit it). The semiconductors of the zinc blende structure, such as GaAs, and of the wurtzite structure, such as CdS, exhibit piezoelectricity.

Ferroelectricity A ferroelectric crystal exhibits an electric dipole moment even in the absence of an external electric field. In the ferroelectric state, the center of the positive charge of the crystal does not coincide with the center of negative charge. The variation of polarization as a function of the electric field for the ferroelectric state represents a typical loop called hysteresis loop. The crystal in a normal dielectric state usually does not show a perceptible hysteresis when the electric field is increased and reversed slowly. Ferroelectricity usually disappears above a certain temperature called transition temperature, and above the transition, the crystal is said to be in a paraelectric state.

The ferroelectric crystals are said to be of *order-disorder* type when the transition is associated with the ordering of ions, or of *displacive* type when the transition is associated with the displacement of a whole sublattice of ions of one type relative to another sublattice. All crystals in a ferroelectric state are also piezoelectric. A stress applied to the crystal will change the electric polarization, and similarly, an electric field applied to the crystal will cause the crystal to be strained.

Transport Properties Transport properties such as electrical conductivity play a critical role in the application of semiconductors to electronic devices. A system of free carriers in an energy band can be considered as a gas of noninteracting charged particles. When an external force is applied, the carriers are displaced under the influence of the field and an electrical current results. The external force may be due to an electric field producing electric conduction current, to a concentration gradient giving rise to diffusion current, or to a thermal gradient leading to a heat

current associated with thermal conductivity. In the absence of an external force, the charge carriers execute the random Brownian motion resulting from collisions due to the interaction of carriers with impurities, lattice vibrations, and other perturbations of the periodic potential. During collision, the carrier may undergo a sharp change in direction, but between collisions, its motion is essentially rectilinear and characterized by its mean free speed.

Magnetic Properties The magnetic moment of a free atom has three principal sources: the spin with which electrons are endowed, their orbital angular momentum, and the change in orbital momentum induced by the applied magnetic field. The magnetization M of a semiconductor material is defined as the magnetic moment per unit volume. The magnetic susceptibility per unit volume is defined as $\chi = M/B$, where B is the macroscopic magnetic field intensity. Substances with a negative magnetic susceptibility are called diamagnetic. Substances with a positive susceptibility are called paramagnetic. A positive contribution to χ can be found in lattice defects possessing an odd number of electrons, as the total spin of the system cannot be zero. Electronic paramagnetism is found also in metals and in free atoms and ions with partly filled inner shell. A ferromagnet has a spontaneous magnetic moment even at zero applied magnetic field. A spontaneous moment means that electron spins and magnetic moments are arranged in a regular manner. The temperature above which the spontaneous magnetization vanishes is called the Curie temperature T_c . The Curie temperature separates the disordered paramagnetic phase (at $T > T_c$) from the ordered ferromagnetic phase (at $T < T_c$). At temperatures below the Curie point, the electronic magnetic moments of a ferromagnet are all lined up when regarded on a microscopic scale. Yet, looking at a specimen as a whole, the magnetic moment may be much less than the saturation moment. To explain this behavior, Weiss assumed that actual specimens are composed by a number of small regions called domains, within each of which the local magnetization is saturated. The transition layer

which separates domains magnetized in different directions is called a Bloch wall.

Compounds in which some ions have a moment antiparallel to other ions are considered as ferrimagnetic. Many ferrimagnets are poor conductors of electricity, a quality which is exploited in device applications. There exists also an antiferromagnet order in which the spins in a single plane are parallel, but adjacent planes are antiparallel. In an antiferromagnet, the spins are ordered in antiparallel arrangement with zero net moment at temperatures below the so-called Néel temperature T_N . An antiferromagnet is a special case of ferrimagnet for which both sublattices have equal saturation magnetization.

Superconductivity The electrical resistivity of many solid materials, metals and alloys, and some particular compounds drops suddenly to zero when the specimen is cooled to sufficiently low temperature. At a critical temperature T_c , the specimen undergoes a phase transition from a state of normal electrical resistivity to a superconducting state.

The magnetic properties exhibited by a superconductor are as dramatic as their electrical properties. When a specimen is placed in a magnetic field and cooled through the transition temperature for superconductivity, the magnetic flux usually present is ejected from the specimen. This is called the Meissner effect.

Optical Properties of Semiconductors The optical properties of matter are associated with the absorption, dispersion, and scattering of electromagnetic radiation. All these processes are relatively complex optical phenomena when considered within the context of condensed matter physics and in semiconductor physics in particular. The nature of optical absorption and scattering could be somewhat intuitively understood. However, this is not so with dispersion which describes optical material effects associated with the fact that in a semiconductor (the same as in any other type of material), the different spectral components of an optical pulse propagate with different speeds. The absorption, dispersion, and scattering of electromagnetic

radiation arise as a result of the perturbation of the material system by the electromagnetic field. The perturbation can involve the electronic state or the vibrational state or both and leads to transitions between the states. The phenomena produced by this perturbation include infrared intrinsic interband absorption, free carrier absorption, lattice vibration absorption, Raman scattering, and electron Raman scattering. Light absorption leads to photoconductivity with applications as photodetectors and photovoltaic effect as solar cells.

In the process of *optical absorption*, light is absorbed by crystals to create electron-hole pairs. When the energy of the absorbed photon is close to the energy gap, but just below, the electron-hole pairs remain bound by Coulomb interaction. This initial bound state is called *exciton*; it may move through the crystal transporting excitation energy but not charge. Interacting with phonons or impurities, the exciton may be dissociated, giving free electrons and holes. For photons with energies greater than the energy gap, electrons from the valence band are excited directly into the conduction band, giving free electrons and holes which may move independently.

Photoconductivity is another phenomenon which is related to both the optical and the electrical properties of semiconductors. In general, it is associated with the increase of the electrical conductivity of an insulating crystal caused by radiation incident on the crystal. The direct effect of light illumination is to increase the number of mobile charge carriers in the crystal, giving rise to the manifestation of electrical current phenomena.

The color presented by a crystal is usually the color of light transmitted through the crystal. A perfect diamond is clear because there is no light absorption in the crystal. Cadmium sulfide with an energy gap of 2.42 eV absorbs the blue region of the spectrum and is therefore yellow orange. Silicon has a metallic luster because the band gap of 1.14 eV is below the visible region of energy. Ruby is a dark-red gem; sapphire is a blue gem. Both are impure crystals of Al_2O_3 which is colorless when pure. The color of ruby is caused

by Cr^{3+} impurities. The blue color of sapphire is due to Ti^{3+} ions present as impurity in Al_2O_3 .

Semiconductor Structures and Lasers

P-N Junction in Semiconductors The p-n junction represents the interface between two regions, one of which is p type and the other n type. On both sides of the interface, electrons and holes diffuse and recombine, leaving uncompensated charged ions that constitute a space charge region or depletion layer. From the region of positive ions on the n-type side toward the region of negative ions on the p-type side exists a built-in electric field. The charge density is positive on the n-type side and negative on the p-type side. The simplest semiconductor device is the p-n junction which is used as rectifier. It also serves as the basis of the transistor which has important applications as amplifier.

Heterostructures A heterostructure consists of two different semiconductors in intimate contact. A heterojunction is a heterostructure with semiconductors of different types. A modulation-doped heterostructure involves two semiconductors, one highly doped on one side and one intrinsic on the other side of the interface. A very thin layer of conduction electrons can be created which constitutes a two-dimensional electron gas (2DEG). The electron energies in a 2DEG form electronic subbands which arise from the confinement of the electrons in the direction normal to the junction interface.

A square-quantum well is formed by placing a thin layer of small-gap semiconductor between two thick layers of large-gap semiconductor. Coupling together larger and larger number of quantum wells leads to the creation of a superlattice with an allowed band of energy levels.

Semiconductor Lasers Crystals can be used as light amplifiers and as sources of coherent radiation – lasers. The laser action is explained by the intrinsic optical properties of the crystal. The interband optical absorption leads to the production of free carriers in the conduction and valence bands. These free carriers constituting excited

states have relatively short lifetime and tend to recombine with emission of photons. This process is called radiative recombination or spontaneous light emission. The frequency of the emitted light corresponds to the band gap energy. A system in an excited state is stimulated by the radiation field to emit a photon and drop to a lower energy state. The rate of stimulated emission is proportional to the energy density of the radiation, whereas the rate of spontaneous emission is not. The term laser is an acronym for light amplification by the stimulated emission of radiation. Laser action is conditioned by population inversion.

A semiconductor p-n junction is a convenient system for establishing population inversion of energy levels. At a p-n semiconductor junction, the stimulated emission of radiation occurs from the radiation emitted when electrons recombine with holes. The pumping action is provided by the DC voltage. The diode wafer provides its own electromagnetic cavity, for the reflectivity at the crystal-air interface is high.

Cross-References

► [Condensed Matter Physics](#)

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Conditional Relations

► [Relations in Buddhism](#)

Conditionality

► [Relations in Buddhism](#)

Conditioning Classical and Instrumental

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A specific procedure that is intended to produce a learning effect. Conditioning procedures are typically categorized as involving either instrumental conditioning or Pavlovian conditioning (classical conditioning). Instrumental conditioning then is a conditioning procedure in which the probability of a behavioral response is altered by the presentation of pleasant (reinforcing) or unpleasant (punishing) event shortly after the response. If the response results in a pleasant outcome, it becomes more likely in the future; if the response results in an unpleasant outcome, it becomes less likely in the future.

Cross-References

► [Conditioning and Learning](#)

Conditioning and Learning

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Related Terms

[Animal learning](#); [Associative learning](#)

Description

Conditioning and learning is devoted to the study of the mechanisms of learning, primarily at the behavioral level of investigation. The focus is on observable actions and responses of human and

other animal species in response to specific stimuli and how these actions are altered by experience or learning (Bouton 2007). Learning is an enduring change in the mechanisms of behavior that results from prior experience with specific stimuli or training procedures. Behavioral changes that are not long lasting, such as those caused by fatigue or a change in motivation, are excluded from the domain of learning because they do not satisfy the criterion of being long lasting. Behavioral changes that are the result of physical maturation are excluded from the domain of learning because they do not require special training procedures.

The field of conditioning and learning has deep roots in psychology. The field dates back to the late nineteenth and early twentieth centuries and was stimulated by three separate lines of inquiry. The first of these originated with Darwin and concerned the evolution of intelligence (Boakes 1984). Before being able to comment on the evolution of intelligence, Darwin and his colleagues had to define what constituted intelligent behavior in nonhuman animals. They proposed that the defining feature of intelligent behavior was flexibility or the ability to alter behavior as a consequence of experience. Thus, intelligence was defined in terms of the ability to learn. This definition of intelligence provided great impetus for studies of learning in various animal species.

The evolution of intelligence remains an active area of investigation in contemporary psychology and behavioral ecology. The topic is now referred to as “comparative cognition” because the focus is on comparing cognition and learning in various animal species, including *Homo sapiens*. Topics considered include episodic memory, directed forgetting, spatial navigation, perceptual and abstract concept learning, serial pattern learning, tool use, and language learning (Zentall and Wasserman 2012).

The second source of interest in conditioning and learning stemmed from an interest in understanding the functions of the nervous system. This line of inquiry dates back to the work of Ivan Pavlov, who discovered that a reflex response (salivation) could become conditioned

and elicited by a stimulus (a tone) that was initially ineffective by pairing that stimulus with an effective triggering event (food). Pavlov devoted the latter part of his life to the empirical study of conditioned behavior because he viewed such investigations as informative about how the brain and nervous system work. Thus, Pavlov regarded his studies of conditioning to be an investigation of the functions of the nervous system.

Pavlov’s interest in using conditioning to uncover how the nervous system works has its counterpart in contemporary investigations of the neurobiology of learning. Great advances in the neurosciences now permit scientists to study the mechanisms of learning not only at the level of behavior but also at the level of neural circuits and neurotransmitter system, as well as at the cellular, molecular, and genetic levels (Rudy 2008).

The third major impetus for studies of conditioning and learning originated with efforts in the early part of the twentieth century to develop animal models that would facilitate investigation of specific features of human behavior that could not be studied with as great experimental control and precision with human participants. Early efforts involved developing animal models of anxiety and neurosis. Animal models continue to be used to study love and attachment, depression and helplessness, impulsivity, stress and coping, and various aspects of drug tolerance and addiction (Carroll and Overmier 2001).

Self-identification

Science

Conditioning and learning is an empirical, data-based discipline that employs the methods of experimental science. The use of experimental methods is required by the definition of learning. Learning is said to result from prior experience with specific stimuli or training procedures. Proving that a behavioral change is an instance of learning requires identifying specific prior experiences that are responsible for or constitute the cause of the behavior change. Identifying such

causal mechanisms can only be accomplished with experimental methods.

The typical learning experiment involves one group of participants that is exposed to the specific training procedure that is the focus of the investigation. Changes in the behavior of this group are then compared to that of a control group that is treated in a similar fashion but does not receive the relevant training procedure. Because learning is inferred from a comparison of the experimental and control groups, inferences about learning often critically depend on the design of the control procedure. The reliance on experimental methods has made the study of conditioning and learning primarily a laboratory enterprise (Domjan 2010). Other empirical methodologies (nonintrusive field observations or correlational techniques) often do not permit concluding that a behavior change is specifically due to learning rather than something else. Hence the study of conditioning and learning has developed as an experimental discipline. Theories that are formulated to characterize conditioning are closely related to the experimental data, and often require testing conditioning procedures against specially designed control procedures.

Characteristics

Conditioning and learning is distinctive in that it is concerned not only with human behavior but also the evolution of that behavior (Papini 2008). Hence, the discipline deals with rules of learning and principles of behavior modification that exist across a range of species including mammals and birds. The focus is on behavioral and emotional responses and processes.

The area deals with those aspects of human behavior that are not mediated by language and do not require high level linguistic competence. These features of human behavior are readily observable in children before they learn language but are not lost as people gain linguistic competence. The domain of conditioning and learning includes procedural and implicit learning that operate in the absence of conscious awareness or control (Squire 2004).

The empirical foundations of conditioning and learning are based on measurements and recordings of how often and how fast certain responses occur. Introspection and self-reported feelings, insights, and thoughts are outside the domain of this field of inquiry.

Another distinctive feature of the field is that it employs experimental techniques that involve manipulations of prior experience. This is often done in highly controlled laboratory settings.

Relevance to Science and Religion

Investigators of conditioning and learning do not consider their area highly relevant to the topic of "Science and Religion." The experiential aspects of religion, as documented by introspective self-reports, are outside the scope of conditioning and learning. Aspects of religiosity that require complex linguistic competence (beliefs and belief systems) are also outside the usual domain of conditioning, as conditioning is typically concerned with the rate and probability of occurrence of simple behavioral and visceral responses. Conditioning and learning may provide some insights into the acquisition and maintenance of religious behavior, such as prayer habits. However, few scientists in this area have addressed that topic.

Sources of Authority

The primary sources of authority in the field of conditioning and learning are the scientists who make the most important and extensive empirical and theoretical contributions to the field. Occasionally, a small body of empirical work or a novel theory will propel someone into a position of authority, but typically a more extensive body of novel empirical and theoretical work is required. The institutional authorities are editors of scholarly journals and officers in professional societies. However, they typically reach those positions of authority because of the strength of their prior empirical and theoretical contributions.

The discipline is self-regulating through peer review and peer participation in governance. Journal editors are typically selected by a committee of experts in the field. An editor's decision to accept an empirical or theoretical report for publication is usually based on the outcome of reviews by other scientists in the discipline who are experts in the topic addressed by the manuscript. Officers in professional organizations are usually nominated and elected by members of the organization, who are generally peers with shared scientific interests.

Ethical Principles

The ethical principles in the discipline are those of the ethical conduct of science and the ethical treatment of participants in experiments. These ethical principles are passed down through an apprenticeship process during graduate training that leads to a Ph.D. degree in the field. The ethical principles are also codified by professional organizations such as the American Psychological Association and the Animal Behavior Society. In addition, there are regulations promulgated by government agencies in the United States and other countries for the ethical treatment of both human and nonhuman participants in experiments involving conditioning and learning.

Key Values

The key values of conditioning and learning are those of the scientific method. Investigators are careful to focus on empirical, observable evidence. They make sure that their reasoning proceeds in a clearly spelled-out logical fashion; their inferences are closely rooted in empirical data; and their claims are empirically verified. The discipline is committed to better understanding of the mechanisms of behavior, both of human and nonhuman animals. Although the focus is on intellectual inquiry, there is an underlying assumption that an empirically based science of behavior will also enable people to improve how they treat each other and how they

interact with other animal species. Studies of conditioning and learning have made major contributions to the improvement of educational technologies and approaches to helping individuals with developmental disabilities. Studies of conditioning and learning have also contributed to the development of cognitive behavioral therapy, which is the dominant therapeutic approach in psychotherapy today. For example, this area of research has led to the improvement of treatment procedures for fears, phobias, and drug abuse (Craske et al. 2006).

Conceptualization

Nature/World

This discipline conceptualizes “nature” and the “world” in the same manner as the biological sciences in general. The relevant domain of the field consists of measurable behavioral and physiological responses. The “world” in which these responses reside includes all of the environmental, evolutionary, genetic, epigenetic, and neurobiological processes that mediate behavioral and physiological responses. Thus, the “world” of conditioning and learning is that of modern biology.

Human Being

The discipline considers “human beings” as those individuals who are members of the species *Homo sapiens* and uses the term “human being” only in that sense.

Life and Death

The discipline accepts common biological definitions of “life” and “death.” The definition of “life” and “death” is not a topic of debate or consideration in the field. The assumption is that life is necessary for organisms to learn and that learning does not occur once the organism has died. The field has not specifically considered when life begins. However, it is widely accepted that the beginning of an individual life precedes birth. In addition, it is now well established that with mammalian species, conditioning and learning can take place before birth, in utero.

Reality

For scientists in conditioning and learning, reality is that which can be observed and measured. “Reality” in conditioning and learning is similar to what is “reality” for the biological sciences.

Knowledge

For scientists in conditioning and learning, knowledge is the body of information that has (and can be) assembled based on careful empirical studies of behavior and its modification by past experience. Empirical studies are invariably guided by formal or informal theory and concepts. Therefore, those theoretical organizing concepts and terms are included in the knowledge base of the field.

Truth

What is considered to be the “Truth” in the field of conditioning and learning is obtained through empirical study and verification. Findings that are reliably obtained across repetitions of an experiment are considered to be “true.” Interpretations or theoretical concepts that are consistent with those empirical facts are considered to be “well supported” or “strongly verified.” Only in the face of overwhelming empirical data do such theoretical concepts or formulations cross the threshold to be considered “true.” Furthermore, even if a theoretical concept has achieved such strong and wide-spread acceptance, it is understood that the concept represents “truth” only as long as a more compelling explanation has not been formulated. Thus, there are no absolute truths in the area beyond empirical facts, and it is understood and expected that our conceptualizations of conditioning and learning will evolve and change as additional and better experiments and ideas are explored. One does not expect the facts about conditioning and learning to change, but concepts and theories that serve to organize the facts are likely to evolve. Furthermore, this progressive evolution of how conditioning and learning is conceptualized is expected to be an unending process. The goal is better characterization and understanding of conditioning and learning, with no a priori endpoint in mind.

Perception

Perception refers to the psychological impact of an environmental stimulus. Perception depends on the physical characteristics of the stimulus, but those physical parameters are not directly mapped onto “perception” and subsequent action. Hence, the organism’s response typically does not track changes in the physical stimulus in any simple and direct fashion.

How an organism perceives a stimulus minimally depends on how effectively the physical energy of the stimulus activates relevant sense organs. That transduction of physical energy into neural impulses is outside the domain of conditioning and learning. However, conditioning and learning is concerned with a number of other important determinants of perception. These include the motivational state of the organism. In a state of fear, for example, a number of species are more likely to attend to auditory cues than visual cues, whereas in a state of hunger they are more likely to attend to visual cues than auditory cues. Another important factor concerns the nature of the response the organism is required to make. When making directional responses (going right vs. left), mammals and birds are more likely to pay attention to where a sound originates rather than what it sounds like. In contrast, when deciding to initiate action or not (a go/no-go discrimination), they are more likely to pay attention to the qualitative features of the sound.

The perception and categorization of stimuli also depend a great deal on prior conditioning and learning. For example, in the absence of specific training, someone may categorize all shades of red as being simply “red.” However, after extensive training in art or interior decoration, one is likely to be able to make very fine distinctions among various shades of red that previously seemed pretty much the same. Conditioning and learning can substantially modify how we perceive stimuli. This type of learning allows us to detect the sounds of a malfunctioning car engine and make finer distinctions between the performance of one outstanding figure skater and another. Expert perception in reading, music, sports, radiology, and numerous other arenas all depends on

learning. What an expert sees or hears is very different from the perceptions of a novice.

Time

Time is difficult to define because it is not an observable entity but rather refers to what happens between one event and a subsequent one. Time is a widely used concept in the field of conditioning and learning. The definition of learning itself incorporates the concept of time, since learning is concerned with how experience at one point in an organism's life influences its behavior at a subsequent time point. Learning is said to have taken place if a training experience changes an organism's behavior over a fairly extended period (day, week, or year). In addition, time plays a major role in many aspects of conditioning procedures. These include the interval between training sessions (usually a day or more), the interval between successive trials (usually several minutes), and the interval between events within a trial (usually on the order of seconds). Learning is typically more effective with longer intervals between trials and between sessions.

Within-trial temporal intervals that are important depend on the nature of the conditioning procedure. In instrumental conditioning a critical temporal interval is the interval between the instrumental response and the subsequent reinforcer or "reward." Instrumental learning is impeded by delaying the reinforcer after the response is made. Temporal intervals are also important in schedules of reinforcement in instrumental conditioning.

Pavlovian conditioning involves the association of two events, conditioned and unconditioned stimuli (e.g., a light and food). The duration of the conditioned stimulus has a major effect on what is learned, as does the interval between the onset of the conditioned stimulus and the onset of the unconditioned stimulus. Another critical factor is whether there is a temporal gap between the conditioned and unconditioned stimuli. Traditional conceptions assumed that these temporal intervals determined the extent to which the conditioned and unconditioned stimuli could become associated. However, contemporary research indicates that these

temporal intervals determine *what* is learned, not whether learning occurs. More specifically, it appears that organisms learn not only whether two events go together but exactly when one event occurs in relation to the other (Amundson and Miller 2008).

Many investigators in conditioning and learning are also studying how organisms tell time and how behavior comes under temporal control. This line of research frequently employs laboratory rats and pigeons and is called "interval timing." Two types of behavioral tasks are employed in these experiments. One approach involves studying how organisms produce time intervals (e.g., learn to respond when 120 s is over). Another approach involves studying how organisms estimate time intervals (e.g., deciding which of two stimuli is the longer one). Research on animal timing is highly quantitative and involves testing precise mathematical models. There are basically two categories of timing models. One category of models employs pacemaker/accumulator mechanisms. The alternative models employ oscillator systems to provide temporal cues.

Consciousness

Consciousness is very difficult to study within the domain of conditioning and learning. Three major components of consciousness have to be considered. First, and most prominent in common parlance, is the experiential component of consciousness or feelings of awareness. The experiential component of consciousness is outside the domain of conditioning and learning since it is dependent on introspection. The second component of consciousness is verbal reports of conscious experience. Since verbal reports are behaviors that are shaped by conditioning and learning, they can be examined and analyzed by behavior theorists. The behavioral analysis of verbal behavior has been prominently pursued by B. F. Skinner and others working in the Skinnerian tradition. This approach can tell us a great deal about learning variables that control verbal reports of consciousness but it cannot inform us about the relationship of those verbal reports to the experiential component of consciousness.

The third component of consciousness involves identifying the underlying neural mechanisms and neural systems that mediate consciousness. Since conscious experience is most unambiguously identified in human subjects, the neural systems that mediate consciousness are best identified in studies with people using techniques such as functional magnetic resonance imaging (fMRI). However, the success of such an effort depends entirely on developing a valid psychological measure of human consciousness. In principle, given such a measure, one might be able to identify the brain areas and neural circuits involved in consciousness using fMRI studies with people. More analytic studies of those brain mechanisms can then be conducted with laboratory animals. Scientists pursuing this strategy have focused on trace conditioning as an animal model of consciousness. Trace conditioning experiments examine the strength of association between two stimuli (a conditioned and an unconditioned stimulus) when these stimuli are presented with a brief gap (a second or so) between them. Studies of trace conditioning in laboratory animals cannot model either the experiential or the verbal components of consciousness. Furthermore, even if trace conditioning activates brain areas and neural circuits that are similar to those identified by human fMRI studies of consciousness, one has to make the added assumption that these brain areas cannot mediate trace conditioning without conscious awareness. That assumption is probably impossible to prove. Thus, modern neuroscience approaches to the study of consciousness in animal preparations have severe conceptual limitations.

Rationality/Reason

The field of conditioning and learning accepts conventional scientific approaches to what is considered rational or reasonable. The field employs conventional practices of scientific reasoning and employs conventional rules of scientific inference in deriving conclusions from empirical evidence. The characterization of what constitutes rationality and reason is outside the scope of the field.

Mystery

The field of conditioning and learning does not concern itself with mystery.

Relevant Themes

Given the emphasis of conditioning and learning on the acquisition of behavioral and emotional responses, the field may contribute to discussion and investigation of how religious practices and experiences are learned. Three forms of learning seem especially relevant: instrumental conditioning, Pavlovian conditioning, and habituation/sensitization. Instrumental conditioning refers to situations in which a specific response is increased or decreased by the consequences of that response. Positive consequences (e.g., praise) increase the future probability of the response and negative consequences (e.g., reprimands) decrease it. Pavlovian conditioning involves the association of two events, with the result that the first stimulus comes to elicit responses relevant to the second. Pavlovian conditioning is especially relevant to the learning of emotional responses. Habituation and sensitization are produced by repetitions of an event or stimulus. Depending on the intensity of the stimulus and its rate of repetition, responses to the stimulus may decrease (become habituated) or increase (become sensitized).

One obvious area in which instrumental conditioning is involved is in the early religious training of children. Responses involved in preparing for and attending religious services are shaped and encouraged by instrumental reinforcement provided by teachers, parents, and members of the clergy. Other behavioral responses involved in religious activities (such as standing, kneeling, reciting prayers at the appropriate times) are also learned and encouraged by instrumental reinforcement (praise), and, inappropriate behavior is discouraged by reprimands.

Whereas behavioral responses are established by instrumental conditioning, Pavlovian conditioning is involved in the learning or acquisition of emotional aspects of religious experience.



These emotions come to be elicited by cues related to religious practices. Religious training and religious practice typically occurs in a distinctive context (place of worship), in the presence of specific individuals (religious leaders, teachers, or fellow worshipers), and with distinctive auditory cues (sacred music or chants), all of which can come to elicit distinctive emotions through Pavlovian associations with more emotion-arousing aspects of religious activity.

The phenomena of habituation and sensitization are highly relevant because religious practice often involves repeated exposure to the same stimuli, such as prayers, chants, and the sights and sounds of the place of worship. Emotional and behavioral responses to these repeated stimuli can change with experience through the processes of habituation and sensitization. Depending on the intensity of the stimulus and the frequency and timing of its repetitions, reactivity to these cues can either decrease (showing habituation) or increase (showing sensitization). Decreases in reactivity result in attenuated arousal and may be interpreted as being “at peace,” whereas increases in reactivity result in increased arousal and may be interpreted as “fervor.”

In the natural flow of human activities, instrumental conditioning, Pavlovian conditioning, and habituation/sensitization do not operate in isolation of one another but occur at the same time, sometimes in an interactive fashion, to determine how human behavior is shaped by learning and prior experience. It is important to note, however, that the details of how these learning principles contribute to religious practice and religious experience have yet to be carefully examined or empirically verified.

Cross-References

- [Biological Psychology](#)
- [Cognitive Psychology](#)
- [Comparative Neuroscience](#)
- [Conditioning Classical and Instrumental](#)
- [Learning](#)
- [Memory](#)

- [Religiosity](#)
- [Ritual](#)
- [Social Psychology](#)

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Conformons

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The term “conformon” was coined by combining two stems, “conform-” indicating “conformations” (i.e., deformable structures) of biopolymers and “-on” meaning a mobile, discrete material entity. Conformons are defined as follows (Ji 2012, p. 235):

Conformons are sequence-specific conformational strains of biopolymers that carry mechanical energy and genetic information necessary and sufficient to effectuate any goal-oriented movement of biopolymers inside the cell.

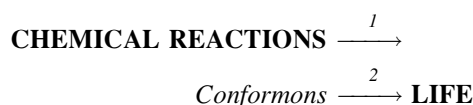
The first experimental evidence for the conformon was obtained in the form of ATP-induced supercoiling of circular DNA double helix in bacteria observed under electron microscope in the mid-1960s (Stryer 1995). The idea that biological properties of enzymes (also called molecular machines) may depend on the mechanical (i.e., conformational) energy stored in enzymes was first proposed by R. Lumry and others in the 1950s and 1960s (Lumry and Gregory 1986).

Cells are examples of self-organizing chemical reaction-diffusion systems that have evolved to perform (or have been selected because of their ability to perform) myriads of goal-directed (i.e., *purposive* or *teleonomic*) motions in space and time. The goal-directed molecular motions inside the living cell are carried out by biopolymers acting as molecular machines (Alberts 1998), and each molecular machine is postulated to be driven by conformons. *Conformons are to molecular machines what batteries and mechanisms are to toys.* Conformons can be generated from the binding energy of ligands as in the Circe effect of Jencks (Jencks 1975) or from the free energy of chemical reactions as in the case of stress-induced duplex destabilizations (SIDDs) in supercoiled DNA characterized by Benham (1996) using statistical mechanical language.

The molecular mechanism of muscle contraction proposed in 1974, based on the conformon concept (Ji 1974), has been supported by the experimental data obtained from the single-molecule measurements of myosin moving along the actin filament in the presence of ATP. Single-molecule experiments were made possible because of the development of the *optical tweezers* and the *total internal reflection fluorescence* (TIRF) microscopy. Employing these methods, biophysicists during the past decade have been able to measure simultaneously both the translational movement of the myosin head (which has the ATPase activity) along actin filament and the hydrolysis of ATP that powers the myosin movement. The single-molecule experimental data of Ishii and Yanagida (2007) clearly demonstrate that,

during a muscle contraction cycle, the free energy of ATP hydrolysis is transiently stored in the myosin head as *conformational strains* or *conformons* (Ji 2012, see Fig. 11.33d). The most recent and direct experimental evidence for the conformon concept was provided by Uchihashi et al. (2011) and Junge and Müller (2011). Using the high-speed atomic force microscopy, these investigators were able to *visualize* the propagation of the conformational waves (i.e., conformons) of the β subunits of the isolated F_1 ATPase stator ring. Therefore, it appears that the conformon concept has now been experimentally verified four decades after it was proposed.

The living cell can be represented as a system of molecular machines (e.g., myosin, kinesin, dynein, dynamin, RNA polymerase, DNA polymerase, topoisomerases, and ion pumps) that are organized in *space* and *time* in various combinations in order to carry out cell functions demanded by a given environmental condition. The organization of molecular motions inside the cell is a form of *work* requiring the *dissipation of free energy* supplied by chemical reactions. It is proposed in Ji (2012, Chap. 8) that the mechanism of *coupling* chemical reactions to the organized molecular motions in the living cell, i.e., *life*, is catalyzed by molecular machines obeying the generalized Franck-Condon principle imported from quantum mechanics, leading to the following scheme:



where Process 1 is governed by the generalized Franck-Condon principle (Ji 2012, Sect. 2.2.3) and Process 2 by the principles of biological evolution reviewed in Ji (2012, Chap. 14).

Conformons are the molecular objects that embody not only *energy* but also *information* necessary and sufficient for driving goal-directed molecular motions of the cell and, hence, can be viewed as the fundamental particles of life. That is, *conformons* can be viewed as the mediators of a new force in nature called *the cell force* in

analogy to the gluons mediating the strong force in atomic nuclei (Ji 2012, pp. 444–448).

Cross-References

- Biology, Theoretical
- Biosemiotics
- Cardiology
- Chemical Thermodynamics
- Energy in Physics
- Molecular Modeling
- Quantum Theory
- Semiotics

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Connectivity

- Magnetoencephalography (MEG)

Consciousness

- Science and Kabbalah
- Self
- Self, From a Psychological Perspective

Consciousness (Buddhist)

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Related Terms

viññāna (Sanskrit); *viññāṇa* (Pāli)

Description

The nature of the mind and its functions are a central concern of Buddhist thought. In fact, in a way, early Buddhism could perhaps be considered as marking the beginning point of the study of the mind in the history of mankind. The analytical attitude adopted toward the mind places Buddhism at an interim point between science and religions, in as much as, although clearly having a soteriological orientation, the Buddhist concern with the mind and its functions shows considerable affinity with scientific methodology.

The primary role of the mind in Buddhist thought finds its expression in two stanzas that open a collection of canonical poetry, according to which the mind is the forerunner of all things (von Hinüber and Norman 1994, Stanza 1–2). According to a canonical discourse, the whole world is led along by mind, which is the one thing that has everything else under its control (Feer 1884–1898, I 39).

The early Buddhist perspective in regard to any manifestations of the mind is that, while its existence as a process is never put in question, the notion that an unchanging substance or self

can be found anywhere in the mind, or apart from it, is dismissed as mistaken. What is commonly referred to as the “mind,” should according to Buddhist thought be understood as a conditioned and impermanent process of mental events. From a Buddhist perspective, this mental flux is all that is required to account for personal continuity during life and throughout the series of rebirths from one life to another, for the margin of personal freedom to take decisions amidst a complex set of conditionings of the mind, and for the karmic retribution that arises in dependence on the ethical quality of the decisions that have earlier been taken.

The complexity of the Buddhist analysis of mental phenomena finds its reflection in the use of different terms to refer to the mind as a phenomenon. Besides “consciousness,” *vijñāna* (Sanskrit) or *viññāṇa* (Pāli), other terms of frequent occurrence are *citta* and *manas*. Although at times these three terms occur together as synonyms (Carpenter and Rhys Davids 1890–1911, I 21), taken on their own, each of them conveys a slightly different nuance.

Citta stands for the mind as the center of subjective experience, in particular in the sense of signifying the activity of the will and what could perhaps best be gathered under the term emotion.

Manas represents mind as a mode of action distinct from verbal and bodily action and as the sixth of the senses, where – besides the five physical senses of eye, ear, nose, tongue, and body – it covers the activity of thought and reflection.

Vijñāna or *viññāṇa* refers to being conscious by way of the senses. The same term also stands for the stream of consciousness that continues during a single life and through subsequent rebirths.

Consciousness is also part of an analysis of the individual into five so-called aggregates. While the first of these five aggregates corresponds to the physical body, the remaining four represent different aspects of the mind. Besides consciousness, these are feeling, perception, and volitional reactions. As an aggregate, consciousness comprises past, present, and future instances of being conscious, be these internal or external, gross or subtle, inferior or superior, and far

or near (Trenckner and Chalmers 1888–1896, III 17).

In a series of similes that illustrate the nature of each of these five aggregates, consciousness finds illustration in the example of a magic show (Feer 1884–1898, III 142). By thoroughly scrutinizing the tricks of a magician, a keen observer would find no substance in them. In the same way, on close inspection, consciousness turns out to be devoid of an enduring substance.

Besides its role in the context of the scheme of the five aggregates, consciousness stands in third position within the 12-link standard representation of the dependent arising of *duḥkha* or *dukkha* – a term whose meaning ranges from barely noticeable dissatisfaction to outright suffering as inherent features of human existence (► *Dukkha*).

According to the traditional interpretation of the 12 links of dependent arising (► *Dependent Arising*), consciousness represents what is reborn. In other words, consciousness is what descends into the mother’s womb at conception (Carpenter and Rhys Davids 1890–1911, II 63). From an early Buddhist perspective, however, it would be wrong to believe that the same consciousness passes away and is then reborn (Trenckner and Chalmers 1888–1896, I 256). Instead, rebirth takes place by way of the stream of consciousness (Carpenter and Rhys Davids 1890–1911, III 105), a changing process that is considered to be devoid of an abiding permanent entity.

Being included in the series of links of dependent arising, consciousness is evidently considered a conditioned phenomenon, dependently arisen in a way that is comparable to fire that depends on its fuel (Trenckner and Chalmers 1888–1896, I 259). Although arising in dependence on the senses and their objects, consciousness is not considered the automatic product of the existence of a sense and its correspondent object. Besides sense and object, there needs to be the factor of engagement between these for consciousness to manifest (Trenckner and Chalmers 1888–1896, I 190).

As a dependently arisen phenomenon, consciousness lacks the property of intrinsic

independence that apparently was part of some ancient Indian conceptions of a self. From a Buddhist perspective, consciousness is rather impermanent, unsatisfactory, and not-self. Contemplating the nature of consciousness in this way will free the practitioner from appropriating consciousness as “mine” or identifying with it as “I” or “myself.”

With later phases of Buddhist thought, the analysis of the mind becomes more detailed, and a range of mental states and mental factors are identified. As part of this development, the impermanent nature of the mind is given increased emphasis, leading to the theory of momentariness. This somewhat radical conception of the impermanent nature of the mind (► [Impermanence \(Buddhist\)](#)), according to which each mind moment disappears as soon as it has appeared, appears to have stimulated further developments attempting to account for mental continuity.

In the southern Buddhist tradition, this was achieved through the concept of the subliminal consciousness, called *bhavaṅga*. With some of the northern Buddhist traditions, the concept of a store consciousness, *ālaya-vijñāna*, appears to fulfill a similar purpose. This store consciousness functions as a repository for the seeds of former deeds through the process of rebirth in *saṃsāra*. Eventually, the store consciousness was considered to be the very source of the world, which thus was seen as a projection of consciousness. In other words, reality in its ultimate sense was held to be “mind only.”

The early Buddhist position, however, maintains a middle position in this respect. According to this middle position, even though the mind is considered to be of prime importance, reality is not grounded in the mind alone. Consciousness is thus merely that by which an actually existing world is experienced, any aspect of which is conditioned, impermanent, and without any abiding substance. While the mind is seen as nothing apart from an ever-changing process of mental flux, the early Buddhist conception of the mind does allow for personal continuity throughout the cycle of rebirths, for the effect of mental conditioning on decision making and for karmic

retribution, without needing to introduce additional concepts for this purpose.

Concern with the mind in early Buddhism is above all pragmatic, in the sense of focusing on what is related to the task of liberating the mind from defilements. It is only with later developments of Buddhist thought that attempts were made to develop a more exhaustive description of the mind in all its possible modes, functions, and manifestations.

Cross-References

- [Consciousness, the Problem of](#)
- [Experience](#)
- [Theory of Mind](#)

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Consciousness, the Problem of

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Consciousness is an obvious reality for us, and yet the most mysterious thing. It is primary given to us. We know what it feels like to be conscious: we know that we know. We are aware of a perception of pain or joy. We consciously enjoy a particular color, or a certain wine. We know how to distinguish between our dream states and waking states. In states of lucid dreaming, some people are consciously aware of the fact that they are now dreaming. However, our culture will have us believe that all that matters, really, is matter, because we can measure, engineer, and manipulate it, to our well-being and also to the detriment of ourselves and others. Yet, what is indeed the first presupposed and given reality is always consciousness, the conscious I that reflects, perceives, thinks, negates, suffers pain and joy, desires and can let go of desires, is angry and can forgive, loves and hates, has goals and dreams out of which it constructs new insights, invents new solutions for problems, or has new ideas about old questions. The problem is how to explain human consciousness in relation to the human brain. While this dualist stance – a conscious I vis-à-vis a totally different material reality – is still defended, because it is our natural starting point and eminent thinkers like Plato, Plotinus, Saint Augustine, or René Descartes have built upon it, contemporary scholars and scientists defend some sort of materialism (Metzinger 1995, 2000). This is the doctrine that all mental phenomena are somehow derived from material reality. Often, such materialist monist positions are also called physicalist, because they insist on the fact that ultimately all phenomena boil down to

physics and will be explained in terms of scientific theory. A minority of thinkers object and insist that the problem of consciousness is so radically different from all material phenomena that it will never submit to a physicalist solution. And fewer still support a worldview that posits matter is ultimately derived from consciousness, so-called ► [idealism](#) or an idealist-monist view. Trying to explain consciousness as some phenomenon derived from matter means engaging in some form of reductionism.

Reductionism

There are various types of reductionism. They can be classified into two main types: ontological and methodological reductionism, depending on whether we mean that phenomena, processes, or events can be exhaustively explained by other phenomena, processes, or events or not. Hence, a scientific or causal reductionist view may be classified as ontological or methodological reductionism. However, reductive materialism and eliminative reductionism are tokens of ontological reductionism. *Ontological reductionism* has the purpose of providing an exhaustive explanation of some phenomenon, process, or event (the *explanandum*) in terms of another phenomenon, process, or event (the *explanans*). Accordingly, *something x* is explained in terms of *nothing but y*. In such a view, consciousness can be exhaustively explained in terms of neural activity. Also, *x* explains the occurrence of *y* and is the real nature of *y* (reductive materialism). In other words, the brain explains the occurrence of consciousness, and hence, the brain *is* the real nature of consciousness. Finally, *some unknown x* of the past has successfully been explained in terms of *nothing but y*. From this, it follows that *some unknown x* will be explained in terms of *nothing but y* in the future (Runehov 2007).

Methodological reductionism has various meanings: (1) every explanation ought to be continually reduced to the simplest possible explanation; (2) a research strategy for analyzing objects of study, such as cells, in terms of their parts, like macromolecules, as well as for

applying successful theories in one area, such as Darwinian evolution, to other areas, such as sociology or religion; and (3) it may aim to reduce a whole to a specific set of parts for a scientific purpose without claiming that this is a complete explanation. Methodological reductionism implies that *something* x is explained in terms of y but x is not reducible to y . Hence, there is no claim for exhaustiveness.

Types of Materialism and Physicalism

Materialism is the theory that everything that exists is material. According to Michael Lockwood, materialism consists of everything that occupies or takes place in space and whose existence is ultimately constituted by the properties and relations, actions, and interactions of particles and fields or whatever basic entities physics deals with (Lockwood 1989).

Materialist/Physicalist Theories of the Relationship Between the Brain and Consciousness

The first theory is known as identity theory (ID). Identity theorists maintain mental states and processes, both conscious and unconscious, are identical to brain states and processes. The identity theory of mind holds that mental processes just *are* brain processes, not merely *correlated with* brain processes. A weaker variant of this theory is the token identity theory, which implies mind-brain identities can occur only on the level of individual (token) events (Davidson and Davidson 1980).

However, we know by now that the brain uses always the same physiological principle. Inputs, whether from the senses or from brain activity itself, create an excitation in a neuron whose membrane, if adequately stimulated, will depolarize, allowing an exchange of ions with the surrounding fluid, generating an electrical activity along its own membrane. This leads to the rapid depolarization of the membrane at the axonal end of the neuron which will result in the release of transmitter substances into the synaptic

cleft, which in turn will trigger a change in membrane permeability at the other side and so transmit the stimulus. Over time, we will see the neuron depolarizing in spikes of electrical activity with a certain frequency. Nowhere in the brain do we see any of the richness of our subjective experience. All we see is confusing patterns of electrical activities and release of different classes of neurotransmitters, often even released by the very same neuron. Thus, the simple equation “brain activity is conscious activity” is seriously challenged (Searle 1992).

Advocates of eliminative materialism, for example, Patricia Churchland (1986), argue that even though consciousness is a complex issue, as an entity it is simply a misconception due to ignorance. Similar to our ancestors’ assuming the gods are angry when a flash of lightning struck and thus hypostasizing the “wrath of the gods” into a real entity, we are ignorant about what consciousness is and hence speak about it as if it were some extramaterial reality. Once we know this, our understanding, our language, and our concepts will change. “The wrath of the gods” used to be a metaphorical way of speaking about a reality that was somewhat diffuse and not known, but it was not about a real entity since “the wrath of the gods” does not exist. Similarly, consciousness is a metaphorical way of speaking about something we do not understand yet, and once we do, this way of speaking will gradually become obsolete and disappear. The problem with such a view is that there is no logical relation between what happened in the past and what will happen in the future. Also, while “the wrath of the gods” is a concept quite far from subjective experience, the conscious I is the subject of experience, and hence, the parallelism of the argument is ill founded. Also, promises of future achievements are a bit like promises of the future paradise: it has more to do with religion than with science.

Eliminative materialism has some similarity with epiphenomenalism, the view that consciousness is just some by-product of physiological activity of the brain, which is not really important. The primary function of the heart, for instance, is pumping blood. As it happens, this pumping also produces different other

phenomena, such as the heartbeat which can be heard or blood pressure which can be measured. But both of them are secondary to the real function of the heart. They are indicator of the heart's operation, but they do not have any substantive reality in and of themselves, let alone without the heart's activity. When the heart stops, the beat stops and blood pressure drops to zero. Similarly with the brain, consciousness is a by-product of neuronal, computational, and cognitive activity. It is quite conceivable that the brain could do its job also without them, but as it happens, consciousness ensues out of the brain's activity. But neither has it a decisive role to play nor does it influence the physiology of the brain (Dennett 1991).

Nonreductionist Materialist/Physicalist Theories of the Relationship Between the Brain and Consciousness

Supervenience and emergence are perhaps the two best-known nonreductive materialist/physicalist theories used today.

Supervenience states that there is a difference at the physical state level for every difference at the mental state level and the changes at the physical level of the brain cause the changes at the mental level. In its weaker form, the principle of supervenience holds that even though mental states depend on physical states, they are not reducible to them. Hence, nonreductive materialists/physicalists argue for some independence of mental life over and above the material/physical once it has been brought about. For practical purposes, it is important to establish whether consciousness, as a reality purportedly derived from brain activity, has an independent, causally relevant activity of its own. Immunity, for instance, also is the result of a complex interaction of a dense network of cells and specific molecules and produces a constant reinstantiation of the integrity of the organism vis-à-vis multiple threats. Yet "immunity" does not have any functional independence. Our everyday experience however tells us that consciousness has independent causality. For example, if we are conscious of a wish, we can execute it most of the times.

Our conscious experience does seem to have causal and functional independence and hence reacts back on its physical substrate, the brain. There seems to be a mutual causation going on. Advocates of the principle of supervenience argue that consciousness is dependent on brain activity, similarly to blood pressure being dependent on the heartbeat; however, unlike blood pressure, consciousness is a functional property of the brain that has causal relevance for the brain and at least some causal independence. Consciousness is supervenient on brain activity in the sense that it has its own causal laws and partial independence.

Theorists who favor nonreductionist materialism/physicalism and who want to give mental events causal capacities often adopt the principle of emergence.

They point to the fact that complex systems generate new functional properties, or rather, such new functional properties arise out of the complexity of their structure and are not reducible to neither of these structures. The traditional example is that water emerges out of the combination of oxygen and hydrogen atoms. However, again there are a variety of tokens of the principle of emergence: part-whole emergence implies that the whole is always bigger than its parts. Strong emergence or ontological emergence argues for independent causal powers of the emergent property, and weak emergence holds that the emergent property follows the fundamental causal processes of physics (van Gulick 2001).

Emergent properties have their own partial independence and create their own new structures. Life is such an example. If amino acids and lipids, ions, and other proteins are self-organized in structures like cells and cell organelles, life emerges. Those cells replicate and hence can create their own structures; they become sensitive in that they move toward areas that contain food and shun away from places that threaten them; they also start creating environments favorable to their survival. Similarly, it is argued, once a system becomes really complex, like the brain that can process and calculate enormous amounts of information and process huge numbers of interrelations of its elements, it is bound to develop a new system property,

consciousness. Once emerged, it starts operating according to its own newly emerged laws. With consciousness, several other phenomena arise that have not been there previously: for instance, some freedom of choice between alternatives, creative problem solving, and creativity in general; art and the appreciation of beauty; morals and ethics; and finally also religion.

Functionalism or Connectionism

Many involved in the study of ► [artificial intelligence](#) (AI) believe that computers can be just as complex as physiological brains and will sooner or later produce consciousness as an emergent property. Although such a system can be realized by any structure and any material, such an artificial neural network would probably be built out of silicon chips. Because of the binary gating of information and the logical linkage of such gating to multiple other binary elements, the storage of previous information and making it available for comparison and other activities, and finally learning and self-modification of the system, such artificial systems are already in some sense similar to the human brain. Computerized neuronal networks simulate an anatomically simplified abstracted version of physiological neuronal activity. However, so far computers have not displayed signs of consciousness.

Connectionists or functionalists argue that

- The brain is a system that has biologically grown to represent reality within a window of biological adaptation to the organism.
- This representation can be conceptualized as a series of computational operations which the neurons enact.
- Once this representational architecture of the brain becomes complex enough, it can produce consciousness.
- At some point in evolution, consciousness was useful because it helps the organism to set up a virtual reality in which actions and their consequences can be played through without any of the lethal consequences that such actions might have in reality.

- For this to happen, it is necessary for the system to represent not only the outside world but also its own states toward itself.
- This representation of the system's internal states is what we call self-consciousness or ego-consciousness.

From this, it follows, it is argued, that consciousness is not something independent with a subsistence of its own, but a virtual representation of the system that shuts down together with its system.

Counterarguments come from different sources, and there are plenty of them. Thomas Nagel pointed out that by looking at any biological system from the outside, we cannot understand how it feels to *be* this system. We will never know *what it is like to be a bat* (Nagel 1974) or like our friend or colleague because we cannot share their internal viewpoint. Our biological system does not allow us to experience what it is like to be flying in darkness on an echolot system, having the environment represented by auditory clicks, beeps, and sounds of varying ultrasound pitch and intensity. For the same reason, we would not know what it is like for our friend to see the very same picture in a gallery. Nagel's argument concerns the philosophical problem of ► [qualia](#), the specific subjective inside view of the experiential reality germane to consciousness. Another famous argument has been advanced by Jackson. Suppose you have a neuroscientist, Mary, who has learned all there is to learn about the brain and its workings and mechanisms and even the concept of color but does not have the experience thereof because she has lived all her life in a colorless, gray-shaded environment. Suppose now, after all this learning, Mary is suddenly able to see color. She will then have learned something she did not know before, namely, the experience of color. This would mean there is now something in her mind that she could not have had through all the knowledge of the brain seen from the outside, namely, the *experience* of color. This obviously means that the conscious experience is something different from the physical makeup that sustains it.

Yet, another challenge derives from Chalmers (1996). He puts forward the thought experiment

that it is possible to conceive of beings who have the very same makeup as ours, the same physiology, do the same things, cannot be distinguished from the outside and by physiological tests from us, but do not have conscious experience, so-called zombies. The very fact that such zombies are conceivable who do not share our conscious experience, everything else being equal, means, according to Chalmers, that the conscious experience itself, our qualia or our “what it is like to feel and experience something,” cannot be equated to our physical makeup.

To illustrate his objection to the suggestion that a machine could possess cognitive capacity similar to a person, John Searle put forward the Chinese room thought experiment: suppose in a room is some operator that has a set of instructions how to respond to questions written down in Chinese. All he does is hand out answer cards, also written in Chinese, without having a clue about what he is doing. The person at the other side of the room will always receive correct and understandable answers, because he or she speaks Chinese. But the operator does not. It would be equally silly to say the operator understands Chinese as it would be to say a computer has consciousness. That it is possible to simulate the human neural system does not mean that a computer neural network is equal to the human neural system. Roger Penrose has pointed out that humans can solve mathematical puzzles and problems that cannot necessarily be solved by computers, for instance, some geometrical problems (Penrose 1994).

Quantum Models of Consciousness

Some suggest that the brain might be a computer but a quantum computer, operating on quantum entanglement. Quantum physics (mechanics) describes quantum systems in terms of probability, which means that we can only specify, e.g., a probable location of the particle. The basic characteristic of quantum mechanics is that whenever we measure and/or observe a physical system, the system collapses to one of its possible

classical states. We do not know which state or states the system is in before measurement or observation takes place. Not knowing which state or states the system is in before measurement is what Niels Bohr meant when he said that *nothing exists unless observed*.

If we now imagine a more complex system, where different particles belong to one system and thereby have to be described as one, we can see that the whole system has a certain joint probability of displaying a combination of values. This joint state is prescribed by physical conservation laws, for instance, the fact that all spins have to add up to zero. If now one of the elements of the system is measured, this means that instantaneously the other element is also collapsing into an according state. Entanglement means that such values of measurements of a multielement quantum system are correlated. If one element is measured, the other element exhibits an according value instantaneously, no matter how distant in time or space it is. It is not defined which value will be seen. But once a certain value is seen in one measurement, the other measurement is known. Such an entangled system which can take on two values has been called a quantum bit or qbit. It has properties similar to a classical bit and hence can be used to encode information bitwise. But by virtue of the entangled state it is in and by the potential entanglement with other qbits, the potential computational power is infinitely greater. It has been shown theoretically that computers built out of such elements, i.e., quantum computers, can solve mathematical problems that cannot be solved by serially operating, classical computers, such as factorization problems of large prime numbers. Thereby, quantum computers seem to resemble the working of the human mind much better than classical computers. Phenomenologically speaking, when we think about something, solve problems, or are on the brink of having an idea, our mind “feels” like it would be soaring in a potential space to then “collapse” onto a concrete solution or idea. Thus, the metaphor of a quantum computer seems to be more adequate for the operation of the human mind.

The technical problem to solve is how to contain and preserve entanglement. This is a property of isolated quantum systems that has to be shielded from the environment, thermally and magnetically. For every interaction of a system with the environment leads to a decay of entanglement, the so-called decoherence. Hence, the technical realization of a quantum computer will depend on engineering entanglement to a preservation state that it can be used at will (Mahler et al. 2002).

Is it feasible to look at our brain as a potential quantum computer? Those in favor of such a view refer to the uniqueness of the human nervous system. Human neurons are built around filaments of skeleton called microtubules. These are hollow structures, built of certain proteins that come in helical orderings. Those proteins can be seen as little qbit-like switches, as the dimension of these molecules is such that they fall within the area where quantum mechanical laws have to be applied. The whole structure of microtubules forms a dense network, covering the whole brain, as they are the skeleton of all neurons. The size of those hollow resonators might be such that they could sustain quantum states via so-called long-range coherence. The basic idea is that even at very low energy, if the structure and size of a system are correct, it can couple to certain frequencies of electromagnetic radiation by virtue of a resonance effect. This can then lead to coherent states, similar to standing waves that can be produced through coherent excitations of resonant media across a whole system. The theory then maintains that the brain might be a system that can collapse quantum mechanical potential states and, by virtue of coherent excitation and/or entanglement as a process, can bring the whole system into a definite state. The moment of collapse of such a quantum potential into a definite state, exerted through some poorly understood mechanism called quantum gravity, is then supposed to be a moment where consciousness arises or is being produced by this collapse (for further details, see the discussion in Atmanspacher 2006).

Although intriguing from a speculative point of view, this model also supposes that something

completely new and qualitatively and categorically different, such as consciousness, emerges. Furthermore, a counterargument is that the brain is “too wet and too noisy” to be able to maintain quantum processes.

Some adopt the weak or generalized quantum theory in order to solve the problem. This axiomatic framework assumes that systems other than quantum systems proper can be described by a similar theoretical structure. Consequently, entanglement would be a property of real quantum systems as well as of other systems that obey similar formal requirements. It has been shown that at least some aspects of the visual system can be modeled along those lines (Atmanspacher et al. 2004). One can also conceptualize the process of conscious awareness as a quantum measurement process. If this is done, the quantum Zeno effect comes into play, i.e., if a quantum system is measured, it displays one of its potential states in the measurement process. Which one is measured is random. If the measurement process is repeated rapidly, then the probability of obtaining the very same measurement value as measured previously approaches. That means if we measure a quantum system very often and repeatedly, we raise the probability of obtaining always the same value to certainty. Similarly, if we attend to a conscious content phenomenologically speaking, the probability of keeping it before our mind’s eye becomes certainty.

However, this does not imply that consciousness operates like a quantum system. Rather, it implies that quantum theory might be applicable to other systems as well, among others, the human brain.

In order to understand how the world, including the brain, works, we have to, ultimately, apply quantum theory. Quantum mechanics presupposes an implicit dualism between a conscious measurement, the decision and act of what to measure, and the measured physical system itself. A reductionist physicalist approach to explain consciousness is only possible as long as one remains on a classical Newtonian level of description, which, strictly speaking, is not appropriate to explain consciousness.

Culture of Consciousness

There are a few other intriguing observations which lead some to considering consciousness in its own right. Let us subsume those observations under the heading Culture of Consciousness. Meditation techniques have been handed down in all cultures. They differ widely in their concretizations. But they have some very simple basic strategies in common. They all teach techniques of focusing attention, at least initially, in order to concentrate the mind. This then alters the current state of consciousness to a less scattered, more focused, and more mindful state. In such a state, one is intensely focused on one act or process such as when solving a problem. Being in such a state also enables one to keep a variety of contents in the present awareness, and it can be directed inward to understanding the present contents of our mind better. In any case, it alters the *quality* of our consciousness.

Shamanic rituals have been documented in cave paintings that can be dated back to at least the Middle Paleolithic period of the Stone Age, i.e., 300,000 to 30,000 years ago. Rituals typically involve intense concentration. The argument goes that when our ancestors tamed the fire, campfire rituals were held, which allowed youngsters to participate in an implicit training of attention. As a consequence, parts of our brain that are involved in modulating emotions, in memory formation, in empathy, and ultimately also in language formation and reasoning become more activated. Hence, the basic capacity and ensuing practice of focusing attention might have been at the cradle of human culture and of the human mind as we know it (Rossano 2007).

Thus, consciousness as a capacity can feed back on the purported substrate, the brain, to change the very substrate and, as an effect, also change its own makeup. Consciousness, then, is not only a result and product of the brain, but the brain structure is also a product of a culture of consciousness. Similarly, as our ancestors started to shape the architecture of the brain through rituals, community processes, and other ways of altering consciousness, as in meditation or ritualistic practices, we are changing, even assaulting

our brains through changes of consciousness related to changes in our culture and environment. It might still be unclear how cultural and environmental influences on our consciousness will affect our brains and ultimately human capacities. But it is clear that how our brain functions cannot be seen separately from how our consciousness operates, and our consciousness seems to have a clear and definite reverberation on the physical substrate, our brain. Jean Gebser's idea of an integral consciousness suggests that ultimately, a new culture of consciousness that will extend the faculties of our current state of consciousness might emerge.

A Potential Way Forward and Some Open Questions

Thus, at least from a pragmatic point of view, a dualist phenomenology seems to be necessary to deal adequately with consciousness. However, it need not feed into ontological dualism. Rather, one could opt for a transcendent monist type of ontology in which neither matter nor mind is primary but is derived phenomenological realities that are both ultimately caused by a unitary, underlying reality. Mind and brain might be complementary similarly to particle and wave representing light. It denotes two descriptions of one and the same thing that are maximally incompatible but both necessary for a complete description. In that sense, mental and physical descriptions are necessary and irreducible to understanding the human being. This would entail a monist ontology with a dualist phenomenology.

Still, we are left with the problem that some claim that consciousness can survive death or that people who have been physically dead and resuscitated sometimes report veridical information received while their brain was physiologically inactive. It is these phenomena that have contributed to the feeling that apart from individual ego-consciousness, there is a spiritual side to the person that has been termed soul and is supposed to be different. Often such metaphysical notions have been merged with a dualist stance of the mind-body problem. It might be more useful to disentangle the problems at this point and note that this question of a potential transindividual

consciousness or soul has not received adequate attention. Materialist and reductionist thinkers would of course state that these questions have become obsolete with our modern views and a scientific approach. Those who focus on phenomena point to the fact that the modern theories ignore such phenomena. Perhaps, it is necessary to document the purported phenomena well before they can be used for scientific argument and keep theorizing open ended for the time being.

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Consequentialism

- [Utilitarianism](#)

Conservation

- [Divine Action](#)

Console Games

- [Games, Computer](#)

Constructionism

- [Social Construction in Psychology](#)
- [Theoretical Psychology](#)

Constructive Theology

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Related Terms

[Christian theology](#); [Dogmatic theology](#); [Systematic theology](#)

The term “constructive theology” is often used synonymously with the terms Christian theology, systematic theology, or dogmatic theology and connotes an understanding of theology as a discourse that is both constructed and engaged in ongoing construction. Constructive theology is, therefore, a discourse that is always in process and open to interaction with other forms of knowledge, including knowledge produced in the social and natural sciences.

One of the differences between constructive and systematic theology is that the latter seeks to develop a system, based on philosophical approaches or particular themes or insights, which provides a comprehensive framework for theological topics. Constructive theology, on the other hand, rejects closed systematic frameworks in favor of more open ended reflections. One of the differences between constructive and dogmatic theology is that the latter often focuses on doctrines and concepts with little attention to matters of everyday life and experience. Constructive theology, in contrast, links doctrines and concepts with particular expressions of life.

The term constructive theology is relatively new. It has been in use since the 1980s. There are several prominent professorships in theology in the United States, which have adopted the term, including professorships in constructive theology at Drew University and the United Seminary of the Twin Cities, occupied by Catherine Keller and Eleazar S. Fernandez, and the Wendland-Cook Professorship in constructive theology at Perkins School of Theology, Southern Methodist University, occupied by Joerg Rieger.

While the term constructive theology has become a constant in contemporary theological discourse, it still rarely occurs in theological dictionaries. One exception is the *Evangelical Dictionary of Theology*, which defines the term in relation to the development of a particular workgroup on the topic of constructive theology, said to be concerned with “clarifying how the church can meet and shape the actual world with a Christian message freed from bondage to arcane models of vertical transcendence.” The *Evangelical Dictionary* accuses constructive theology of unwittingly deconstructing and demolishing biblical faith, implying that biblical faith is only supported by more conservative theological models (Elwell 1984, 269, 271).

Although the agenda of the so-called Workgroup on Constructive Theology has changed over the years, the workgroup still exists, and its theological production over the past four decades helps define constructive

theology better than any definitions that individuals might give. The theological orientation of the Workgroup on Constructive Theology has morphed from an initial commitment to theological liberalism and critical modernism in the 1970s and 1980s (Hodgson and King 1982) to engagements with liberation traditions and postmodernism in the 1990s (Chopp and Taylor 1994). Since that time, the workgroup, which is currently made up of a diverse group of about 60 theologians working in the United States, has grown increasingly complex in its theological orientation. In one of its most recent textbooks, it has developed a new concern for traditional theological roots and developments, as awareness of these roots is weakening in the academy and with students (Jones and Lakeland 2005).

The large variety of theological perspectives of the Workgroup on Constructive Theology today includes liberals, postliberals, and liberationists; feminist, Latino/a, African American, neo-orthodox, and process theologians; historicists, pragmatists, and cultural theorists; postmodernists of Derridean and Marxist varieties; and postcolonial theologians (Jones and Lakeland 2005, 5). For an example of workgroup members engaging postcolonial methods and topics, see the volume *Empire and the Christian Tradition* (Kwok, Compier, and Rieger 2007). The publisher of choice of many theologians identifying with the methods of constructive theology has been Fortress Press.

In one of its most recent collaborative publications – the fourth in a series of textbooks produced over 35 years – the members of the Workgroup on Constructive Theology note “that religious beliefs have the power to tear down cities as well as build up nations, that theology has the capacity to save lives as well as to take them.” In short, “theology really is a life-and-death endeavor” (Jones and Lakeland 2005, 1). This is the most crucial concern of contemporary constructive theology; any engagement with other forms of knowledge, including the knowledge produced by the sciences, needs to be seen in terms of this life-and-death endeavor.

Other constructive theologians have expressed the task of constructive theology in the following ways:

Catherine Keller notes that “faith is not settled belief but living process. It is the very edge and opening of life in process. To live is to step with trust into the next moment: into the unpredictable” (Keller 2008, xii). The alternative, rejected by constructive theology, is a belief in God that assumes that it has it all figured out. The task of constructive theology in this account is to deal with faith as a dynamic entity and to liberate it from the misunderstanding that it can ever be fixed and static.

According to David Jensen, another professor of constructive theology at Austin Presbyterian Theological Seminary, uniformity of theological details is not the goal of constructive theology. In an edited volume on the doctrine of the Holy Spirit, Jensen identifies the “bedrock of conviction” of progressive theology in the following way: “As the Spirit gives life, we are to seek life amid the forces and spirits that threaten life in our day” (Jensen 2008, xvii). Because constructive theology engages life, it finds itself in opposition to all that endangers life.

Constructive theology is, therefore, never a merely descriptive endeavor. It is an effort to understand and construct theology in the present, imagining what life-giving faith might look like.

While the term constructive theology is often used in relation to progressive theology in the United States, since 1995 a *Journal of Constructive Theology* is being published in South Africa by the Centre for Constructive Theology at the School of Religion and Theology (SORAT) at the University of Kwazulu Natal. The contributions published in this journal bring together classical theological issues and the struggles of everyday life, including social tensions affecting South African society and other matters of public concern, like the AIDS crisis. The subtitle of the journal is “Gender, Religion and Theology in Africa,” and the editors are Professors Isabel Apawo Phiri and Sarojini Nadar of the University of Kwazulu Natal.

Constructive theology in all this different contexts is characterized by a concern for the

constructed nature of all theology and a commitment to the ongoing constructive task of theological work. It takes seriously the insight that all reflection and thought, theological and otherwise, are related to life and that there is no escape. This is true also for beliefs and faith. As the theologians of the Workgroup on Constructive Theology have put it: “Beliefs are...profoundly shaping not only how we perceive our world but also how we engage and respond to it” (Jones and Lakeland 2005, 13). At the same time, our beliefs are also shaped by our perceptions and engagements of the world.

Critics of constructive theology worry that emphasizing the constructed nature and the constructive task of theology will lead to theological relativism. Yet relativism is not the necessary result of an appreciation for the relativity of faith, belief, and theological reflection. On the contrary, overlooking the relativity of faith, belief, and theological reflection often results in approaches that universalize relative positions. While it has often been taken for granted, for instance, that the theologies produced by white male Europeans or Americans are universal, we are beginning to understand that these theologies are also relative, as they are produced in particular places and times by particular individuals and groups. Similar insights apply to the work of scientists as well (Harding 2008).

Understanding how faith, belief, and theological reflections are always responses to particular challenges of life and to particular experiences of God is a first step toward the formation of common concerns and denominators that bring together different approaches (Rieger 2001). More specifically, examining faith, belief, and theological reflection in the midst of the struggles of life that affect us all, albeit in different ways, allows for the development of constructive theologies that acknowledge relativity but do not end up in relativism. Postcolonial theologies, for instance, are constructive theologies that have developed particular ways of dealing with relativities imposed by the powers that be while bringing together the concerns and life experiences of the many who

have experienced the effects of these powers in their own bodies.

Taking seriously the constructed nature and the constructive task, at the core of the definition of constructive theology, can open up new possibilities not only for the work of theology but also for collaborative projects that combine insights from theology and the social and natural sciences. In the process, these disciplines can develop a new sense for the contingencies of everyday life, which does not neglect the big questions of truth but locates truth in particular contexts.

Cross-References

- [Critical and Cultural Theory](#)
- [Liberal Theology](#)
- [Postliberal Theology](#)
- [Pragmatism \(Theological Interpretations\)](#)
- [Process Theology](#)
- [Relativity](#)
- [Systematic Theology](#)
- [Theology of Liberation](#)

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Constructivism

- [Social Construction in Psychology](#)

Constructivism (Philosophy of Mind)

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Related Terms

(Epistemological) Antirealism; Idealism

Description

The collective term “constructivism” (from Lat. *construere*: to construct) covers all theories of cognition, which particularly emphasize the active contribution of the subject in the process of cognicizing. Thus, “constructivism” is used to group together various epistemological views in philosophy, psychology, sociology, theory of sciences, etc., which maintain that cognition or knowledge is not, or not so much, passively received, but actively built up and constructed.

Beyond this general characterization, several basic types of constructivism can be distinguished, namely, *Radical Constructivism*, *moderate constructivism*, *global and regional constructivism*, and *cultural and naturalistic constructivism*.

Radical and Moderate Constructivism

Radical constructivist views reject cognition as being sufficiently determined by the external world, independent of the mind, so that warranted or justified beliefs about the world can be achieved. However, radical constructivists usually do not deny the existence of an external world like ontological antirealists do. Rather they deny that anything definitive can be known about it, which is a view more in line with an

epistemological antirealist view. Moderate constructivist views acknowledge the active role of construction in our belief-building processes, but also hold on to the possibility of cognitive relevant feedback from reality, in terms of falsification or validation. According to this view, the accurate recognition and description of objective facts and contexts is, at least in principle, possible, even though human knowledge remains conjectural and provisional.

Global and Regional Constructivism

In addition, global and regional types of constructivism can be discerned. Many philosophers or scientists are not generally constructivists, but hold constructivist views with regard to particular regions of reality or subject matters under discussion, such as, for instance, moral or aesthetic properties, mathematical objects, natural kinds or species and, in principle, anything.

Cultural and Naturalistic Constructivism

Finally, there are cultural and naturalistic versions of constructivism. While cultural variants of constructivism maintain that cognition is mainly a sociocultural product (see the note to T. S. Kuhn below), naturalistic variants put emphasis on the evolutionary, biological, or neurological conditions and foundations of human cognition.

Brief History

Constructivism has a long history, which can be traced back to medieval *nominalism* and ancient *skepticism*. However, constructivist views have become more influential only since the seventeenth and eighteenth centuries, when British empiricism, and subsequently German idealism, emerged. Particularly D. Hume and I. Kant are to be mentioned as influential precursors to and pioneers of contemporary constructivism. According to Hume, all “ideas” held in the human mind, of any level of complexity, can be derived from simple “impressions,” i.e., mental reconstructions of sense perceptions, which we interconnect in a habitual way. Moreover, since, according to Hume, all we have are perceptions and inferences

do not lead beyond perceptions, but just to these again, we cannot know whether there exists a world independent of our perceptions and what it would be like. Kant argued that the schemes of ordering which constitute human cognition (i.e. “categories” such as substance, relation, causality, etc., and the “a priori forms of intuition,” i.e., time and space) are located in the cognicizing subject rather than in the external world. For that reason, empirical knowledge does not reflect the world as it is in itself, but only the way it appears to us, i.e., the “world of appearances.”

In the recent history of philosophy, attempts made to give a new foundation to mathematics, in view of the foundational crisis of mathematics, have been labeled as “constructivism.” For intuitionists (L. E. Brouwer, A. Heyting) and subsequent constructivists (P. Lorenzen, K. Lorenz), mathematical objects are only considered to exist if it is possible to specify an effective procedure for constructing them. In contrast, indirect proofs of existence are rejected as being inadequate.

In the second half of the twentieth century, within epistemology and the theory of science, two schools have emerged which are explicitly referred to as “constructivism”: Erlanger constructivism and Radical Constructivism.

Erlanger Constructivism

The Erlanger school of constructivism pursues a program of developing a “reasonable language” – especially a language of science – in a methodical and noncircular way. This concept was introduced by W. Kamlah and P. Lorenzen with their formative work “Logische Propädeutik” (1967) and later continued by K. Lorenz, J. Mittelstraß, and others. Some representatives confine themselves to (re-)constructing the language of science, while regarding our everyday language and lifeworld (“Lebenswelt”) as being an inescapable starting point or “prescientific a priori.” Others, however, hold our daily practice of language to be both capable of and in need of justification.

Radical Constructivism

Radical Constructivism can be characterized as a global and naturalistic version of constructivism. Its most well-known representatives (H. Maturana, F. Varela, H. v. Förster, E. v. Glasersfeld) reject *direct realistic* as well as *representational* views of cognition and support that stance with philosophical arguments as well as with evolutionary, neuroscientific, and biological findings. The resulting antirealistic attitude leads radical constructivists to a merely *instrumentalist* view of cognicizing, according to which our everyday as well as our scientific cognition does not reveal what the external world is like (so that we would “know that”), but what is *viable*, i.e., “fitting” to our experience, and benefits our survival in some way (so that we have “know-how”). Representatives of Radical Constructivism within neurosciences (G. Roth et al.) do not regard reality as a construction of the “I,” but rather the individual “I” as an evolutionary useful, even though illusionary, construction of the brain.

Discussion and Impact of Constructivism

While Radical Constructivism has numerous followers among biologists, psychologists, sociologists, and educationalists it has few supporters among philosophers and is regarded as controversial by them. Radical Constructivism requires a consequent departure from any kind of (e.g., critical or scientific) realism, which we usually take for granted in our everyday life and often also in the practice of science. This departure, however, is not easy to maintain, since radical constructivists cannot easily do without statements about how things really are, for instance, when they argue for an antirealistic view of cognition against the realists. Hence, they should not rely on findings of the empirical sciences, for if these findings should give support to Radical Constructivism, they would require a realistic interpretation. Apart from that, it is not easy to see which kind of philosophical arguments in fact support Radical Constructivism successfully. Thus, constructivist views of cognition, whether radical or moderate, global or regional, cultural or naturalistic, seem to be

primarily motivated by an alleged lack of plausibility on the part of realistic alternatives. This eventually leads to the question of whether constructivist views of cognition can offer an overall more plausible explanation of our experience than alternative theories. This issue, however, may vary drastically across different subject areas and remains an ongoing discussion.

Constructivist considerations play an important role in the philosophy of religion and in religious studies. The formation and development of religious traditions owe themselves to complex processes of sociocultural construction (as well as criticism), which are explored and reconstructed by the history, psychology, and sociology of religion and other subdisciplines of religious studies. In principle, constructivist considerations may serve to criticize as well as to justify religious beliefs and practices. In the context of functional explanations, for instance, religious beliefs and practices were seen to be a product of socioeconomic conditions (K. Marx), infantile illusions or projections (S. Freud), or society-stabilizing mechanisms (E. Durkheim). However, defenders of religion can also rely on constructivist considerations. When it comes to the problem of diverging or competing truth claims among different religious traditions, to name only one example, religious pluralists (J. Hick, P. Knitter et al.) argue that religious beliefs and concepts can be understood in terms of an experience of a transcendent and ultimate reality, in itself incomprehensible, which is perceived and conceptualized differently within various religious traditions. However, the above mentioned explanations, as well as many other explanations of religious phenomena, often have very little support from empirical data.

Cross-References

- ▶ [Constructive Theology](#)
- ▶ [Epistemology](#)
- ▶ [Pluralism \(Religious\)](#)
- ▶ [Social Constructivism](#)

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Constructivism in Buddhism

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Related Terms

[Enactivism and Buddhism; Neurobiological constructivism and insight meditation](#)

Description

Following recent developments in cybernetics and general systems theory (Ashby 1956; Foerster 1981), in the 1980s an independent theory of biological epistemology was developed in the cognitive sciences under the paradigm of

self-organization. In this theory, cognition, mind, truth, and consciousness are no longer seen as something absolute, but emerge out of the flow of material and energy in a process of constant becoming. The basic assumptions of this approach (Maturana and Varela 1987) are as follows:

1. Cognition is conceptualized as an embodied process that is based on the fact that organisms are intertwined with their environments through their actions and perceptions. Each individual organism actively produces its own reality in the act of perception. “Every act of knowing brings forth a world.” (Maturana and Varela 1987: 26) There are as many realities as there are different organisms.
2. An organism’s actions determine what it perceives. Perception shapes cognition and is encoded into the neurological structures of living organisms. In turn, their cognitive structure shapes their actions. This self-referential circle of perception and action configures reality as in a *self-fulfilling prophecy*.
3. Different organisms link their behavior, leading to a qualitatively new form of behavior, i.e., the *production* of signs that coordinate behavior. The ability to use these signs in isolation from their immediate contexts results in the development of a new domain of action-language. Words elicit words. Communication elicits communication. Thus, along with language, the mind also develops primarily from the process of forming social connections between organisms.

In “languageing,” constructs such as the “I,” “self,” “meaning,” “sense,” and “nonsense” evolve. The associated human condition has an inherent risk of deep alienation and the suffering that goes with it. The alienation results from the fact that the praxes of perception and action become disconnected from the social and bodily origins on which they depend. This gives rise to an implicit ethical dimension. Love thus appears to be neither an abstract concept nor simply a form of sexual desire. Rather, it now appears as the basic emotion that makes humans human. In the words of Maturana and Varela:

What biology shows us is that the uniqueness of being human lies exclusively in a social structural coupling that occurs through languaging, generating (a) the regularities proper to the human social dynamics, for example, individual identity and self-consciousness, and (b) the recursive social human dynamics that entails a reflection enabling us to see that as human beings we have only the world which we create with others – whether we like them or not. Biology shows us that we can expand our cognitive domain. This arises through a novel experience brought forth through reasoning, through the encounter with a stranger, or, more directly, through the expression of a biological interpersonal congruence that lets us *see* the other person and open up for him room for existence beside us. This act is called *love*, or, if we prefer a milder expression, the acceptance of the other person beside us in our daily living. This is the biological foundation of social phenomena: without love, without acceptance of others living beside us, there is no social process and, therefore, no humanness. (Maturana and Varela 1987: 246)

At the end of the 1980s, an interdisciplinary group of scientists working with Varela et al. (1991) began to investigate to what extent the epistemology and ethics of neurobiological constructivism and the concept of embodied cognition show parallels with Buddhism.

Buddhist teachings, and in particular the early Buddhist system of Theravada Buddhism, is also a self-referential epistemological system. In this view, it is also the perceiver himself who creates the conditions of his perceiving and knowing, in his acts of perceiving and knowing. In contrast to most of the Western epistemological systems, which have focused on the search for something invariable or constant, be it an immortal soul, a universal physical constant, or an absolute truth, here reality becomes something dynamic that organizes itself in a process of constant arising and passing away, a mental and physical flow. Reality, perception, and mind develop in a creative process of continuous embodiment.

A highly fruitful new research domain that has become known as “neurophenomenology” has developed out of the meeting between neurobiological constructivism and Buddhist insight practices. This new domain is learning to take first-person methodologies seriously as

a scientific approach to the study of cognitive processes. Using this approach it is possible to relate controlled self-observation of awareness processes to the spatiotemporal patterns of neuronal dynamics in a productive way (Petitot et al. 1999).

Now, for the first time, a research program has been developed that, in contrast to the research on meditation carried out in the 1970s and 1980s, adheres to the true goals of Buddhist insight practice – i.e., the transformation of the self through self-knowledge. In almost all forms of Buddhist meditation, mental concentration (*samadhi*) is not an end in itself, but simply a means to gaining insight into the changeable and therefore essenceless nature of the self (Lutz et al. 2007).

Self-identification

Science

Although some researchers of this school practice or have practiced Buddhist meditation themselves, they see themselves mainly as scientists who are serious about complying with the high standards of scientific practice and reflection. Theories and concepts must stand the test of critical discussion. Hypotheses derived from them must be expressed in a way that allows empirical falsification.

Religion

All forms of communication are considered to be biologically and socially constructed and must therefore be seen as relative to an observer. This kind of stance stands in fundamental contrast to all religious dogma that claims to be able to make statements about the Absolute. However, in its epistemological reflections, neurobiological constructivism is faced with problems of form that are related to those encountered in mysticism. Like mystic reflection, it comes up against the problem that it must assume the unity of a difference, but cannot observe this unity with the senses or describe it through the medium of language.

Characteristics

A new branch of research has emerged which is linked to the name Thomas Metzinger and based on the perspective of analytical philosophy of mind, which also has a certain affinity with Buddhist insight practices. Here again we find the notion that the I or self is an illusion (“nobody ever had or was a self,” Metzinger 2004). However, in contrast to the view presented here, this model has shortcomings that prevent it from satisfactorily integrating the phenomenological perspective of conscious experiencing into research.

There are also well-founded approaches that bring together Buddhist insight practice and Western cognitive science in psychology (e.g., Shapiro 1980) and neurology (c.f. Austin’s (1999) excellent book). However, in terms of first-person methodologies, these approaches are not as well developed and theoretically consistent as that presented in this entry.

Relevance to Science and Religion

Dialogue with leaders of Buddhist schools is actively sought. However, a strict logical differentiation is made between scientific and religious descriptions (see, e.g., Varela and Engel 1998).

Sources of Authority

The research network of the neurobiological constructivists sees its foundations as being in the first and second generations of cybernetics, which rendered it possible to give formal descriptions of recursive systems (Norbert Wiener, William Ross Ashby, Gregory Bateson, Heinz von Foerster, etc.). The main authority on the phenomenological perspective is Edmund Husserl, who developed and carried out a program of scientifically based phenomenology. Among the neuroscientists we must mention all those who have continued to develop the paradigm of connectivism. For the dialogue

with Buddhism, the best authorities are teachers who follow a tradition that places the emphasis more on the practice of meditation than on theoretical issues.

Ethical Principles

The main principles and values are academic and intellectual integrity and the attempt to embed the results of neuroscientific research and cognitive science in an overarching ethical framework.

Conceptualization

Nature/World

The world and nature are seen as the horizon of operationally closed cognitive systems. This horizon must be presupposed but can never be reached. Meaning can only refer to meaning. Epistemically there is no access to the world outside of the limits of meaning set by one’s own cognitions. These limits can be expanded by training (e.g., by Buddhist meditation).

Human Being

Human beings are conceived of as biological, physical, and social phenomena. These three spheres are seen as inextricably linked. Since social praxes are seen as being embodied in the body and brain, this inevitably results in an implicit ethical dimension. The human mind – and therefore also happiness and unhappiness – is created by a person’s own insight practice. Love and compassion, understood as the feeling of permitting others to be worthy and accepted alongside oneself, thus appear as a biologically inherent human potential for self-transcendence.

Life and Death

In both neurobiological constructivism and the early Buddhist scriptures, the process of becoming and thus also the process of becoming conscious are described as a circular psychosomatic process. The inescapable consequence for

the process of becoming is that the actions of an organism determine what it perceives. The mode of perception shapes the potential of future cognition. Both are inscribed in the neurological structure of the perceiving organism and influence its future being and experiencing.

The Buddhist teachings describe this process as the law of dependent arising (*paticca-samuppāda*). The mind determines the body; the body determines the mind. Sense-based consciousness (*viññāna*) gives rise to the sensations (*vedanā*) in the body. The sensations produce a reaction (aversion or desire) that is in accordance with earlier conditioning of the mind (*saññā*), with meanings being attributed to the sensations. This reaction has a corresponding effect (*sankhāra*). As a result of this effect, a new sense-based consciousness arises. In *sankhāra*, the process of the mind “forming” and “being formed” is embodied. In a continuous process of becoming, mind materializes itself and is manifested as a physical structure (*nāma-rūpa*). The physical body with its cognitive capacities and its environment thus appears as the embodiment of past mind-body reaction patterns and at the same time creates the conditions for the future process of the mind.

The Buddhist concept of rebirth assumes that this process does not cease at death, but is perpetuated via a never-ending chain of further subsequent life forms. At the current state of the art, neurobiological constructivism does not have any evidence for reincarnation. Its descriptions thus refer only to the cognitive nexus of the mind-body processes of a single biological, human individual.

Reality

Reality is nothing other than the operation of operationally closed systems in the space of the present. However, reality cannot be accessed directly by observation or communication, but can only be described or deduced in retrospect.

Knowledge

Knowledge is a sphere of sense operations produced by communication in which models of reality develop. These models or programs are

conditionings that enable systems to cope with the world in their own specific ways in accordance with the action tendencies that arise.

Truth

Truth is a sense operation of the social sphere produced by communication in which knowledge is labeled with the values “true” or “false.” The possibility of an absolute, final truth is thus excluded for the domain of language.

Neurobiological constructivists must also confront the circularity of their reasoning, which becomes a problem when the observer is integrated. Attempts by the traditional epistemologies to clarify the role of the observer led to the paradox of the subject-object problem. All attempts of a subject to make itself an object are doomed to failure, since the object is now in fact the subject and the explanation thus collapses into either a paradox or a tautology. What remains, in the final analysis, is only the subject’s attempt to substantiate itself. However, to do so it would have to be able to step outside of itself – to assume an objective position – which is impossible, since the world can only be observed within the world.

Although those who support this position consider it to be science, scientific theory-building in the domain of constructivist epistemology can no longer be justified using a general “Logic of Scientific Discovery” (Karl. R. Popper). Even if this had not already been clear before, the foundational theories developed by the mathematician Gödel show that if a logical system attempts to prove itself, this must inevitably result in contradictions. However, since science is obviously empirically successful even without demonstrating its logical consistency, the question of its justification must be turned round. How does science still manage to generate its subject matter and truths – and answers to the question as to its own means of gaining insight – if they are no longer justifiable by transcendental reasoning (Kant) or logic? The answer to this question is revealed by the instruction “observe the observer” or, for science as a system, “how systems form due to the observation of observations” (Luhmann 1998, *my translation*). Thus, circular

justifications are now admissible, which are an important innovation in comparison to classical epistemology. As in “naturalized epistemology” (Willard V.O. Quine), it is now accepted that assumptions regarding the premises of knowing can themselves be influenced by empirical research. The principles and premises of the research itself can therefore be conditioned by the social praxis of research. We thus arrive at an eigen theory of the process of knowing that has the task of explaining how insight develops out of itself and finally renders self-understanding possible. The result is an epistemology in which the traditional subject-object distinction becomes secondary, the focus shifting instead to the process of the development of cognition and insight. The question is now no longer “What is the observer?” but “How does the observer arise?” The experiencing subject and the objects of perception and knowledge are therefore now no longer considered to be something substantial or absolute, but appear to create each other in a dynamic process of emerging observation.

The task of a complete eigen theory of knowledge is to show, consistently with our empirical experience, how the process of gaining insight into a reality creates a reality in which self-understanding is possible.

Perception

Perception is understood as a process in which an organism or system permits itself to be perturbed and provoked into action by the environment in accordance with its own cognitive structures and reaction patterns.

Time

Cognitive systems are time-based systems which generate certain rhythms and therefore their own system times through their own operations. The present appears not as a point but as an extended structure within physical time (cf. Varela 1999).

Consciousness

Neurophenomenological studies have demonstrated that there are structural parallels between the dynamics of neuronal processes and the change in the contents of consciousness.

However, the secret of consciousness has therefore still not yet been revealed. The supporters of this research tradition generally assume that consciousness cannot be conceived of as an entity located within the brain. Rather, it is assumed that consciousness must be understood as a process and is not therefore to be found at a distinct location (cf. Cosmelli and Thompson 2010). Here consciousness is seen neither as a thing nor as a “something,” but as an emergent phenomenon which arises out of a relational dynamic that generates itself. This position is consistent with Buddhist teachings, according to which beyond the law of dependent arising (*paticca-samuppāda*), there is no substrate of a soul or essential personality.

Rationality/Reason

In both neurobiological constructivism and Buddhism, human rationality is seen as a precondition for being able to know oneself. Nonhuman animals do not have the capacity to reflect upon their own process of self-knowledge.

Mystery

The epistemologies of the Buddhist teachings and radical constructivism have two implications which distinguish these two systems radically from most other philosophical or religious systems:

1. In neither of these systems of thought, there is a fully explicated absolute truth or an explicit meaning to our experience. All attempts to determine a truth with absolute validity are rejected by these two systems as an illusion. Maturana and Varela speak of the *nonteleological nature* of all biological forms, and the Buddhist teachings repeatedly emphasize the *essenceless* and *lack of substance* of all our sensory and cognitive processes.
2. There is an unexpected depth dimension to groundlessness, the nonrational basis of our being. An implicit order is revealed in human existence that is beyond all external prescripts and rules. The biology of incarnation contains an ethical dimension, according to which love is recognized as the implicit basis of human praxis. In Buddhist teachings,

the spiritual dimension of human existence is realized as loving kindness (*mettā*) and compassionate love.

For neurobiological constructivism, the mystery of life is manifested implicitly in our knowing how we know. One can transcend one's own being by understanding on a deep level that mind is not to be conceived of as different from the relational matrix actualized through one's own life praxis.

In contrast, the goal of the Buddhist teachings is to completely overcome human suffering as expressed in the "four noble truths" (*catvāri āryasatyāni*): the truth of suffering (*dukkha*), the truth of the cause of suffering, the truth of the end of suffering, and the truth of the path that frees us from suffering. On a superficial level, the truth of suffering appears to be the overcoming of uncertain social conditions, illness, death, etc. However, in the Buddhist doctrine, the truth of suffering has another, deeper dimension, which only becomes evident in the deep experience of *anattā* (not self), the experience of the essencelessness of all phenomena. In *anattā* we find that all attempts to introduce some kind of meaning inevitably find their antithesis in the reality of impermanence – i.e., finally in death. Only in the experience of *anicca* (impermanence), the inconstancy of all being, does the ethical dimension of the Buddhist teachings become comprehensible. Since our strivings cannot have a final goal – since any goal would unavoidably dissolve in the absolute certainty of death – the ethical gain of any action must lie in itself. All actions must be perfect, without any vestige of a transcendental expectation or a meaning beyond the lived reality. The author of the action must become completely at one with his experience. Any vestiges of a desire for something that is not being lived can never be fulfilled, nor can lingering aversion to what has been lived be discharged. The past is gone forever.

Only in the conceptual vacuum of the "ego-self" (*attā*) does the claim to having had a life other than the one that has been lived appear. It is out of this discrepancy that all the neurotic constructs of bitterness, disappointment,

and discontent and also feelings such as guilt and alienation arise. When we are attached to these states, the gap between being and experiencing increases. Openness toward others (the *Mitwelt*) is eclipsed by our aspirations to the confirmation of our concepts. Our actions are simply guided by the egocentric motives of the fantasy worlds of our "egos." In the Buddhist view, the solution to this dilemma lies in "destroying the ego," the interfering factor that prevents us from being in contact with reality. The separation between subject and object falls away, and action and perception are once more in harmony. The ethics are implicit in the living of this unity. They are lived in the awareness that all phenomena exist only in relation to other phenomena. In Buddhist terminology the three "sublime attitudes" (*brahma-vihāra*) are termed *mettā*, *muditā*, and *karuṇā*, which can be roughly translated as loving kindness, empathetic joy, and compassion. Here the knower becomes aware of the relativity of his/her own reality and beliefs. The idea of an inherent and independent soul is replaced by insight into the relational dynamics of one's own consciousness. At this level the meditative practices of self-awareness are no longer seen as a withdrawal from responsibility toward the world, but lead to a new openness to the *Mitwelt*.

With the attainment of *nibbāna* (in Sanskrit "nirvana"), the Buddhist teachings assume that there is experience that is beyond dependent co-arising. In the *Dhammapada* we read, for instance

A monk with his mind at peace,
going into an empty dwelling,
clearly seeing the Dhamma [law of nature] aright:
his delight is more than human.
However it is,
however it is he touches
the arising-and-passing of aggregates:
he gains rapture and joy:
that, for those who know it,
is deathless,
the Deathless.
(*Dhammapada* 373/374, Translation: Venerable
Thanissaro)

Since according to Buddhist doctrine, the experience of *nibbāna* lies beyond both the



five senses and all conceptual ideas, it cannot be captured in scientific terminology. Thus, the reality of nibbāna cannot be scientifically proven, and thus, it cannot be confused with the states of deep contemplation experienced by meditators, which are now demonstrable using the imaging procedures of modern neuroscience.

Relevant Themes

Comparison of neurobiological constructivism and Buddhist doctrine has proved fruitful in many ways. Also for those who would wish to view Buddhism as a religion, the Buddhist teachings can, to some extent, be seen as compatible with the neuroscientific worldview. The doctrine of the nonexistence of the soul is highly consistent with several positions within the philosophy of mind and the cognitive sciences. Buddhism would seem to be an interesting dialogue partner precisely because it can help not only to develop a new ethical position that is far from nihilistic but also to create hopeful basis in our lifeworlds that might help us to become reconciled to the idea that our egoic experience is merely an epistemic misconception. To quote Francisco Varela:

At very least, the journey of Buddhism to the West provides some of the resources we need to pursue consistently our own cultural and scientific premises to the point where we no longer need and desire foundations and so can take up the further tasks of building and dwelling in worlds without ground (Varela et al. 1991: 254).

Cross-References

- [Buddhist Meditation Practices](#)
- [Consciousness](#)
- [Cybernetics](#)
- [Emergence, Theories of](#)
- [Neuroscience](#)
- [Phenomenology](#)
- [Psychology in Buddhism](#)
- [Science in Buddhism](#)

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Consummation

- [Eschatology](#)

Contemplation

- [Buddhist Meditation Practices](#)

Contemplative

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Of or related to contemplation – that is, the act of focusing one’s attention upon something in a thoughtful, purposeful, and sustained manner. In Christian traditions contemplation, often involves intentional reflection upon one’s own inner experiences for the purposes of gaining a more profound understanding of the self, the world, and God. Other rituals of devotion often accompany Christian contemplation; examples include prayer, chanting, the reading of scripture, and specific body positions such as bowing on one’s knees.

Contemplative Neuroscience

► [Meditation-Research](#)

Contemporary Biology

► [Biology](#)

Context

► [Ecological Psychology](#)

Control

► [Automation, Electronic](#)

Control Theory

► [Control Theory \(Cybernetics\)](#)

Control Theory (Cybernetics)

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Related Terms

[Automation](#); [Control theory](#); [Cybernetics](#);
[Man-machine](#); [Regulation](#)

Description

Control theory is an interdisciplinary branch of engineering and mathematics that deals with the behavior of dynamical systems. When one or more output variables of a system need to follow a certain desired reference over time, a controller manipulates the inputs to a system to obtain the desired effect on the output of the system (► [Action Control](#)).

Cybernetics is closely related to control theory and systems theory. It is the interdisciplinary study of the structure of regulatory systems. The term “cybernetics” was coined in 1948 by American mathematician Norbert Wiener (1894–1964) from Gk. *kybernetes* “steersman” perhaps based on 1830s French *cybernétique* “the art of governing” (Wiener 1948). Both of them became a discipline of their own right in the middle of the twentieth century. Today, control theory and cybernetics are developing automatic devices applicable to physical and social systems. Departments and subjects on those topics are nowadays in most of the universities.

Self-Identification

Science

Although control systems of various types date back to antiquity, a more formal analysis of the field began with a dynamics analysis of the

centrifugal governor, conducted by the physicist James Clerk Maxwell in 1868. This generated a flurry of interest in the topic. But it could be said that the paradigm of control theory and cybernetics are self-identified as scientific disciplines since the early middle of the twentieth century.

Contemporary cybernetics began as an interdisciplinary study connecting the fields of control systems, electrical network theory, mechanical engineering, logic modeling, evolutionary biology, and neuroscience (► [Neuroscience](#)) in the 1940s. Early work sought to define and apply principles by which systems may be controlled. More recent work has attempted to understand how systems describe themselves, control themselves, and organize themselves. The ideas were soon related to biology. This branch of science concerned not only with control systems in electronic and mechanical devices but with its extension to useful comparisons and application to man-made and biological systems.

Religion

Cybernetics explores theories of self-reference to understand such phenomena as autonomy, identity, and purpose, and emphasizes with some human and social concerns. In fact, some cyberneticians seek to create a more humane world, while others seek merely to understand how people and their environment have coevolved.

Characteristics

Cybernetics is distinguished from other disciplines such as physics or chemistry because it treats not things but ways of behaving. It does not ask “what is this thing?” or “why does it behave like that?” but “what does it do?” and “what can it do?” Because numerous systems in the living, social, and technological world may be understood in this way, cybernetics cuts across many traditional disciplinary boundaries. The concepts which cyberneticians develop thus form a metadisciplinary language through which we may better understand and modify our world.

Related recent developments (often referred to as sciences of complexity) that are distinguished

as separate disciplines are artificial intelligence, neural networks, systems theory, and chaos theory, but the boundaries between those and cybernetics proper are not precise.

Relevance to Science and Religion

Control theory sees itself as a scientific endeavor with the aim to enhance the knowledge about where action by the system causes some change in its environment and that change is fed to the system via information (feedback) that causes the system to adapt to these new conditions: The system’s changes affect its behavior. In that broad sense, there is some growing interest in explaining human behavior from a mechanistic point of view (Mechanism) but the possible religious implications are weak.

Although there is a link between cybernetics, culture, and human behavior, very little work in cybernetics has centered on the application of this theory to human behavior. Instead, it has focused on technological advances in electronic and mechanical engineering.

Sources of Authority

As a branch of the engineering closely related to other empirical sciences, control theory finds the sources of authority in empirical data, repeatable experiments, and publication in peer-reviewed papers and textbooks. Their authority is self-derived by the peer-review process and from the underlying assumption of engineering that empirical data are the most reliable means of proving any statement about the behavior of any system.

As a second source of authority, there have been many good researchers who have influenced the establishment of these theories. Besides, there are many national and international scientific organizations such as The Cybernetics Society of the UK (2012) or The American Society for Cybernetics (2012). In addition to those societies, there are many scientific fora for addressing specific research topics such as the IEEE Systems,

Man and Cybernetics Society (2012), IFAC, etc. These organizations run their regular scientific meetings and in the majority have their own scientific journals. These organizations show increasing numbers of members.

Ethical Principles

On the one hand, control theory places emphasis on how the behavior of complex system is influenced by those very systems, trying to describe and explain it in a (mathematical) analytical way (► [Complex Systems](#)). It brings together theories and studies on communication and control not only in machines but in living organisms. From this point of view, there can be ethical implications that can be derived from the consequences of human actions, taking human being as complex systems.

On the other hand, disciplines that involve scientific research demand experiments that should be repeated and confirmed/refuted without making any harmful impact on humans and environment.

Key Values

Control theory and cybernetics have developed a concern for how a wide range of processes, including those involving people and work. Another key value of control is that of regulation, using feedback information from the system itself, in order to reach or acquire a desired behavior.

Conceptualization

Nature/World

Nature entertains all dynamic processes in the observable environment, including the interdependence relations between them.

Human Being

The human being is considered as a complex system with many regulation processes.

Control theory can model and analyze some of these processes.

Life and Death

Life is a dynamic process of a complex system, let us say human or any other kind of organic being. Death occurs when that process stops.

Reality

Reality is considered the physical world around us that humans can observe and measure.

Knowledge

The results of the scientific study of any process, in accordance with the feedback information that takes place in any regulation system.

Truth

The rules that so far explain the dynamic behavior of the processes.

Perception

The observations and measurements of any property or parameter that takes place in the universe. For a person to sense environmental changes there must be some reference point in his thinking, sensing, or perception which is addressed and then compared with some newer sensory information.

Time

Time is the fundamental dimensions of reality that makes a process change dynamically. Control theory aims to explain the changes in time of the behavior of a system.

Consciousness

There is not any conceptualization of this term from the control theory point of view.

Rationality/Reason

There is not any conceptualization of this term from the control theory point of view.

Mystery

There is not any conceptualization of this term from the control theory point of view. Even if this discipline could acknowledge in principle a place

for mystery, it means something that could be potentially understood applying adequate scientific knowledge.

Relevant Themes

With the development of new techniques, especially those that come from the artificial intelligence paradigm (► [Artificial Intelligence, General](#)), the control has evolved. From classical or conventional control to intelligent controllers, leaving behind the so-called modern control, this new approach tries to emulate intelligent functionalities of living beings. Ethical questions about the limits to science and technology arise from those advances. Critical issues such as intelligent machines, if machines will be able to reproduce the crucial capacities of human being, or if these intelligent devices will be able to think are posed. So far, it has been proved that automatic control means machines that learn, but how far will this go?

Besides, another ethical implication is that theoretically, every living system has some influence on every other system in large or small ways.

Finally, Wiener popularized the social implications of cybernetics drawing analogies between automatic systems and human institutions in his book *The Human Use of Human Beings: Cybernetics and Society* (Wiener 1954).

Cross-References

- [Action Control](#)
- [Artificial Intelligence, General](#)
- [Complex Systems](#)
- [Neuroscience](#)

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Conversation Analysis

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Related Terms

[Critical discourse analysis](#); [Discourse analysis](#); [Discursive psychology](#)

While there are no exact synonyms for conversation analysis, some scholars are working in closely related traditions such as discourse analysis or discursive psychology. The term conversation analysis originally was developed to apply to the ethnomethodological study of talk in interaction initially developed by Harvey Sacks (1992) and others, and which grew out of the ethnomethodological perspective developed by Harold Garfinkel (1967). The term conversation analysis has since come to be used by some others studying interaction from non-ethnomethodological frameworks as well. This terminological ambiguity does cause some confusion when searching for research in the area of conversation analysis and determining which research is ethnomethodological conversation analysis and which has its roots in other perspectives.

Description

Conversation analysis is a qualitative approach to the study of talk in interaction which developed out of the ethnomethodological perspective originated by Harold Garfinkel (1967). The goal of

conversation analysis is to discover how participants create social order and social organization through talk in interaction. Harvey Sacks (1984, 1992) decided to study talk because it was a form of social behavior that could be audio or video recorded, thus allowing for repeated direct observation of how participants acted and responded to the actions of others. While early research in conversation analysis primarily focused on informal conversations between acquainted persons (referred to as “ordinary” conversation), it has developed and expanded over recent decades to include studies of talk in a wide range of institutional and organizational settings, including talk in legal, medical, educational, political, and business contexts.

While what people are talking about, the “subject matter” of talk, is typically of interest both to the participants and to social scientists, for conversation analysts the subject matter of an interaction cannot be separated from an understanding of the procedures used to create the interaction. Participants display their understanding of the interaction via their actions, and use their knowledge of the shared procedures used to create and organize talk in interaction to interpret the actions of others. The sequential context of utterances (the words spoken in a turn at talk) is critically important for this interpretive process. The context includes the immediately prior utterance as well as earlier parts of the interaction. According to Garfinkel (1967), human action has the property of reflexivity; the interaction that is produced is also the mechanism through which participants create their social roles and the institutional context they are interacting within (Heritage 1984).

Sacks (1992) advised conversation analysts to ask “why that now” when trying to understand a particular segment of talk. Human action occurs in real time, in specific instances and occasions. In short, action is *situated action*, not decontextualized action. Thus when we examine human action, we discover that it is impossible to speak about “cause and effect” relationships between actions because the relationship between human action is not deterministic, and people decide how to respond to actions based on an

interpretation of what that action means in the context it occurs within.

Sacks (1984) notes that ethnomethodology is a “natural observational science.” By studying the methods and procedures people use to create interactions, we can develop a “grammar” of social action that explains the rules of constructing interactions in a wide range of settings and contexts. Sacks (1992) argues that interaction is orderly because people use shared methods for constructing their actions (see also Heritage 1987).

The Sacks et al. (1974) analysis of turn taking in ordinary conversation described arguably the most important organizing principles of face-to-face interaction – how participants in an interaction accomplish and coordinate the exchange of turns at talk. Many researchers consider the turn-taking system of ordinary conversation a basic set of organizing procedures which are then adjusted to form all of the other types of interactions. Adjacency pairs are two turn sequences (such as questions and answers or invitations and their acceptance or rejection) which enable participants to influence actions beyond their own turn and which can be combined in a variety of ways to produce more complex actions. In addition, routine mechanisms for “repair” of problems in talk are available to participants (Jefferson 1974), enabling them to restore mutual understanding and coordination of talk when it has broken down.

Conversation analytic studies are almost always based on naturally occurring interactions because the goal is to study what people actually do rather than artificial reconstructions or simulations of interaction. Conversation analysis involves the detailed analysis of audio or video recordings which are transcribed using a unique system developed by Gail Jefferson (1984). This transcription system preserves the details of the talk and how it was produced (including timing, simultaneous speech, repetitions, intonation, volume, and idiosyncratic pronunciations, among other characteristics). Heritage (1987) notes that social action works not *in spite of* but *because of* its details. Nonverbal behaviors, such as facial expressions and gaze direction, and the use of

settings and artifacts (e.g., documents, tools, or technology), are also critical components of human action. Conversation analysts take these behaviors into account, either using a system for transcribing such behaviors onto the transcript or viewing the videotape and noting such behaviors as relevant for the analysis.

Conversation analysts believe that discoveries can be best made by direct observation of social action rather than through a priori theory development and hypothesis testing. Sacks' (1984) argument is that as scientists, we are limited in terms of what we can hypothesize by what we can imagine. However, social life is much more complex than we could imagine, so a deductive hypothesis-generation approach will not effectively lead us toward knowledge about how participants construct their actions in everyday life. Instead, we use direct observation as a basis for theorizing (Heritage 1987). By observing human behavior directly, we can develop accurate theories about how people coordinate their actions and create intersubjective understanding.

Social scientific research that relies on a positivist approach uses theory building and testing via a deductive process involving the creation of hypotheses about the social world. Typically, statistical techniques are used to test hypotheses; these techniques rely on systematically derived samples from the population of interest. However, conversation analysts are not making statistical arguments about the relationships between variables they are studying actual behavior. Whether and how a given action is related to a subsequent action depends on its use in the local context and is visible through direct observation of the interaction itself and of participants' responses to that action. Because of this, the data sets used in conversation analytic research are described as "collections" rather than samples.

Conversation analysts collect examples of, observe closely, and attempt to categorize or describe conversational events in a way that makes their social organization (the procedures used to create them) visible. For example, Schegloff's (1979) paper on telephone call openings is generally held up as an example of an ideal

approach to the analysis of collections of data. He collected about 500 examples of telephone call openings. At first glance, the called party's "hello" when they pick up the phone looks like the beginning of the conversation, and it also looks like a greeting. But Schegloff noticed that the called person's "hello" lets the caller know that they have the phone at their ear and are now available for interaction. This "hello" is therefore the *second* turn in the interaction, not the first, and is an answer to the summons (the ringing of the phone), rather than a greeting. Schegloff was able to discover this phenomenon by observing a "deviant case" in which the phone rang and someone picked it up but did not speak. After a brief pause, the caller (instead of the person called) said "hello" in an attempt to elicit a response from the called party. Schegloff (1979) concluded that if the called person does not speak, the caller can speak first and use their turn at talk to repair the absence of the called party's response. What is important here is that Schegloff was not making a statistical argument (e.g., in 499 out of 500 calls, the called person speaks first), but an analytical argument which incorporated all 500 excerpts, even the so-called deviant case. The deviant case in which the caller spoke first still displayed an orientation to the rule that the called party *should* speak first. Conversation analysts also sometimes use the single case method. Single case analysis involves applying current conversation analytic knowledge to the understanding and explication of a single instance of interaction, often one which is problematic in nature. A single case analysis can be an effective diagnostic technique to discover the source of communication problems in specific situations, to find ways of avoiding or repairing these types of problems. For example, Whalen et al. (1988) analyze an emergency call to the police in which the caller became embroiled in an argument with the call taker which prevented them from successfully completing the business of the call (sending an ambulance).

In sum, while ethnomethodology and conversation analysis are very different from traditional sociology, they are profoundly sociological in their purpose and the subject matter of their

research. The extensive use of conversation analytic methods to study talk in workplace interactions and other organizational and professional settings has produced research with direct applicability to the improvement of the work done in those settings (see Heritage and Clayman 2010 for examples).

Cross-References

- [Collective Behavior](#)
- [Constructivism \(Philosophy of Mind\)](#)
- [Knowledge, Sociology of](#)
- [Narrative Psychology](#)
- [Natural Language Processing](#)
- [Organizational Behavior](#)
- [Phenomenology](#)
- [Philosophy of Language](#)
- [Psycholinguistics](#)
- [Social Psychology](#)

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Conversion

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Related Terms

[Religious affiliation](#); [Religious commitment](#)

Description

Conversion is surely one the most intriguing and controversial issues in social sciences and humanities still resisting universal definition or theory. Already in 1908, George Jackson had clearly stated that conversion resists all “standardization” (Snow-Machalek 1984). Eighty years later, Thomas Robbins noted exactly the same by saying that conversion studies consist “of multiple confusions related to divergent premises, conceptual frameworks, nomenclature and behavioural referents have employed by researchers” (Robbins 1988). The current situation is not much different as there are no systematic programs of methodologically sophisticated research on conversion (Hood et al. 2009). One could say that conversion is simply a religious change, but in what sense religious, and what is the subject of the change? Conversion studies have no disciplinary autonomy. Conversion studies are represented by a bundle of various methods and approaches grouped under ambivalent concept of conversion depending on authors’ varied philosophical and theoretical affiliations and concerns. We, scholars of religion, need to pay attention to what way we conceptualize conversion into assumptions we adopt

and methods we use and in what ways our theories reflect our own intuition cultural pattern, and sociopolitical intention. As the term conversion is not a universal concept, it is hard to expect a theory free from the term's own history, cultural origins, and usages in particular religious and sociocultural contexts. Also as an analytic tool, conversion is often hardly useful in empirical research. Scholars engage conversion solely in a retrospective manner, and theories and models are often based on converts' first-hand reports.

Changing the Conversion Concept

The Latin word "convertere" (to revolve, turn around) connected with Greek words "strephe" and "epistrephe" or "metanoia" from the New Testament, refers to a positive state or process of committing oneself to new community, beliefs, and rituals in Judeo-Christian context (Flinn 1999). In the European Middle Ages, conversion was predominantly related to the religious intensification of one's piety and religiousness in a context of a monastic life, or to conversion of Jews and Muslims to Christianity. After the spread of Protestantism and distortion of medieval Church universality, conversion gained more individual character and became associated with a self-authenticating, intense, "newborn" experience guaranteeing personal and collective religious revival leading to a switch to a Christian denomination and distinguishing one as a "real Christian." Classical conversion forms of Christian Protestant life fully emerged after European Christian denominations flourished in American colonies, emphasizing a personal experience of God's saving grace. In spite of many ways of using this term in various Christian streams, conversion as a sudden and dramatic religious change leading the individual to a Christian community of believers has been preserved. Constructing conversion in religious studies is primarily a Christian, or more precisely, Protestant heritage. It was only later that conversion was discovered in religions under the disputable label of "world religions," like Buddhism or Islam. What was previously held about Christianity as unique and dramatically different from others

was now held as a category of religion and religious experience. This is most apparent in early psychological conversion studies, but also present in conversion studies in general.

Early Psychological Conversion Studies

The first scientific psychology paper dealing with conversion was published in 1896 by James Henry Leuba, shortly followed by others (William James, Edwin Diller Starbuck, Granville Stanley Hall). There was a strong connection between early psychological theorizing about conversion and Protestant theology linked to (1) uncritical adoption of theological terms and concepts which were treated as scientific, (2) overemphasizing the essential nature of religious experience (conversion) as the heart of religion and its sole positive outcome, (3) separating conversion from other social and cultural aspects of human life leading to a broadly criticized *sui generis* approach and phenomenology of religion, and (4) overestimating the solely private character of religious experience and giving preference to introspection. The *sui generis* approach holds that religion (and religious experience) has its own inherent essence and cannot be reduced to anything else. Since religion is a wholly different and unique phenomenon neglected from the cultural and social reality, it deserves its own category, different research methods, and understanding. James privileged religious experience over the other constituents of religion (group, doctrine, or practice) and considered conversion as universal, one of the most genuine and authentic religious experiences. In his view, conversion is a matter of adolescent psychology, an event of self-unification that was always highly positive for the subject. This focus on the positive relationship between the conversion and mental and physical health, self-esteem, and well-being is characteristic of psychological conversion study till present-day. Conversion is by definition a positive change, and there is little interest among scholars in the negative religious change.

Sociological Conversion Studies

After a period of domination psychology in conversion studies followed by a short silence sociology came into play. This was caused by the emergence of a very popular but scientifically useless and fallacious brainwashing models (Robert Jay Lifton, Edgar Schein) and new religious movements (NRMs). Sociology with its gradual-vanishing-of-religion paradigm was surprised and fascinated by NRMs' broad social impact. This brought new issues into the spotlight. Sociological conversion research was predominantly focused on religion and ► [socialization](#) processes (Jeffrey Hadden, Theodore Long), deprivation (strain) theories (Rodney Stark, William S. Bainbridge), and social nonconformity issues (John Lofland). Broadly used drift models (John Lofland, Rodney Stark, James Downton), which assumed a step-by-step conversion process gradually fulfilled by active individual, showed that there is nothing special about conversion. It definitely lost its solely individual psychological character based on a universal religious experience category, and it started to be treated primarily as a social process related to group membership, commitment, ideological affiliations, or recruitment efforts of crucial importance to established social networks. The universal Jamesian "core experience" behind culturally conditioned expressions was being challenged. Facing various non-Christian religious movements, conversion failed to maintain its homogenous nature based on the Pauline model and lost its "once and for all" character. These facts quite seriously damaged the perennial assumptions about conversion, mainly its autonomy and distinctive religious nature. On the other hand, conversion seemed to be an issue too complicated to assign to an unstable category of membership (Arthur Greil, David Rudy), and "drift models" were valid only in the specific religious historical contexts of particular religious movements. Later on, scholars' concern shifted from conversion-as-membership to conversion-as-identity and discourse change (Richard Travisano, R. Kenneth Jones).

The Way We Talk About Conversion

Despite significant theoretical shifts, conversion as a radical transformation of identity or orientation has been preserved by a distinguishing between profound, permanent change and less serious, noncomplex, and reversible alternations (Arthur Nock, David Gordon). These dichotomies enable a differentiation between many types of religious changes, but they are not able to tell us how much change one needs for conversion to take place. They define what conversion is not in more detail than what it is. Some authors (David Snow, Richard Machalek, James Beckford) stressed the need for certain empirical indicators of conversion and criticized scholars' uncritical reliance on converts' stories, thus ignoring the situational context of these linguistic expressions, since converts' verbal accounts are always retrospective and there is no way to study conversion "live." Resulting models and theories are "ideal typical natural histories" of a particular religious group and its adherents, not causal models of the conversion process. A neophyte tries to establish herself as full-blown member; she learns how to express and talk about her own experiences in accordance with the movement's rationale (Snow-Machalek 1983). This reflects the narrative approach to religious experience in sociology (David Yamane) and conversion studies (Peter L. Stromberg).

Current Approaches to Conversion

In psychological conversion studies, psychoanalytical approaches were established (Chana Ulmann), ► [meaning-system analysis](#), which refers to the analysis of interactive set of person's cognitive, affective, behavioral, and motivational elements (self-perception and identity life purposes, attitudes and values, concepts, attributes, goals, sensitivities, ultimate concerns, etc.) that are undergoing change in the process of conversion (or spiritual transformation) (Raymond Paloutzian), ► [attachment theory](#) (Lee Kirkpatrick, Phillip Shaver), and

► [attributional theory of religion](#) (Bernard Spilka, Kenneth Pargament, Phillip Shaver, Ann Taves). Margit Warburg, inspired by the methods from history, deals with the possibility of obtaining sociological data from converts' narratives (Warburg 2008). The way we look at conversion today is influenced mainly by sociological social psychology and the cognitive science of religion (Illka Pysiäinen, Fabrice Clément).

Conversion in "Science and Religion"

Conversion is undoubtedly a doctrinal construct of Protestant theology, and as such, it was introduced to social sciences. Before any scientific study of religion was established, conversion was studied in the area of missionary studies and practical theology. Nowadays, scientific findings about conversion are being used in missiology, and missionaries graduated in anthropology often participate in conversion studies (Paul Hiebert) (Rambo 2003). Theology still occupies an important place not only in understanding and shaping of conversion experience, but also in its explanation. The development which went from conceptualizing conversion as a *sui generis* religious experience to its subsequent challenging by cultural pluralism thanks to NRMs and non-Christian religions, ended in "the linguistic turn," which gradually disrupted the term's autonomy. Since there is no religious organ or brain region (as **neurotheology** holds), or special social or psychological process equivalent to conversion, there are many ways of studying and defining it, and a general theory of conversion is unlikely to emerge. The only exception is the holistic model of Lewis Rambo who attempts to include everything from later psychological and drift models and creates a universal theory (Rambo 1993). Behind attempts to uniformly conceptualize conversion as a homogenous phenomenon at its core, despite heterogeneous features on the surface, there is still a metaphysical presumption about its autonomous nature. Conversion is studied non-theologically, although there are often background theological assumptions about the human condition and

purpose of life. In method and theory debates, a theological-friendly approach is usually linked to refusing any kind of reductionism or naturalistic approach, preserving the phenomenological nature of conversion and preferring first-person methodologies. Conversion concepts narrow our focus on "world religions" with a systematic doctrine to adopt and unified practices to follow in conversion process, even though this is not the case of most religions. The dynamics of the conversion concept in "science and religion" can be also seen as a result of the term's transition between two distinctive meta-representational contexts.

Cross-References

- [Christianity](#)
- [Emotion](#)
- [Faith and Belief](#)
- [Memory](#)
- [Phenomenology](#)
- [Psychology of Religion](#)
- [Religion, Sociology of](#)
- [Religious Experiences](#)
- [Self, From a Psychological Perspective](#)
- [Social Psychology](#)

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Cooperative Game Theory

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Game theory is divided into two branches called the noncooperative and cooperative. The main difference between these two issues is how it formalized the communication or interdependence among the players. In cooperative theory, it is usually assumed that there is no communication among players and the mathematical model describes only the output that results when the players come together in different roles.

In the noncooperative theory, it is assumed that there is communication between players, and one of the main aims is how to allocate the benefits or loss of the group among its members.

Coping

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Coping refers to the processes by which individuals attempt to manage stressful situations and their attendant negative emotions. Currently, there is no consensus as to how many types of coping strategies exist, but in general there are three overarching types: problem-focused

strategies that are directed at resolving or managing the problem, emotion-focused strategies that are directed toward regulating emotional responses, and meaning-making strategies that focus on incorporating stressors within existing worldviews and/or altering worldviews to accommodate new perspectives. Strategies in all three types of coping may be behavioral or cognitive. Coping typically occurs within a social context. Individuals may directly access social support, either for tangible help in managing the problem, assistance in emotional regulation, or for general advice, or engage in dyadic coping. The outcome of individuals' coping efforts affects not only their own well-being but also that of others, generally in the immediate social context, but sometimes in the larger socio-cultural arena.

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Related Terms

[Defense mechanisms;](#) [Problem-solving;](#)
[Self-regulation](#)

Definition

Religions coping is a multifaceted construct reflecting a variety of ways of bringing one's religious life to bear on stressful experience. It typically includes strategies such as prayer and/or meditation, relying on God, and reading religious texts for guidance. In general, religious coping is often adaptive and can lead to preservation of physical and emotional health, and a greater sense of self-efficacy. However, it is possible to distinguish helpful from harmful kinds of

religious coping. Pargament argues that the most important difference between them may be that in helpful religious coping, there is an experience of collaboration with the transcendent or divine to cope, whereas in harmful religious coping, “anger at God” or a feeling that one is being punished predominates.

Coping: A Brief History

Coping is a discipline that grew out of psychoanalysis and its study of defense mechanisms. However, psychoanalysis focused solely on unconscious strategies that people use to ward off anxiety and neglected conscious, purposive strategies that individuals use to modify their environments, their responses to the environment, and their internal emotional states. Early studies of coping styles focused on trait-like perceptual processes, such as attending to the problem (approach or monitoring) or avoiding the problem (avoidance or blunting). These were assumed to be characteristic ways of dealing with all problems. However, researchers such as Richard Lazarus questioned how consistent individuals were across situations and argued that coping consisted of conscious choices that individuals made in the face of environmental demands. Thus, coping processes consist of efforts that individuals make to manage a specific problem and the attendant negative emotions. Not all coping researchers agree that all coping is voluntary and refer to involuntary actions such as crying or swearing. Yet others argue that these are immediate emotional responses that should be distinguished from coping efforts.

There is currently no consensus as to exactly how many coping strategies there are. Most researchers acknowledge two broad overarching strategies – problem-focused and emotion-focused coping – but within these broad categories, there are many finer-grained distinctions. Most researchers acknowledge common strategies such as escape/avoidance, withdrawal, seeking support, substance use, and cognitive

reappraisal. The latter is sometimes referred to as meaning making. But there are many other strategies currently under investigation, including religious coping and providing social support to others, as well as other strategies that may be addressed to specific problems. Other researchers distinguish between emotional expression and emotional processing (i.e., what am I feeling and why?).

Two recent developments are noteworthy. The first is the recognition that coping does not occur in a psychological vacuum – rather, most coping takes place in a social context. Dyadic coping refers to joint efforts to manage problems that pairs of individuals – generally couples – make, usually with chronic stressors such as serious illness. Again, there is currently no consensus as to what dyadic coping entails. Some researchers identify four broad categories, ranging from non-involvement, to the provision of emotional or instrumental support, to collaborative efforts, and to domination or control by one of the partners. Others refer to relationship-focused coping, which consists of empathic coping – recognizing the other’s needs and adjusting one’s responses accordingly – and compromising. In other words, chronic stressors impact both members of the dyad, and partners make decisions as to what extent and how they are involved with each other’s problems. Further, the relationship in the context of the stressor must be managed as well.

The second major trend is to broaden the range of coping from dealing with an immediate, specific situation to dealing with potential problems. This includes proactive strategies to prevent or mitigate the occurrence of a stressor in the relatively near future, such as studying for an upcoming examination, and anticipatory coping, which is the accumulation of resources to prevent future problems, such as going to college to get a better job.

Self-identification

The purpose of coping is to buffer the adverse effects of stress. After several decades of

research, most scientists acknowledge that stress can have adverse psychological and physiological consequences, including mental illness and disruptions in homeostasis at the cellular and system levels, which can lead to chronic illnesses. However, there are clearly individual differences in the effects of stress, which can be attributed to many factors, including physical or psychological hardiness, social support, and coping strategies. Thus, coping has measurable impacts on health and well-being. The recognition that coping strategies can be learned – and unlearned – provides ample opportunity for interventions to teach individuals new strategies to cope with the challenges that they face.

Decades of research in coping have not led to simple answers. It is fairly easy to identify types of coping that have adverse effects, or which worsen the problem, such as substance use, rumination, or wishful thinking. However, the positive effects of coping are often highly contextual. In other words, the study of coping is complicated by the fact that there are no “silver bullets” – strategies that have positive outcomes regardless of context. This is further complicated by individual differences in coping preferences. For example, some individuals may prefer to cope by ignoring the problem as much as possible (or feasible). Forcing them to engage in information seeking or other problem-focused strategies may result in a worsening of their situation. Thus, coping interventions may need to be tailored not only to individual situations but also to individuals’ preferences. Further, researchers are beginning to understand that coping may have different short- and long-term outcomes. For example, fully engaging in a difficult problem, such as bereavement, may create additional distress in short-term outcomes but result in better long-term outcomes.

Coping as a Distinct Discipline

As a discipline, psychology typically uses four methodologies: individuals participate in controlled experiments; they answer general

questionnaires about their personality, attitudes, values, and behaviors; they can be observed in various settings; or they can be interviewed. Studies of coping processes, however, ask individuals to do something rather different. They are asked about their thoughts, behaviors, and internal emotional processes in very specific, stressful episodes. In our experience, this task is difficult for many people. When asked, “How did you cope with this situation?” respondents, especially men, typically say, “Well, I solved the problem.” Extensive interviewing experience led us to the necessity of having to ask first what emotions they were experiencing and then to ask how they coped with their emotions. Indeed, individuals often do somewhat better using coping checklists, which allow them to recognize cognitions and behaviors that may not emerge spontaneously in coping interviews. Thus, asking individuals to introspect about specific stressful episodes is a unique and difficult methodological problem for coping. This has led some researchers to doubt whether individuals can adequately report on their internal processes, especially retrospectively. Instead, they propose that experience sampling methods, in which individuals are beeped at random intervals during the day and asked to report on their immediate experience, are a more valid way of tapping internal processes. However, others have suggested that well-crafted questionnaires and interviews can elicit valid coping responses, even retrospectively.

Another source of distinction is the emphasis on appraisal processes. In order for individuals to cope, they must first appraise the situation as a harm or threat, loss, or a challenge, or simply as an annoyance. This approach emphasized that adaptation is a function of both the person and the environment, as appraisal is influenced by both personal and contextual factors. This allows the scientific study and recognition of the importance of subjectivity for adaptation. Stressfulness does not derive strictly from situational characteristics but rather is a balance between environmental demands and individual resources. Rather than dismissing subjectivity as a confounding factor

or “noise” in the system, coping research recognizes the central importance of appraisal to adaptive processes.

Relevance of Coping to Religion

Religious issues are increasingly incorporated in coping research. While early researchers ignored the use of religion in coping, its widespread prevalence forced the field to consider the effects of religious coping, such as prayer and reliance on God or a higher level of being. In general, religious coping is associated with better mental health, although its effects on physical health are not as clear. However, there are different types of religious coping, and not all are beneficial. If individuals become passive, or perceive their travails as an indication that God has deserted them, then they may have increased distress and even poorer outcomes such as increased mortality. However, the study of religious coping is still in its infancy. We do not as yet understand the situations in which individuals use religious coping, its effect in different situations, and the similarity and differences in religious coping across different religions.

Sources of Authority

There are several key figures in coping research. Given the vast expanse of the field (over 70,000 published studies), not all important scholars can be recognized here, and we apologize to those whom we may have inadvertently omitted. As mentioned earlier, the study of coping has its roots in psychoanalysis, and Anna Freud (1966) was the most instrumental in identifying different types of defense mechanisms, while George Vaillant (1977) organized them into a developmental hierarchy. Richard Lazarus (Lazarus and Folkman 1984) promulgated the importance of cognitive appraisal in the coping process, and he and his colleagues, notably Susan Folkman, developed one of the first coping scales, based partially on the work by Rudolph

Moos. Lazarus and Folkman also were the first to define coping as adaptive, or responsive to situational demands, and purposive, not simply reactive to those demands. Coping actively reflects the pursuit of individual goals within stressful situations. James Coyne, Anita DeLongis, Stephen Hobfoll, David Mechanic, and Leonard Pearlin extended the recognition of the influence of social situations on the coping process. Importantly, Pearlin (1989) argued that coping was often tied to specific social roles and suggested that the most efficacious coping was that which constrained the stressor to a specific role domain and did not allow it to spread across domains. Carolyn Aldwin (2007), Nancy Eisenberg, Gisela Labouvie-Vief, and Ellen Skinner examined coping as a reflecting and influencing developmental process. Crystal Park (2010) and Howard Tennen have focused attention specifically on the importance of meaning making, while Kenneth Pargament developed a measure of religious coping. Alex Zautra (2003), Peter Vitaliano, and Tracey Revenson provided new insights on how people cope with illnesses, most notably chronic illnesses such as arthritis and cancer. Shelley Taylor (Aspinwall and Taylor 1997) and Lisa Aspinwall proposed proactive and anticipatory coping, which are ways of avoiding or mitigating the effects of stress before they occur. Methodologically, Charles Carver and Michael Scheier (Carver et al. 1989) developed the most widely used coping scale, Annette Stanton developed an improved measure of emotion-focused coping, and Arthur Stone pioneered the use of experience sampling in coping research. Manfred Diehl (1998) and Cindy Berg have proposed a new focus on everyday problem-solving as another way of examining adaptation in late life and have developed measures to further this line of research.

Ethical Principles

Two basic ethical principles guide coping research. First, the types of stressors people often experience are far more severe than can be

replicated in a laboratory setting. Thus, in order to understand how individuals cope with major stressors, researchers must conduct their studies in a field setting. These include studies with patients with serious illnesses, with people who have experienced natural disasters, with soldiers who have experienced combat, and with those experiencing divorce, death of a loved one, or other serious family distress.

The second principle is an understanding that having individuals recount serious stressors can be extremely stressful in itself. For example, asking veterans to recount trauma experiences or rape victims to recall their attacks can evoke episodes of posttraumatic stress. Thus, research conducting retrospective studies of major stressors should have clinicians for referrals in case their respondents experience serious stress responses.

Key Values

The key value of stress research is ultimately to reduce distress and to promote mental and physical health. Stress is ubiquitous; all individuals will experience major stressors at some point (or at many points) in the course of their lives. The major assumption is that the ability to cope with stress and to mobilize existing resources can protect individuals' mental and physical health or enhance their well-being in the face of inevitable physical decline.

Major Conceptualizations

Stress is a ubiquitous part of the world, and ► [nature](#) has developed means of protecting organisms against stress. Every living being, from single-cell organisms to mammals, shares certain stress protection mechanisms, such as heat-shock proteins that protect and repair damaged genes, as well as direct dismantling of cells which are too damaged to repair. According to theories of hormesis, cells and organisms that have been stressed but which recover may display greater resilience to future stressors. Protection against the effects of stress is so important that

organisms have developed multiple and somewhat redundant systems to protect themselves.

In many ways, humans are the most stress resistant of the creatures on earth. As Rene Dubos stated, humans' greatest advantage – adaptability – is also our greatest disadvantage. Humans have devised means to tolerate stressful conditions which would result in the death of most other creatures, but doing so can come at serious costs, such as creating major chronic illnesses and much unhappiness at the individual level, strain at the sociocultural level, and, one could argue, at times environmental degradation, as we strip the earth of resources to support massive populations and to maintain the infrastructure that permits humans to live all over the planet, including in extreme environments.

A major focus of humans coping with stress is what some would call *meaning making*. From a spiritual point of view, which posits the inherent meaningfulness of life, a more appropriate term might be *meaning finding*, also known as ► [discernment](#) in some religious communities. If ► [life](#) is inherently meaningful, then ► [death](#) is also inherently meaningful. Individuals' understanding of the meaning of death affects how they cope. For those who believe in an afterlife, either reincarnation or some higher level of existence, how one copes with stress (temptation, suffering) affects who or what they will become in the next life. For those who believe that the present life is unique, death can provide meaning to life. Understanding that life is limited can encourage individuals to make the most of the life that they do have and to focus more on the positive aspects of stressful situations than to dwell on the negative aspects.

In the process model of stress and coping, the key element is appraisal, or the meaning an individual derives from the experience. Appraisal represents a transaction between what an individual brings to the situation and the characteristics of the situation. Thus, it would not be too great a stretch to say that this approaches a nondual model of reality and ► [consciousness](#). In other words, experience and ► [perception](#) are central, and there is a continuity of experience that renders the boundaries between the self and the rest of the world provisional – an understanding that

one's appraisal of the situation is not "objective" but embraces subjectivity.

From a developmental perspective, an individual's knowledge base is built up through experiences, many of which are stressful. In these situations, individuals often must increase their knowledge not only of the situation but of themselves as well. We must be able to evaluate our strengths and weaknesses, and according to stress-related growth theory, our assumptions about the world and our place in it can become more apparent. An increase in knowledge can be accompanied by a decrease in stress. Either one now has sufficient resources to meet challenges, or one can gain perspective through which one recognizes that many, if not most problems, are self-limiting and, in the grand scheme of things, not terribly important – in short, reflecting the saying attributed to Jesus: "The ► [truth](#) will set you free" (John 8:31–32).

The relationship between ► [time](#) and the stress and coping process is complex. On the one hand, stress and coping processes play out over time, but they can also alter one's perception of time. For example, in highly stressful situations, time can appear to slow down tremendously, as when soldiers report that they watched a bullet coming toward them. In situations characterized by too little stimulation, time appears to expand and slow down, while in those characterized by overstimulation, time can appear to mysteriously speed up. In other words, stress can alter the perception of time, often quite dramatically.

Jung said there was no conflict without ► [consciousness](#). Inverting this, one could say that stress may be the birth of consciousness. In other words, awareness derives from the original stress of encountering the world. The ethos of Western approaches to coping focuses on ► [rationality](#) and reason – in other words, one "should" use problem-focused coping to analyze the situation, devise a plan of action, and carry it out to solve the problem. However, coping research has shown repeatedly that emotion- and problem-focused coping are tightly intertwined and almost always co-occur. Emotions can provide the motivation for coping, and internal regulation is a sine qua non for effective

action in the world. Once again, the stress and coping process paradigm can be seen as quite usefully synthesizing apparent opposites.

If there is a mystery in coping, it is that, from conflict between self and world, the nonduality of self and other can be experienced and can provide the key to coping. As Henry Bayman remarked, "whatever you do, you do to yourself." This can be a most practical mystery.

Cross-References

- [Action Control](#)
- [Affective/Emotional Computing](#)
- [Emotion](#)
- [Ethics](#)
- [Free Will](#)
- [Freedom](#)
- [Personality Psychology](#)
- [Plasticity](#)
- [Psychology of Religion](#)

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Correspondence Hypothesis

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The idea that religiosity in the case of secure attachment develops from (a) generalized, positive representations of self and other (IWM aspect), and (b) partial adoption of a sensitive caregiver's religion (social aspect).

Cosmography

► [Geography in Islam](#)

Cosmology

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Related Terms

[Astronomy](#)

Description

Cosmology is the study of the origin, evolution, fate, composition, and large-scale structure of the Universe as a whole, as a complete entity in its totality. Contained within cosmology is cosmogony, which deals with the origin and evolution of the contents of the Universe, such as black holes, stars, galaxies, clusters of galaxies, and quasars. Astronomers provide data for observational cosmology, which deals with the large-scale properties of the observable Universe. Important astronomical constraints to modern cosmology are the discovery that the galaxies are receding

in every direction, away from us and each other, at speeds that increase with their distance; the discovery of the cosmic microwave background radiation, with its thermal black body spectrum and extraordinary isotropy of one part in 10,000; and the observed abundance of hydrogen, by far the most abundant element in the observed Universe, and helium, the second-most abundant element. All of these observations are best explained by the Big Bang cosmological theory, in which the expanding Universe arose from an exceptionally hot and dense state about 14 billion years ago. The background radiation is interpreted as the relic of the dense, hot radiation that preceded the formation of matter; the radiation has now cooled to just 2.7 K. Nucleosynthesis during the first three minutes of the Big Bang accounts for the formation of hydrogen and most of the cosmic helium, as well as deuterium and lithium. A key conclusion of modern cosmology is that the observable Universe has a history, and that we can trace its evolution from the Big Bang to the present by looking back into time when the radiation from distant objects was emitted. Recent developments in observational cosmology include evidence that the Universe contains substantial amounts of invisible dark matter, which might amount to up to 25% of the mass of the Universe. The presence of this unseen material is inferred from observations of visible galaxies, but there is no current consensus about its detailed properties. Observational cosmologists are also probing the large-scale, three-dimensional distribution of galaxies using redshift surveys such as the Sloan Digital Sky Survey. Wherever they look, in whatever direction and near or far, they find walls, chains, and filaments of galaxies of up to a billion light-years across, together with seemingly empty places known as voids, of about 100 million light-years in diameter. Observations of supernovae in distant galaxies indicate that the expanding Universe is accelerating or speeding up as it flies apart, rather than slowing down, pushed apart by some mysterious dark energy. Instruments aboard the *Wilkinson Microwave Anisotropy Probe* satellite have been used to detect temperature fluctuations, or ripples, in the

angular distribution of the background radiation, providing constraints to cosmological models and investigations of how the first stars and galaxies formed. Theoretical cosmologists use mathematical equations to describe models of the expanding Universe, usually incorporating Einstein's *General Theory of Relativity*, with or without an adjustable cosmological constant that counteracts gravity and affects the rate at which the Universe expands. The models usually include the cosmological principle, which states that on the largest scales the observable Universe is isotropic and homogeneous, so that it looks the same at any location and there is no preferred place in the Universe. Recent cosmological models use studies of supernovae, galaxy clusters, and the background radiation to put constraints on dark matter, dark energy, and the cosmological constant.

Self-identification

Science

Observational cosmology self-identifies as a science that measures the large-scale physical properties of the observable Universe in its entirety. It usually assumes that celestial bodies obey identical physical laws to those on Earth, such as the laws of universal gravitation and the *General Theory of Relativity*. Some theoretical cosmologists use these laws to explain cosmological observations, and they can design future observational tests of their theories. Other theoretical cosmologists are preoccupied with the mathematical equations and related cosmological models, sometimes with little regard for observational cosmology.

Religion

The origin of the Universe is one topic in which modern cosmology and religion overlap. The Big Bang cosmology provides a good account of the evolution of the Universe since about 14 billion years ago, but no cosmologist knows for certain what happened before that. Their equations break down at that first moment, blowing up into infinities of density, temperature, and the curvature of

space-time. Some cosmologists say that we will never have direct observational evidence for what happened before the Big Bang, which may have obliterated any evidence of previous space, time, or matter. So cosmological speculations about how the observable Universe came into being, and where everything came from, bear no more authority than most of the world religions whose creation myths explain the beginnings of the Universe and life. For most of history, cosmology has indeed been part of mankind's religious rather than scientific view. This has not kept some theoretical cosmologists from proposing an ultimate theory that will eventually explain why the Universe exists, even invoking a God particle or stating that they may eventually know the mind of God, but such a final theory has not been found despite more than half a century of trying.

Characteristics

Observational cosmology is a non-experimental science in that celestial bodies cannot be taken apart or manipulated by controlled experiments in terrestrial laboratories, and cosmological hypothesis can only be verified by passive observations. Some theoretical cosmologists develop models that have little or no definitive observational tests.

Relevance to Science and Religion

Modern cosmology is most likely incapable of answering some basic cosmological questions, which are addressed by religions and lie outside the domain of direct scientific inquiry. These include the origin, fate, and purpose of the Universe. In Saint Augustine's interpretation of the book of *Genesis* in the *Bible*, for example, the Universe was brought into being in a less than fully formed state but gifted with the capacities to transform itself from unformed matter into a truly marvelous array of physical structures and life forms. In 1951, Pope Pius XII endorsed what we now call the Big Bang cosmology, arguing that it demonstrated that the Universe had a beginning

in time and proved the existence of God, the Creator, and the Buddhists have long taught that the Cosmos we live in is only one of an infinite number, and that the Universe never begins or ends, but endures.

Sources of Authority

The ultimate source of authority in cosmology is peer review using known physical laws, mathematical calculations, and verifiable predictions of observational consequences. Any cosmological explanation of celestial phenomena ought to be tested through decisive, new observations that show that the explanation is true or false, right or wrong. Nevertheless, some theoretical cosmologists are not particularly interested in observational constraints to their models, claiming authority in the equations and models themselves.

Ethical Principles

Cosmologists are skeptical, taught to question any discovery and to test it by peer review, and they are trained to employ personal detachment and uncompromising honesty.

Key Values

The key values of cosmology are the physical explanations of the origin, evolution, fate, composition, and large-scale structure of the Universe as a whole, as a complete entity in its totality.

Conceptualization

Nature/World

Cosmologists regard nature as equivalent to the physical world outside Earth, although the natural terrestrial world is used as a foundation for physical laws thought to be applicable throughout the Universe. Nature is supposed to include both known and unknown cosmic objects and

phenomena, either perceptible with contemporary astronomical telescopes or currently unseen and potentially observable with future instruments. Some theoretical cosmologists have suggested that our observable world is just one of multiple Universes that can never be observed, but this is essentially a nonscientific proposal somewhat like a similar Buddhist one.

Human Being

Cosmology does not normally consider either human beings or the pains and pleasures of human life, which are thought to be outside the domain of cosmological inquiry. Cosmologists do determine the contents and structure of the Universe, and by extension humanity's place in it. The Earth and Sun, for example, lie in the outskirts of a perfectly normal galaxy, no different from billions of other galaxies all participating in the expanding Universe that has no observable center or edge.

Life and Death

Cosmologists adopt the discoveries of astronomers and astrophysicists, who have shown that our planet and everything on it are composed of elements synthesized either in the nuclear crucibles of stars that exploded into space before the Earth and Sun formed or before that during the first moments of the Big Bang that gave rise to the expanding Universe. Despite our ability to pry living things apart, identifying their atomic, chemical, and molecular constituents, which can often be found outside Earth, no one has discovered the spark of life, showing how inanimate matter could have been transformed into a living thing, either on our planet or elsewhere. Astrophysicists forecast that life on Earth will not last forever, and that the entire human race is scheduled for extinction in a few billion years when the brightening Sun will vaporize the Earth's oceans.

Reality

To most cosmologists, the real Universe consists of the currently observable one, but they often believe in a yet undiscovered, invisible reality

that lies beyond the visible one and includes all that exists. Some cosmologists are immersed in a paper world of theories that describe their reality, but some astronomers would say that their perspective has become blurred by mathematical equations and is disconnected from the real, observable Universe.

Knowledge

Cosmologists regard knowledge of the Universe as a cumulative, ongoing process of the discovery and explanation of its large-scale ingredients and their collective behavior.

Truth

Most cosmologists believe in an objective, scientific truth verifiable by decisive observations and significant tests. Others hold that cosmological models and related mathematics can also provide true descriptions of the Universe.

Perception

Observational cosmologists use new technology and novel telescopes to extend the capacity of their physical senses, thereby perceiving, becoming aware of, and eventually understanding otherwise invisible physical properties of the large-scale Universe. These perceptions are repeatable, and can be obtained by anyone using the same or similar instruments. Some cosmologists regard mathematical extrapolations of existing physical laws as another method of perception.

Time

Because light travels at a finite speed, astronomers look back into time when observing distant objects. Powerful telescopes are therefore used as time machines to see objects as they were in the past, when their light was first emitted. The general conclusion is that everything in the observable Universe is changing, arising in one form, evolving into other ones, and eventually passing away to be replaced by something else. Observational cosmologists are, for example, now tracing the history of the expanding Universe back to the first moments of the Big Bang, when fluctuations were imprinted in the background radiation and

soon thereafter when the first stars and galaxies were formed. No cosmologist knows for certain what happened before the Big Bang, and time might have even begun with this creative event.

Consciousness

To a cosmologist, consciousness is the mental awareness of the surrounding Universe, involving the perception of its large-scale properties that might be explained by known physical laws.

Rationality/Reason

A cosmological concept is normally termed rational if it uses accepted physical laws and can be decisively tested by significant observations. Some cosmologists regard any mathematical extrapolation of existing physical laws as rational.

Mystery

The entire Universe is regarded as a great hidden mystery awaiting discovery and understanding, and its known constituents may also have mysterious aspects that remain to be examined and understood. The ultimate origin of the Universe remains shrouded in mystery, as do the properties of dark matter and the mysterious dark energy.

Relevant Themes

There are many critical, unanswered questions about the Universe that lie outside the domain of cosmology, and are concerns of religion. They include the origin and fate of the Universe and life within it, and the purpose of either one of them. No cosmologist knows for certain what happened before the Big Bang, or how the observable Universe came into being, and they do not know if life originated from inanimate matter, or exactly what might have provided the spark of life on Earth. And owing to the recent discoveries of dark matter and dark energy, which we know almost nothing about, the eventual fate of the observable Universe remains unknown, despite the fact that distant galaxies are now accelerating into invisibility.

Cross-References

- ▶ [Astronomy](#)
- ▶ [Astrophysics](#)
- ▶ [Landscape](#)
- ▶ [Physics in Christianity](#)
- ▶ [Physics in Judaism](#)
- ▶ [Physics in Protestantism](#)
- ▶ [Science in Buddhism](#)
- ▶ [Space](#)
- ▶ [Space and Time](#)
- ▶ [Time](#)

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Cosmology in the Jewish Culture

- ▶ [Astronomy in Judaism](#)

Cosmos

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The universe seen as a whole, often as a universal living entity.

Counseling Psychology

- ▶ [Clinical Psychology](#)

Counseling Psychology USA/Europe

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Related Terms

[Guidance](#); [Mental health](#); [Prevention psychotherapy](#); [Therapy](#)

Description

Counseling psychology is the study and application of psychology for the purpose of promoting well-being, alleviating psychological distress, and resolving crises in individuals, families, and groups. A central aspect of counseling psychology is the therapeutic relationship between a mental health professional and a client, and facilitation of personal and interpersonal growth in various areas (emotional, social, vocational) throughout the life span. Although counseling psychology has been closely linked with clinical psychology, subtle differences exist between these subdisciplines; counseling psychology tends to focus on less severe ▶ [psychopathology](#), and counseling psychologists are more likely to theoretically assume a humanistic perspective when working with clients.

Counseling psychology's humanistic orientation dates back to Carl Rogers' publication of *Counseling and Psychotherapy* in 1942, which stimulated the development of counseling from a nonpsychoanalytic and nonmedical perspective. Although the history of counseling psychology has been divided into seven distinct periods from 1908 to 1984, it was in 1943 that APA Division 17 was formed and named the Division of Counseling and Guidance (although discrepancies occurred in following years regarding the name) (Whiteley 1999). In 1953, the name of APA Division 17 was changed to Division of Counseling Psychology (and later that year the birth of the *Journal of Counseling Psychology*

was announced – with the first edition being in Feb 1954).

In the past 20 years, counseling psychology has continued to emerge as a unique subdiscipline, with greater focus on viewing people and their behavior within a sociocultural context, influenced by variables of gender, ethnicity, sexual orientation, age, and culture. Recently, there has been increasing methodological diversity and sophistication in the field, as well as an emphasis on multiculturalism and health psychology.

Self-Identification

Science

From its origins, psychology has identified as a science; psychological science is the study of mind, brain, and behavior, and counseling psychology is one of the subdisciplines within this broader study. Counseling psychology attempts to explain and investigate human behavior; it is the science of the personal, the subjective, and the individual. Counseling psychologists strive to make sense of the mind and examine human behavior as the raw data for testing theories and hypotheses about how the mind works. Since the German psychologist Wilhelm Wundt opened the first psychological laboratory in 1879, the field of psychology has continued to utilize the scientific method to learn about the relationship between the mind, brain, and behavior. Empirical methods are increasingly emphasized in the field of counseling psychology, and efficacious interventions are derived from evidence-based studies that employ systematic, objective methods of observation (Gazzaniga and Heatherton 2006).

Characteristics

Historically, counseling psychology has been closely linked to the subdiscipline of clinical psychology. The main difference has been perspective. Counseling psychology assumes a humanistic theoretical approach and focuses on healthy individuals and less severe

psychopathology, whereas clinical psychologists work with individuals with severe mental illnesses and tend to be more medically oriented, focusing on treatment of disease. At the roots of counseling psychology is a focus on prevention (as opposed to intervention), and of growing importance are issues of social justice and multiculturalism. Additionally, counseling psychologists are trained in a wide variety of basic therapeutic skills and are considered to be generalists (i.e., incorporating vocational and career counseling, developmental issues, ► [positive psychology](#), etc.).

Relevance to Science and Religion

Science and religion have often been compartmentalized and seen as two distinct entities. The field of psychology is no exception to this, as there has been historical antagonism between religion and psychoanalytic branches of psychotherapy (Gurney and Rogers 2007). Recently, however, clinicians and scholars in the field of counseling psychology have realized that many clients do not divide their faith from their behavior, work, or relationships, but rather view it as deeply connected to who they are, recognizing that their lives have divine significance (Pargament and Mahoney 2005). Studies provide evidence to the sanctification of sex, body perceptions, and behavioral health patterns, acknowledging the interwovenness between ordinary and extraordinary in the counseling room (Mahoney et al. 2005; Murray-Swank et al. 2005). A growing number of studies indicate a connection between health and faith/religion; religious adults, for example, report more adaptive strategies for coping with life stresses, enhanced feelings of self-efficacy, and a stronger sense of social support than nonreligious adults (Loewenthal 1995). Given counseling psychologists seek to work with clients from a humanistic and holistic perspective, taking into account individual strengths and resources, there are increasing connections between counseling psychology and religion, particularly in regard to ways in which faith enters the counseling room.

Sources of Authority

The notion of counseling psychology from a nonpsychoanalytic perspective arguably dates back to Carl Rogers' publication of *Counseling and Psychotherapy* in 1942 and the formation of American Psychological Association's (APA) Division of Counseling and Guidance (Division 17) in 1943. It was, however, during the Boulder Conference in 1949 that the unique perspective of the professional practice of counseling psychology developed; the theme of prevention was underscored and a contextual approach was emphasized throughout this conference. This was further articulated at the 1987 Georgia conference on the Future of Counseling Psychology (Hage 2003). Thus, a preventative, social-developmental, contextual, and health-based framework emerged as the roots for counseling psychology.

Additionally, the *Journal of Counseling Psychology*, originally published in 1953 (the same year that APA Division 17 changed to the Division of Counseling Psychology), is considered to be a grounding source for the discipline of counseling psychology.

Ethical Principles

Counseling psychologists adhere to the ethical standards established by the American Psychological Association as well as the American Counseling Association. Counseling psychologists who work in K-12 school settings also adhere to the ethical standards purported by the American School Counselor Association.

Key Values

At the core of the identity of counseling psychology is an appreciation of the individual, the subjective, and the agentic and the desire to promote growth and development. Toward that end, the counseling psychologist strives to increase clients' coping skills, foster an awareness of societal barriers to ► [self-actualization](#), and advocate for

a holistic mind-body-environment approach with a focus on prevention (Howard 1992).

Conceptualization

Nature/World

Nature is conceptualized as biological and physiological component of life. Inherited traits, abilities, and capabilities are considered to be part of human being's nature, that is, our genetic "wiring."

Human Being

Humans are biological beings with complex and adaptive brains and minds that enable unique behaviors, such as moral reasoning, decision-making, language, creativity, and cognition. These unique capabilities and behaviors distinguish humans from the rest of the animal kingdom.

Life and Death

Life is considered to be the presence of biological and physiological functions that lead to psychological activity. Debate remains among counseling psychologists about when life begins, within or outside of the womb. Death is defined as the cessation of biological and physiological workings of the mind and central nervous system.

Reality

Psychological scientists define reality as observable aspects of one's environment that involve sensation and perception. Sensation is the sense organs' detection of external stimulus, and perception is the internal representation of the brain's processing of external stimulus. Among counseling psychologists, perception is often emphasized; in other words, it is important to understand a client's subjective experience of reality in order to effectively promote well-being. Mental disorders such as schizophrenia may distort reality.

Knowledge

Knowledge is the accumulation of information related to the world that is gained and acquired. There are both objective (agreed upon and

irrefutable) and subjective aspects of knowledge. Knowledge is used to guide our daily actions, solve problems, and make decisions.

Truth

According to an objectivist view, truth is conceptualized as the objective reality that underlies facts. Constructivists, however, define truth as an individual and subjective construal of reality. A constructivist way of knowing and understanding has gained credence in the field of counseling psychology.

Perception

Perception is the processing, organizing, and interpreting of sensory signals that results in an internal representation of an external stimulus. The human mind actively constructs representations of the world and uses those perceptions to guide actions.

Time

Time is an objective measurement used to sequence events and categorize change in the world. Human perception of time can be variable and subjective, and psychoactive drugs can impair one's perception of time.

Consciousness

Consciousness is defined as subjective, moment-by-moment experiences – an awareness that individuals have of their actions and motivations behind their behavior. Contents (or objects) of consciousness are differentiated from levels of consciousness (sleep and wakefulness).

Rationality/Reason

Human beings employ reason to determine if information or a conclusion is true and, consequently, understand reason as authority. There are two types of reasoning, deductive and inductive reasoning. In deductive reasoning, an individual reasons from the general to specific, using a rule to determine if a conclusion follows logically from the rule; with inductive reasoning, an individual utilizes specific examples to determine if a general principle is valid (Gazzaniga and Heatherton 2006). Reasoning can be impaired in

certain mental disorders, such as schizophrenia, a thought disorder, or dementia.

Mystery

Despite the objectivity of the scientific method, counseling psychologists acknowledge that humans – their mind, body, and behavior – will not be completely understood; the subject matter to be studied in this subdiscipline is far too complex. There will always be a level of mystery, of that which is still unknown, in the field of counseling psychology.

Relevant Themes

Given the focus on the personal and agentic in counseling psychology, it is imperative to acknowledge – moreover, openly address – client belief systems in therapy. For some individuals, religion is salient to counseling, as it is central to their worldview formation, personality, and behavior. Yet, a gap continues to exist between “science and religion” engagement as counseling psychologists tend to compartmentalize the objective, science-based “natural” from the transcendent “supernatural.”

Cross-References

- ▶ [Clinical Psychology](#)
- ▶ [Narrative Psychology](#)
- ▶ [Personhood and Scientific Methodology](#)
- ▶ [Phenomenology](#)
- ▶ [Positive Psychology](#)
- ▶ [Psychiatry in America](#)

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CPU

- [Electronic Circuits in Computers](#)

Creatio Continua

- [Christian Cosmology](#)
- [Divine Creativity](#)

Creatio Ex Nihilo

- [Christian Cosmology](#)
- [Divine Creativity](#)

Creation

- [Christian Cosmology](#)
- [Creationism](#)
- [Divine Action](#)
- [Science and Kabbalah](#)
- [Time](#)

Creation in Judaism

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Related Terms

[Creation and science in Judaism](#); [Jewish science and creation](#); [Views of creation in the Jewish culture](#)

Rabbinic tradition makes three central claims about God. He creates the world, reveals his teaching, and redeems the world. Creation names the content of the opening chapters of the Book of Genesis in the Hebrew Scriptures about the origin of everything. Redemption names the content of sermons reported in the various books of the prophets in the Hebrew Scriptures about the end of everything. Revelation is the means by which God communicates to all of humanity through the Jewish people the doctrines of creation and redemption. It is generally accepted in all forms of Judaism that the Hebrew Scriptures are a record of revelation. All meanings of all three concepts are interrelated and constantly changing through Jewish speculative writings about Kabbalah and natural philosophy. Of the three the doctrine whose meaning is most closely tied to the intellectual history of the sciences is creation, for it is the only one of the three that has its own distinct scientific discipline – physical cosmogony, which deals with the origins of the cosmos. Creation is in fact discussed in a variety of biblical texts (notably Ex 40:12–25, Ps 74:12–17; 104:1–35, and Job 26:7–14; 38:4–30:30), but the most thorough or detailed presentation occurs in Gen 1:1–2:3. This text divides itself into a series of distinct sets of events each of which it calls “day” or “day and night.” Each day describes a layer of the universe, which, taken together, is the seven layered reality that the text calls “the sky (shamayim) and the earth.”

At the base of reality is the layer of the universe before divine intervention. At this level there exist (presumably from eternity) a “deep” (tehom), darkness, the earth surrounded by waters, something called “tohu and vohu” (often translated as what is “null and void”), and a divine wind (ruah elohim). On day 1, God begins his action by declaring orders to the pre-world existent objects. Each day marks a specific commandment, the obedience to which at the end of the process initiates our physical and living worlds. God’s first command is for there to be a substance, “light” (which is the only one God actually makes) by which he divides the region of darkness infested with light into two separate regions of space, and names them “day” (viz., the distinct region of light) and “night” (viz., the distinct region of darkness). The rotation from any fixed point at the center of the universe allows a continuous repetition of day and night. Each cycle is called a “day,” and the layers of creation are seven. The unit of seven complete days is called the week. Creation’s last day is called “the Sabbath.”

Day 1 produces the basic separation into distinct periods of days and nights. Day 2 produces the sky above the earth. These two most general regions of the space of the universe are themselves kept separate by a universal ring called a “raqiyyah.” In Genesis 1:6ff this divider is called what is commonly translated into English as “a firmament” but really means something that can be stretched out. God acts on this second day by speaking to and making the raqiyyah, and then dividing it into two distinct rings of space, which he named “sky” (shamayim). At this point, the earth appears as a ring at the center of the universe, whose central hole and surrounding external are called “waters,” so that within the central region of the space of the earth, there are the “lower waters” below a ring of earth above which is the “higher waters.” This action completes God’s creation of the regions of space in the universe. What follows is the creation of the “living things” both on and in the universe.

On day 3, God performs two distinct set of acts. One is directed at the waters and the other is

directed at the earth. He tells the waters to collect together into one place and names the region of waters “seas” (yamim) and the region of earth “dry land” (yabashah). Then he tells the earth to sprout forth plants. Day 3 is the transition between the divine ordering of the space of the universe (whose last division is between land and seas) and the divine generation of the inhabitants of that space (whose first production is the plants that stand at the base of what we would recognize as the food chain of all life).

On day 4, God commands into existence the stars (Me-erot, literally lighters, i.e., things made of light) that occupy the sky, whose two purposes in the universe are (1) to differentiate years, days, festivals, and seasons, and (2) to give light to the universe. On day 5, God commands the waters to produce diverse kinds of living (nefesh) swarming things as well as create large sea-monsters (teninim) and all (other) living animals (chayah) that creep and swarm in the waters, as well as every kind of bird (literally “winged flying thing”). Then God blesses them. (“Blessing” is one of at least six things that God does that count as creating; the other five are making, producing, saying, separating, and naming).

On day 6, God commands and makes every living domestic and wild animal as well as everything that creeps (rather than swarms) on land (rather than in the waters). Finally, he creates “the human” (ha-adam) as male and female, and implies that all the other (lower) members of the created chain of being (from plants to animals) exist for him/her as food. (Arguably Judaism has a strong moral emphasis on ways to eat because of its priestly origins).

Finally, God completes his creation of the world on day 7 with the creation of the day of rest (Shabbat). On it he ceases from all of his work (melachah) which he made and rests (shabat).

For all of the rabbis in all of the subsequent periods, whatever this narrative truly means is the full description of the origin of the universe. The problem is what it means. In general, as theologians will say in the nineteenth century, God has two books of revealed nature – science, the book of nature itself, and revelation, the

revealed word of God – and in neither book is the discernment of the true meaning apparent or simple. As nature hides its secrets, so do the Scriptures. Hence, everything depends on how the key terms in the narrative are interpreted, and their meaning is not obvious. In general, the interpretations that different rabbis gave to these terms varied with the kind of world and life views they held, which themselves are greatly influenced by the science of their day. Hence, during the period of the early rabbis, Hellenistic Stoic themes are discernible, as are Aristotelian and Platonic cosmology in the interpretations of the medieval rabbinic commentaries, as are physicalist reductive interpretations in modern commentaries. What remains constant is the list of problematic terms. Here is a list of questions: What are “the deep,” “tohu and voahu,” and the “divine wind”? What is a “day”? Is it a period of time or a spatial division? What is the “light” created on the first day, how does it differ from the lights of the stars created on the fourth day, and where is the original light now? What is a “raqiyyah”? In what does it consist and how does it function to separate the earth from the sky? What is life (nefesh chayah)? What is a “human” and what does it mean that he was created male and female? Finally, how do “work” (melachah) and “rest” differ and how does that difference affect Jewish worship on the seventh day? Note that on any of the ways that the rabbis interpret these creation texts, their meaning integrates physical accounts with judgments about both moral and liturgical purpose.

Cross-References

- [Astronomy in Judaism](#)
- [Judaism: An Overview](#)
- [Kabbalah in Judaism](#)
- [Natural Sciences in Judaism](#)
- [Philosophy in Judaism](#)
- [Physics in Judaism](#)
- [Redemption in Judaism](#)
- [Revelation in Judaism](#)
- [Theology in Judaism](#)

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Creation and Science in Judaism

- [Creation in Judaism](#)

Creationism

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Related Terms

[Creation; Evolution; Science and religion](#)

The term “creationism” needs to be carefully defined. The historic Christian creeds speak of God as “creator of heaven and earth.” The Hebrew Bible also begins by referring to God’s act of creation, and the Qur’an speaks of God as creator, in terms that echo the biblical account (e.g., Qur’an 7:54). So if we define a “creationist” as one who believes that God is the creator of everything that exists, then all orthodox Christians, Jews, and Muslims are creationists. For the purpose of this entry, however, the term

“creationist” will be used more narrowly. A creationist, in this sense, holds that belief in God’s creative activity is incompatible with an entirely natural explanation of the origins of the universe and of human beings. While some creationists merely assert their belief in a divine creative act, others offer arguments for their view. They insist, for instance, that the proposed natural explanations on offer – such as a naturalistic “Big Bang” cosmology or Darwin’s theory of evolution by natural selection – are inadequate. More generally, they insist that no account of origins that does not make reference to divine activity can be regarded as satisfactory.

The creationist view, so defined, is more widely held than many non-creationists realize. A 1991 Gallup poll in the United States reported that 47% of Americans believed that “God created man pretty much in his present form at one time within the last 10,000 years.” By 2005, the figure had risen to 53%, while nearly two-thirds agreed that creationist account of origins should be taught alongside evolution in public schools. Nor is its impact restricted to the United States, as some critics fondly imagine: it has become a global phenomenon and has spread beyond the boundaries of Christianity. Even in apparently secular and skeptical European countries such as Switzerland and Germany, “young-earth” creationists – those who believe the earth to be less than 15,000 years old – represent about 20% of the population. Among Asian countries, Korea now has a flourishing and influential creationist movement. While modern creationism has Christian origins, by the late twentieth century it had also spread to Islam (particularly in Turkey) and among orthodox Jews worldwide.

In the history of religious thought, the creationist view is both traditional and novel. It is traditional in that before the seventeenth century most Jews, Christians, and Muslims did assume that the world had its origins in a miraculous divine act. Jews and Christians, whose Bible offer the elements of a universal chronology, further assumed that this creative act had occurred about 4000 BCE. The idea that the earth may be enormously older than the biblical chronology suggests, or that Adam and Eve may

have had ancestors, was widely rejected until well into the nineteenth century. To this extent, modern creationism is the revival of an ancient view. But modern creationism differs from this ancient view in at least one respect. Before the seventeenth century, existing bodies of secular knowledge could be more or less easily fitted into a biblical framework. The intellectual revolutions of the seventeenth century broke that framework apart, so that today’s creationists find themselves opposing what most scientists regard as well-established theories.

Science and Religion

With regard to science and religion, creationists are among those reject what Stephen Jay Gould described as the NOMA thesis: the idea that science and religion represent “non-overlapping magisteria,” distinct teaching authorities which cannot come into conflict (Gould 1997). A popular version of the NOMA view holds that science deals with matters of fact, while religion deals with issues of value. Creationists also reject the idea that scriptural statements regarding creation should be interpreted in a purely metaphorical manner or in so general a fashion as to avoid any conflict with proposed natural explanations. With regard to the origin of species, for example, creationists reject the position known as “theistic evolutionism” (a version of which is known as “evolutionary creationism”). Theistic evolutionists accept that evolution by natural selection can explain the complexity and diversity of living organisms, but insist that God was guiding this process. In defending this view, they often appeal to the traditional distinction between “primary” and “secondary” causes: the idea that even a natural process can be providentially guided. Creationists, however, reject such reconciling strategies.

Many atheists, it should be noted, also reject the NOMA thesis. They take their stand on the side of science and reject competing religious claims. Creationists, by way of contrast, take their stand on the side of religion and reject competing scientific claims. Nonetheless, most

modern creationists do not consider themselves to be rejecting science as such. Indeed, they often claim that they are offering a reformed or revised form of science, sometimes called “creation science.” Opponents of creationism sometimes suggest that this is merely a way of avoiding the implications of a constitutional separation of church and state, since it enables creationists to claim a place for their views, *as* science, in the public school curriculum. However, many creationists do believe their position to be “scientific,” in the sense of defensible by reference to observation and experiment. Whether they are correct in this belief is, of course, another question (see [Evaluation](#)).

If creationists consider their position to be scientifically defensible, how do they explain the fact that so many scientists disagree? Most commonly, creationists argue that the modern scientific consensus represents faulty science, based on false or at least unwarranted assumptions. Some of these assumptions have to do with the particular methods used by scientists. Young-earth creationists argue, for example, that the practice of radiocarbon dating rests on unwarranted assumptions regarding the amount of carbon dioxide in the oceans and atmosphere and the rate of formation and decay of radiocarbon atoms. Other allegedly false or unwarranted assumptions are more philosophical in nature. Intelligent design supporters, for instance, argue that contemporary science is distorted by its commitment to a “methodological naturalism,” which rules out *a priori* all reference to divine agency (Johnson 1995: 105). It follows that creationists do not generally claim to be against science as such; what they oppose is what they claim to be a crippled or distorted form of science.

Varieties of Creationism

Despite their shared opposition to exclusively natural explanations, modern creationists hold to a variety of positions regarding the origins of the earth and of human beings. Leaving aside extreme positions such as flat-earthism and geocentrism – from which creationists generally

distance themselves, even when they are held on religious grounds – one can distinguish four positions within the creationist camp. The first distinction to be made is that between old-earth creationism (OEC) and young-earth creationism (YEC), the latter being the most widespread form of contemporary creationism. Intelligent design theory (ID) may be regarded as a third category: In some respects, it resembles a traditional OEC, but it has other, distinctive features. A final form of creationism exists on the cusp between creationism and theistic evolutionism. It accepts natural explanations of the origins of the human body but insists that the human soul was directly created by God. I shall refer to this last position as a “divine animation” theory (DA).

Old-Earth Creationism

Old-earth creationism is characterized by the belief that although the earth and human beings have their origins in miraculous divine acts of creation, the earth is significantly older than a strict adherence to the biblical chronology would allow. By the end of the nineteenth century, this had become the dominant view among both believing scientists and Christian theologians. Beginning with the work of geologist James Hutton (1726–1797), whose natural history notoriously found “no vestige of a beginning, no prospect of an end,” and continuing with that of Charles Lyell (1797–1875), the idea of the “antiquity of the earth” was increasingly accepted. The most common response of both Christian scientists and theologians was to accept this new knowledge and reinterpret Scripture to avoid any conflict with it.

The old-earth creationist attitude was, perhaps, first clearly expressed in a letter of the astronomer and philosopher of science John Herschel to Lyell in 1836: “Time! Time! Time!—we must not impugn the Scripture Chronology, but we *must* interpret it in accordance with *whatever* shall appear on fair enquiry to be the *truth* for there cannot be two truths” (Cannon 1961, 308). By the beginning of the twentieth century, the attitude was widely shared. Even William Bell Riley (1861–1947), one of the first self-styled “fundamentalists” and a staunch

opponent of evolution, rejected the idea that Christians must believe the earth to be only 6,000 years old, holding that “the plain statement of Genesis . . . leaves latitude for millions and even billions of years” (Larson 1997, 223).

Some of the nineteenth- and early twentieth-century scientists who accepted the antiquity of the earth had no interest in reconciling their view of creation with the biblical account. An example would be Louis Agassiz (1807–1873), whose view of creation was, from a Christian perspective, highly unorthodox. But among those scientists and religious thinkers who did attempt a reconciliation, various strategies could be employed. The best known were the “gap” theory and the “day-age” theory. The former held that a great expanse of time – enough to accommodate the geologists’ findings – lay between the creative event told of in the first verse of Genesis and that spoken of in the rest of the biblical account. The latter held that each “day” of the 6-day Genesis account represented, not a 24-h day, but a long period of earth history. A third view – the “pictorial-day” theory – held that the creation of the world was *revealed* (rather than *brought about*) in six days.

What this means is that old-earth creationists were (and are) often rather vague about the details of God’s creative act. On the eve of the publication of Darwin’s *Origin of Species* in 1859, most naturalists still believed the origin of species to be supernatural. But if asked for details, many of them “would plead ignorance of the means and affirm only the fact” (Gillespie 1979, 21). Those who did speculate about the manner in which God created the earth came up with a bewildering variety of schemes. The only thing that united them was the conviction that creation involved miraculous divine acts, whatever form those acts may have taken.

The old-earth creationist position finds expression today in what is sometimes called “progressive creationism.” This holds that while the earth is indeed ancient, and its various forms of life have appeared only gradually, they have done so by a series of divine creative acts. In particular, progressive creationism denies the possibility of “macroevolution,” in the sense of a natural

process that leads to the formation of entirely new types of plants and animals. It insists that the basic kinds of plants and animals were created by a series of divine creative acts, although some variation among these kinds may then have occurred by way of natural selection. Despite conceding the possibility of “microevolution”, this view remains a form of creationism, as defined above. It denies the possibility of an entirely natural explanation of human origins.

Young-Earth Creationism

Young-earth creationists, by way of contrast, insist on a more or less strict adherence to the biblical chronology and what they regard as the literal sense of the biblical record. The implications of biblical chronology are not, of course, immediately evident, so their estimates of the age of the earth vary. But it is safe to say that no young-earth creationist holds the earth to be more than 15,000 years old. Nor do they agree about precisely how God is supposed to have acted. They have offered, for instance, a bewildering diversity of accounts of the biblical flood, which is thought to have been caused by

the eruption of a subterranean abyss, caves in mountains, oceanic tides caused by comets, rain from a comet, realignment of the earth’s center, depression of the abyss by the ocean floor, collapse of a vapor canopy, collapse of an icy asteroid on earth’s surface, eruption of supergeysers from the earth’s core, collapse of a ring of icy particles, [or the] tilting of the earth’s axis by bombardment of asteroids with subsequent displacement of its oceans. (Young 1987, 31)

So it would be wrong to regard even YEC as a single “theory.” Nor should YEC be regarded as a simple continuation of premodern beliefs. It does resemble what most Jews and Christians believed before the seventeenth century, but by the late nineteenth century the young-earth view had been largely abandoned, at least by educated Christians. It follows that YEC is not a simple continuation of the ancient position; it is a recent revival of it, in a more assertive form and a different intellectual context. That revival began with the work of the Seventh-day Adventist thinker, George McCready Price (1870–1963). Early Adventists had held to

a literal reading of the biblical creation story, which was supported by the visions of their founder, Ellen Gould White (1827–1915), and reinforced by their beliefs regarding the Sabbath. Price follows them in this respect but sets out to revive the idea that Noah's flood had played a key role in the formation of the geological and fossil record. Indeed, he argues that only a catastrophic event such as biblical deluge could explain that record.

Price was no means the first to hold to a "catastrophist" view of earth's history, nor was he the first to attribute geological phenomena to the power of water. At a time when there was still little reason to question the biblical narrative, "diluvialist" thinkers such as Thomas Burnet (1635–1715) had speculated about the origins of the waters of the flood and their role in forming the surface of the earth. In the late eighteenth century, the "neptunist" geology of Abraham Gottlob Werner (1749–1817) had suggested that the earth was originally covered with water, from which rocks had formed by a process of precipitation. Although defenders of the biblical account often embraced this view, on account of its apparent resemblance to the biblical story, the origins of neptunism owed little to biblical authority. It was, in origins, a secular theory.

It follows that Price's "flood geology" was very different from Werner's neptunism. Price did present it as a proposal for the reform of geology: he believed it to be the best available explanation of the geological phenomena. But he never denied that its primary inspiration was biblical. Indeed with some philosophical insight, he insisted that the origin of an idea is irrelevant to its assessment as an explanatory hypothesis. If a hypothesis explains the phenomena, it should not be condemned merely because its origin lies in a particular set of religious beliefs.

While the revival of YEC began with Price, it gained momentum with the publication of *The Genesis Flood*, a work coauthored by an evangelical biblical scholar, John C. Whitcomb (b. 1924) and engineer Henry Morris (1918–2006). First published in 1961, this book has become a creationist best seller. In 50 years, it has been reprinted more than 29 times and has

sold more than a quarter of a million copies. In support of their belief in an actual, worldwide flood, its authors engage in detailed biblical exegesis as well as a careful analysis of the geological and fossil evidence in the light of that exegesis. This extends, for example, to a calculation of the gross tonnage of Noah's Ark (13,960 t) and speculation regarding the ways in which so many animals might have been cared for in so confined a space.

Intelligent Design Theory

The most recent incarnation of the creationist position is known as "intelligent design" theory (ID). While there can be no doubt about its religious motivations, ID differs from earlier forms of modern creationism in avoiding explicit reference to the Bible or even the identity of its intelligent designer. "Inferences to design," its proponents argue, "do not require that we have a candidate for the role of designer" (Behe 1996, 196). This strategy, it should be noted, is condemned by many young-earth creationists, who regard it as a kind of cowardly equivocation, as well as by ID's opponents, who regard it as another subtle attempt to smuggle religion into public institutions in the guise of science. Such criticisms, it should be noted, are often *ad hominem*: they attack the character of the proponents of ID rather than their arguments, a fact that is not uncharacteristic of the contemporary debate.

ID's most influential thinkers are Michael Behe (b. 1952) and William Dembski (b. 1960). In Chap. 6 of the *Origin of Species*, Darwin had written: "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down." In *Darwin's Black Box*, Behe takes up the challenge, offering an argument that he believes to demonstrate the insufficiency of natural selection. In particular, he argues that many biological structures exhibit "irreducible complexity" (Behe 1996, 39). They are systems whose various parts are so related to one another that the removal of any one of them would make the system inoperable. (Behe's analogy is that of

a simple mousetrap, where the removal of any one of its parts would make it unable to catch mice.) His prime example of an irreducibly complex biological structure is the bacterial flagellum, which acts as a kind of rotary propeller. Because, he argues, such a system could not have been formed by “numerous, successive, slight modifications,” it demonstrates the inadequacy of Darwin’s theory.

William Dembski’s views are less easily summarized, but they have to do with the likelihood that a system exhibiting what he calls “specified complexity” would emerge “by chance.” Dembski’s not unreasonable assumption is that we should reject any hypothesis if, given that hypothesis, the fact to be explained (the *explanandum*) would be exceedingly unlikely. How unlikely? Dembski introduces the idea of a “universal probability bound” (Dembski 2002, 22), which he sets at 1 in 10^{150} . He calculates this figure generously by multiplying an estimate of the number of elementary particles in the universe (10^{80}) by the maximum number of changes which could occur each second (10^{45}) by the age of the universe in seconds (which he estimates very generously as 10^{25}). The actual figures are somewhat arbitrary, but this hardly matters. They indicate the degree of unlikelihood that would render a hypothesis worthy of rejection. Dembski’s second move is more controversial. It is to argue that the likelihood that a system exhibiting specified complexity should emerge by means of any natural process falls below this bound. If this were true, then, Dembski argues, all that remains is “design.”

Divine Animation Theory

It is sometimes suggested that the Catholic Church has distanced itself from creationism by accepting the theory of evolution by natural selection. Attention is drawn, in this context, to Pope John Paul II’s 1997 claim that Darwin’s proposal was to be regarded as “more than a hypothesis” (*plus qu’une hypothèse*). But in fact the only human evolution the Pope was prepared to accept is that of the human body. Repeating a claim made by his predecessor, Pius XII in 1950, he insisted that we must regard human

souls as having been “immediately created by God” (John Paul II et al. 1997: 383). That human souls are immediately created by God is itself a traditional Catholic position: It is found, for instance, in the work of Thomas Aquinas (1225–1274). Indeed, it was in reference to such a view that the term “creationism” was first used. So while in one sense the Pope’s position can be regarded as a form of theistic evolutionism, it is, perhaps, better regarded as a kind of “divine animation” theory.

What relation has the Pope’s view to the scientific theory of evolution? There are those who believe it to be scientifically irrelevant. Gould, for example, regards it as an example of his NOMA principle, which leaves the science intact. In a similar way, Michael Ruse suggests that “if you want evolution plus souls, that is your option, and if you want evolution less souls, that is also your option. Either way, evolution is untouched” (John Paul II et al. 1996, 394). But it is not clear that the Pope’s view is so harmless. Insofar as it concerns human beings, evolutionary theory has never limited itself to an explanation of the origins of the human body. Charles Darwin believed that natural selection could explain not merely our emotional life but also the origins of such key human characteristics as the moral sense. Indeed in *The Descent of Man* (Chap. 4), he rejects the idea that our moral sense is somehow implanted by God, seeing it as an outgrowth of those social instincts that are found in many animals.

Is Darwin’s view consistent with the Pope’s position? Apparently not, for however one may regard the powers of the soul (or the powers to which the soul gives rise), the moral sense is surely one of them. So it seems that a Catholic thinker would be forbidden from following Darwin this far. What has happened here is that the Pope has made evolutionary theory theologically acceptable at the cost of limiting its scope. The direct creation of the human soul by God may not be a miracle, in David Hume’s sense of “a violation of a law of nature.” Indeed it occurs in a regular and law-like manner, following the conception of each human being. But it is an event that cannot be explained without reference

to divine action. (Only God could bring about this change.) If one defines creationism as the view that belief in God's creative activity is incompatible with an entirely natural explanation of the origins of the universe and human beings, then the Catholic Church's position must also be regarded as a form of creationism.

Evaluation

While some forms of creationism describe themselves as "scientific" (indeed as "creation science" or "flood geology"), there is little doubt that what they take to be science is decisively shaped by a prior commitment to religious authority. Young-earth creationists in particular follow a policy that is succinctly summarized in the subtitle of Whitcomb and Morris's book: "the biblical record and its scientific implications." It takes as its starting point an interpretation of the biblical text that is as literal as possible, and accepts only that evidence which is consistent with what the scriptures say. Whitcomb and Morris freely admit that this is what they are doing, but justify their reliance on religious presuppositions by arguing that secular science is equally dependent on dogmatic presuppositions, albeit of a different kind. Intelligent design theory (ID) is less obviously shaped by a commitment to scriptural authority, but it would be fair to say that few scientists who are not already committed to a conservative religious position find its arguments as all convincing. There are secular critics of the neo-Darwinian synthesis, but few of these have been convinced by the ID claim that the evidence demands belief in a designer.

Scientific Criticisms

Not only are creationist beliefs based on religious presuppositions, they also face severe criticism on scientific grounds. Indeed attempts to refute creationism date from the very beginnings of the YEC movement, when in 1925 the German geologist and Catholic priest, Stephan Richarz, published a detailed rebuttal of Price's arguments. Contemporary critics point out that creationists appear to misunderstand the theory of

evolution, suggesting that it claims biological organisms to have arisen "by chance." While this does seem incredible, it is also a misrepresentation of Darwin's central idea. The variations on which natural selection operates may arise from processes that are apparently or even irreducibly random. But this does not mean they are "random" in the sense that all outcomes are equally likely. Even processes that are unpredictable at the level of individual events can be governed by probabilistic laws. In any case, the process by which variations are selected is far from random. It is constrained in a variety of ways, not least by environmental pressures.

The ID argument that some biological structures are "irreducibly complex" is more subtle. But it overlooks the possibility that a structure that was initially merely advantageous (and therefore not necessary at all) might later become essential. As H. Allen Orr writes,

some part (*A*) initially does some job (and not very well, perhaps). Another part (*B*) later gets added because it helps *A*. This new part isn't essential, it merely improves things. But later on, *A* (or something else) may change in such a way that *B* now becomes indispensable. This process continues as further parts get folded into the system. And at the end of the day, many parts may all be required. (Orr 1997)

When sea-creatures first developed lungs, their new organs were merely advantageous. But once their descendents became thoroughly terrestrial, lungs became essential. If processes of this kind lay behind the development of the bacterial flagellum, it is not "irreducibly complex" at all.

Theological Challenges

Whatever one makes of their science, creationists do raise some serious theological questions. Even if something like the theory of evolution by natural selection is compatible with classical theism, in the sense that both could be true, an evolutionary view of human origins offers some challenges to the believer. Firstly, it undercuts what was once a very popular form of argument for the existence of God, the argument from the complexity and adaptation of living organisms.

As Darwin wrote in his autobiography, “the old argument of design in nature . . . fails, now that the law of natural selection has been discovered” (Darwin 1958, 87). Secondly, even if it is *possible* that God created the diversity of living beings by way of natural selection, we can still ask if this is how we would expect an omnipotent and benevolent deity to act. One might argue that the wastefulness and apparent cruelty of the process is evidence against the existence of the God in whom Jews, Christians, and Muslims profess to believe.

With regard to the relation between religion and science, creationists are sometimes accused of a “god of the gaps” theology, in which divine action is posited in order to fill an explanatory lacuna in our existing scientific theories. In doing so, it is said, they offer hostages to fortune, since science may come to offer natural explanations that supplant the theological ones. But it is not clear what force this criticism has. After all, the challenge faced by the theistic evolutionist is that of explanatory redundancy. If “secondary causes” can do all the explanatory work, why bother talking about divine action? The problem was already recognized by Aquinas in his *Summa theologiae* (1a, qu.2, art. 3, obj. 2), who, of course, formulated his arguments for God’s existence in response. It follows that it is not enough to assert the compatibility of evolution with the doctrine of creation; one must give some reason to speak about divine action in the first place.

Young-earth creationists also pose very sharply the question of scriptural authority. Many theistic evolutionists regard Darwinism as incompatible with a literal reading of Genesis 1–3, but reconcile their science and their religion by reinterpreting the biblical account of the creation. But is such a reinterpretation justified? A traditional Christian view of biblical authority, dating back to St Augustine (354–430 CE), offers principles for settling apparent conflicts between divine revelation and secular knowledge. The first of these, which we may call the *principle of the priority of demonstration*, holds that where enquiry based on natural principles leads to a conclusion that both conflicts with a literal reading of Scripture and cannot be doubted,

Scripture must be reinterpreted (McMullin 1998, 294). By way of contrast, a second principle, the *principle of the priority of scripture*, states that when rational enquiry leads to something less than certainty, the authority of the literal sense of scripture is to be preferred (McMullin 1998, 295). Nor are these merely ancient principles. They were employed by the church authorities during the trial of Galileo and invoked by Pope Pius XI in 1950 when condemning polygenism (the view that the human race had more than one origin). It is true that neither Pius nor his successors advocated a literal interpretation of the 6 days of creation. But one can understand why those who hold to a strong view of biblical authority might be reluctant to abandon what they see as the plain sense of God’s word in favor of a “mere” human theory, no matter how well supported that theory may be.

Cross-References

- [Creation in Judaism](#)
- [Evil, Problem of](#)
- [Evolution](#)
- [God of the Gaps](#)
- [Intelligent Design](#)
- [Natural Selection](#)
- [Naturalism, Ontological and Methodological](#)
- [Soul](#)

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Creative Nonfiction

► Creative Writing

Creative Writing

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Related Terms

Creative nonfiction; Fiction; Narrative nonfiction; Poetry; Screenwriting; Television writing

Description

The creative writing program is generally divided into either a Masters of Arts or a Masters of Fine Arts. While either program offers various creative writing courses and workshops, the latter is generally weighted toward almost all writing while the former includes the academia of literature. Many creative writing programs, especially in the United States, prefer a Bachelors degree in either literature or creative writing before entering their program, but it is not always mandatory.

A few institutions, within the last decade, have also been offering a Ph.D. program for creative writing, but it is the exception.

In general, creative writing courses range from online to full-time to bimonthly meetings with advisors. The latter has proven particularly successful because of the freedom it provides for students with full-time jobs and families. It also forfeits the expense of campus living.

Increasingly, universities and colleges have been extending their programs into summer workshops that are usually held in tourist destinations. This allows a participant to feel as if they are on vacation, but also focused on his or her particular writing discipline such as poetry, fiction, and creative nonfiction. The workshops usually include authors of some reputation working and living with the participants.

The academic study of creative writing does not belong specifically to the fields of science or religion, but both studies are an integral and often inspirational part of the creative writing process. While it is too numerous to list the influences of science and religion upon certain works of creative writing, the impact extends well beyond the genre canons of science fiction and Christian or spiritual fiction.

In the last four decades, the amount of creative writing programs in the United States has increased from 37 to 822 while, conversely, the overall sales of books have been steadily decreasing. There have been various theories as to this cause including the loss of the independent book-seller, to cable television, to video games.

The first serious creative writing program is attributed to the Iowa Writers Workshop, set up after World War II as an attraction for those entering the university on the G.I. Bill. While establishing itself as a regional school, the Iowa Writers workshop also included writers from China, South Korea, England, and other countries. Many of the other programs that began in the south, and most recently, in the Western States, have focused on a more traditional regionalism, incorporating local voices more often than international ones.

Within the last 10 years, institutions of higher education have become even more specific in

their focus. For example, The University of Oregon's MFA program encourages the "act of writing," the University of Florida hopes to "produce good writers," and the University of Wyoming on students to get "real-life" writing skills (Kathryn Houghton 2006). Many others have begun to offer a cross-disciplinary curriculum between creative writing, screen writing, poetry, creative nonfiction, and television writing.

There has always been a certain level of controversy over the effectiveness of creative writing programs. As mentioned before, with book sales either stagnant or decreasing, the wide-scale loss of traditional bookstores, a rapidly declining readership, and an increase of other media such as video games, films, and internet, the proliferation of creative writing programs have been called into question. Is the creative writing program still relevant or is it simply a way for educational institutions to make money? While many writers and academics have publicly denounced the intellectual merit of such programs, others have come out in strong support. The New Journalist Tom Wolfe has called creative writing programs "swamps" where "mosquitoes breed" while the novelist M.J. Hyland claimed "that a good teacher, and a good course, can speed up the apprenticeship of a talented writer, and give him good company" (Hyland 2009).

Self-Identification

Science

New forms of writing are currently being developed and improved upon including; graphic novels, interactive storytelling, and hyperfiction (online, hyperlinked), to name a few, all in attempt to develop a new vehicle for fiction as well as to deliver a story succinctly and still aesthetically. While there is still quite a bit of experimental fiction, in terms of style, realism, the most common style of writing today has, to borrow Woods' description, "flattened out" with overuse (James Wood 2008). Realism, Woods adds, is probably one of the least realistic styles, if such a statement can be made.

Creative writing programs such as the one at Brown University have sought to discover new ways to connect the age of technology to fiction while others have worked to bring the sentence into its most evolved state, a way to convey a myriad of thoughts, feelings, etc., in a wholly peripheral manner. In doing so, argue writers such as Tom Wolfe, the story itself has been lost to the author's intensive self-reflection and self-consciousness.

Religion

Religion and spirituality are a fundamental part of the western narrative and the writing process itself.

Characteristics

John Barth in the New York Times article *Writing: Can it Be Taught?* wrote that before creative writing programs writers "authors have acquired their authority in four main ways – first by paying a certain sort of attention to the experience of life as well as merely undergoing it; second, by paying a certain sort of attention to the works of their great and less great predecessors in the medium of the written language, as well as merely reading them; third, by practicing that medium themselves, usually a lot; and forth, by offering their apprentice work for discussion and criticism by one or several of their impassioned peers, or by some experienced hand, or by both." While all four of these examples are still in play, John Barth, a long-time teacher of creative writing, believed that the writing programs in higher education provided a competitive and inspirational atmosphere in which aspiring authors could work productively with peers and mentors. While he did not endorse all programs or teachers, he did say that finding the right place, for the right writer could indeed make a difference. He adds: "Either way, the thing gets learned, all right, and it gets learned, where it does, because it got studied, practiced, and reacted to, in or out of school."

According to a slightly more cynical Louis Menand, creative writing programs "are designed on the theory that students who have never

published a poem can teach other students who have never published a poem how to write a publishable poem” (Louis Menand 2009). Menand himself studied poetry at a writing program and while he claims he’s never published a poem, and admits that: “I stopped writing poetry after I graduated, and I never published a poem – which places me with the majority of people who have take a creative-writing class. . .” he is, however, a regular writer at the New Yorker and has written several well-received books of nonfiction.

Relevance to Science and Religion

Science and religion has always preoccupied the writer’s mind and many creative writing programs today are beginning to incorporate a core-curriculum into the B.A. undergraduate study of writing, seeing that the understanding of science and religion is essential in creating authors who have a broader understanding of the world than simply the specific skills of creative writing.

Science and religion are also two major genres of fiction as well.

Sources of Authority

While there seems to be little question that journalism, visual art, and music have a respectable place in educational institutions, creative writing is still often viewed as a solitary activity requiring more will than skill. But most writers agree that the craftsmanship behind story and novel writing requires more than an understanding of writing or literature. A story or a novel is the complex interplay between voice, character, setting, and words, more specifically the right words. Understanding the effect of one’s writing upon an audience is difficult under solitary conditions and that is where the workshop, an examination of a piece by other readers and writers, comes into play. The creative writing program has supplanted the artist colony in terms of giving the writer interaction and dialogue between artists entrance for beginning as well as allowed writers to work closely with more established writers.

In Joseph Heller’s *Portrait of an Artist As An Old Man*, the narrator, Eugene Pota, a writer who is mostly known for a single book he wrote many years previous (closely based on Heller’s *Catch-22*) gives a lecture at a southern university to creative writing students in which he details the unhappy lives and tragic endings of so many writers. “What then, are the reasons, I have to wonder, that make the biographical information of so many of them a body of literature of despair?” He warns parents that if their children want to become an author that they “must spring into action to save that child. Stop it – if you can.” (Joseph Heller 2000). But in the end, Pota knows that few of the students will listen to his plea. Writing as a career is rarely glamorous, often destructive, rarely satisfying, but those willing to enroll in a creative writing program seem to be growing every year as do the amount of novels being written, he says.

While the very definition of an author comes from “authority,” many writers today focus on the vulnerability of the authorial voice, the loss of readership, and the lack of analysis of the modern world. Many authors consciously deconstruct their own authority by connecting personal life choices to the subject in which they are writing upon. J.M. Coetzee’s novel *Diary of a Bad Year* has three voices speaking concurrently. First the authors written political views, second the authors conversations with his neighbors and friends, and thirdly the neighbors and friends view of J.M. Coetzee. By the end of the novel, the author’s “authority” has all but been compromised.

Ethical Principles

Creative writing seeks to understand what the ethics of a certain society are, why they have been created, and how they affect the human character.

Key Values

The key values of creative writing vary from author to author, lending authenticity to the voice.

Conceptualization

Nature/World

Creative writing would broadly define “nature/world” as a setting or an environment that influences the outcomes of certain choices made by certain characters.

Human

The human and his or her experience is the essence of creative writing.

Life and Death

Life and death are simply a mirror for an author’s audience to put the mortality of the characters into perspective.

Reality

Since a writer’s life is to make the unbelievable believable, reality becomes a distant, unattainable goal. Reality in fiction is only as real as a reflection and the surface upon which it appears.

Knowledge

In good creative writing knowledge is always ambiguous.

Truth

Truth in creative writing is only linked to the strength of the author’s voice.

Perception

The narrator’s point-of-view is the only perception.

Time

Time is linked exclusively to the setting and vice versa.

Consciousness

Once again, consciousness is linked almost exclusively to the narrator.

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Creativity

► Imagination

Creator – Co-creator

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Philip Hefner, a contemporary Lutheran theologian, focuses on human agency in the postmodern world and on the relationship between science and religion. His theology is hermeneutical, showing that the tradition can be interpreted in constructive ways in any situation as long as religious ideas, doctrines, and dogmas are treated as proposals and not apodictic statements. It offers new ways of thinking about God and Creation in relation to technology, especially as applied to medical practice.

Hefner’s ► *theology* focuses on the human being embedded in nature, society, and culture. Its religious roots are in the Lutheran Evangelical tradition, but modified by a focus more typical of eastern religions. Its theological roots go back to Teilhard de Chardin and Ralph Wendell Burhoe, but also include elements of process theology (the evolutionary process of human becoming), feminist theology (holistic approach), eco-theology (environmental concerns) and, above all, post-modern theology. The emphasis is on the processuality of creation; management of paradoxes; interrelations and interdependency of all systems; systemic feedbacks that inform and

modify the evolutionary process; plurality, complexity, and contingency of occurrences; decentrality of creation; ultimate purpose of wholeness; importance of community and politics; and, importance of human agency and ethics, as expressed by human moral competence and readiness for accountability. The evolutionary perspective is grounded in the natural and social sciences. When it is applied to theology, it allows to interpret the creation as a process of evolution, in which humans actively participate as agents of changes.

Hefner has contributed to the evolution of Christian theology mainly through his interpretation of the changing relationship between religion and science, through his work devoted to the metaphoric and symbolic concept of the *created co-creator* (Hefner 1993), and the application of that concept to the interpretation of nature, human nature, society, and culture. Religion and science are the foci of his work, but other components of culture, such as symbols, rituals, myths, poetry, art, technology, and medical practice, help support his claims about the origins and nature of the co-creator, and the mechanisms and direction of the co-creator's evolution, and his or her participation in the processes of evolution of nature.

Nature is seen as God's greatest project. Everything that exists, including humans, societies, and cultures, is natural and a part of creation. Therefore, theology must focus on nature and become informed by natural sciences. Questions such as What does it mean for nature to be part of God's image, and Christ's redemption need to be addressed? If nature cannot proceed adequately without enhancement by human decisions, by what values should those decisions be guided?

Hefner coined the concept of *created co-creator* in the 1980s to refer to the human being as created by God but also shaped by the genetic makeup and culture that have emerged in the ongoing process of nature's evolution. Since human genetic and cultural makeup keeps changing, being a human actually means participating in a process of becoming human. The human purpose is to contribute to the wholesomeness of natural processes, and the meaning-creating

activity grounded in the functioning of our minds is our most important activity. Our activities and their outcomes (e.g., cloning, genetic engineering, creating transhumans) become consistent with nature and, thus, with God's Creation. Through imagination, humans create the future, and whatever they create are natural, "quintessential human acts" (Hefner 1998). Hefner asks: What is this biocultural human being created for? What forms can this symbol take? What is the significance of cloning as revelation of the human situation? Is genetic engineering now an integral element in human nature? Is this ability now a defining mark of what it means for us to be human? If we consider human life to be sacred, can genetic alteration be included in our concepts of the sacred? (Hefner 2007)

Hefner further claims that *society*, as an outcome of the evolutionary process, should be considered by theology informed by social sciences. The survival of societies depends on what is being done to the techno-earth – the ecosystem transformed by technology. Nature technologized by humans allows technological civilizations to emerge. It comprises social systems that interact with the ecosystem transformed by the created co-creator.

Culture is also an extremely important outcome of the evolutionary process in Hefner's theology. "Culture is where it happens" – he claims. Societies create cultures and cultures shape societies. But above all, the work of the created co-creator happens in culture. That work is guided by values, myths, narratives, symbols and rituals, and the politics of symbols and rituals that shape the praxis for the support of the earth. Among the many elements of culture, Hefner selects *religion and science* for a more detailed scrutiny.

Hefner starts with a dialogical model of the interaction between theology and science, but evolves toward a model of the wholeness of *religion-and-science*, as one compound noun, a symbol of the human quest for meaning. He wants the yoking of science and religion to be translated into policies and practices that contribute to human welfare and the good of the planet

(Hefner 2005, 2008a, c). He switches from a focus on theoretical science to one on scientifically informed technology, as well as medical and technological practice. Science and religion are contextualized by social institutions and intertwined with all other elements of culture before they manifest themselves in the complex human experience. Myths that societies create and tell are one example of an important factor influencing both religion and science as if from the outside at any point in time. According to Hefner, much work has been done to illustrate how natural and social sciences inform theology, but much less has been done to show how theological interpretations of religion may inform natural or social sciences. Even less has been done to define the role of religion for science and technology (Hefner 2008b). Therefore, he suggests that religion can play a reflective, defensive, practical-moral, and spiritual role. This leads him to ask such questions as: What difference would the fuller expression of religion make to science-religion interaction? What is the source of *creativity* and power from which a self-generating nature emerges, beginning with the Big Bang and the Primal Soup, and continuing in our time with the self-conscious human techno-creator? How should we address the question of accountability for the co-creation? Why is it important to recognize the mythic undercurrent in scientific and technological endeavor?

► *Technology*, according to Hefner (2003a), is embodied science. It is not only full of religious meaning, but it is a sacred space where God engages us in a creative confrontation. Technology combined with engineering creates the technological civilization, which makes us dependent on technology in utterly new ways. Now we are capable of constructing cyborgs and transhumans, that is, technologically enhanced and genetically engineered humans whose mental and physical abilities and aptitudes have been altered by our will (Hefner 2003b, 2008d). These new forms of life break down the boundaries between nature and humans, culture and nature, humans and animals, nature and technology, physical and nonphysical. In Hefner's

interpretation, such boundaries have been artificially constructed and imposed, although there is continuity between nature, humans, society, culture, and technology. Cyborgs and transhumans are simply the newest outcomes of the process of nature's evolution. Thus, Hefner asks: How can our traditional ideas of God, creation, and nature be reformulated, so as to be able to interpret cyborg/created co-creator? What shape can moral theology take so as to speak of and to a cyborg/created co-creator? Where is the boundary between healing and improvement or enhancement? What is our improvement or enhancement for? Finally, in his most current writings, Hefner devotes a lot of attention to medical technology and claims that the central issue is "the insistence that our original nature, received in conception and birth, is open to alteration at our own hands" (Hefner 2008d). He asks: Toward what project does our intentionality aim? How far can we extend the right to be healed? How do we approach the issue of justice in this realm? Hefner's theology is evolutionary, visionary, flexible, and adaptable to the future, continuously imagined, and constructed by the *co-creator*.

Cross-References

- Bioethics in Christianity
- Christian Ethics
- Cyberethics
- Divine Action
- Evolutionary Theology
- Process Theology
- Science and Religion Dialogue and the Interreligious Dialogue

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Credition, the Process of Belief

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Related Terms

Process of believing

The term “credition” is a neologism, which is conceived in analogy to emotion and cognition and denotes the process of believing as it appears in religious as well as in nonreligious contexts (Angel et al. 2006). In common understanding believing is mainly related to religion. That is the case especially in the Western – and partly the Slavic and Middle Eastern – sphere, where the notion of religion is usually associated with the so-called Abrahamic religions (Judaism, Christianity, and Islam). In the Western tradition, an explicit or implicit focus on the concept of religion frequently has prevailed since earlier philosophical debates. For instance, scholars have reflected the relation between religion and science (Gutting 1983; Brooke 1991), between belief and knowledge (Polkinghorne 1998), or

between “fides et ratio” (Plantinga and Woltersdorff 1983; Helm 1999). Philosophers of religion have come to make a distinction between faith and belief (Swineburne 2005; Smith 1998; Kenny 1992; Sessions 1994; Mitchell 1994) [see article on “► Faith and Belief” by Taede Smedes in this encyclopedia]. But, indeed, many of the current academic discussions concerned with the character of believing attempt to ignore the religious fixation (Stich 1996; Boyer 2002, 2003). This reveals a problematic trace in the European history of mind which is characterized as preferring a far too exclusive fixation on religion and neglecting “religiosity” as a highly relevant anthropological approach to understand human beings and their behavior [see article on “► Religiosity” by Hans-Ferdinand Angel in this encyclopedia].

As a theoretical construct, the concept of credition focuses on the process character, that is, on what happens “while someone is believing,” rather than on the relationship between belief and knowledge or “fides et ratio.” Creditions are related to cognition and emotions to which they stand in a finely tuned balance. Hence they are connected with empathy, perception, action control, memory, and the self-concept. Creditions are conceived as mental processes which are thought to have an important impact on (the control of) human behavior. Neuroimaging and neurophysiological studies have shown that belief processes involve brain areas known to be involved in emotion-related and cognitive processing. But there is a discrepancy between the increasing interest in empirical research and the lack of coherent terminology and conceptualization which might be bridged by the concept of credition (Seitz and Angel 2012). The term credition can be conceived on the one hand as a psychological concept (Angel 2011), and on the other hand it can also be held up as a philosophical concept, more precisely, as one of the philosophies of mind or even of *philosophies of mind in process* (Angel 2012). Accordingly, questions like those of degrees of belief (Huber and Schmidt-Petri 2009), the role of (subdoxastic) will

(resp. volition), intention, desire, passion, or justification and morality can be raised.

Processes of believing, one the one side, are results of attitudes. One the other hand, they influence them as well as they influence our actions. Creditions as mental processes are conceptualized at the interface of perception and action. They may be understood as a kind of operator, which is involved in the manifold processes between a perception-related input and an action-related output. Subjective appraisal plays a dominant role for valuation of internal and external events as well as in subjective control of action (Seitz et al. 2009). Its driving forces are part of processes which are commonly ascribed to religious or secular beliefs.

Creditions are proposed to be characterized by four interdependent biopsychological functions: the enclosure function, the converter function, the stabilizing function, and the modulator function (Angel 2011). Recent neuroimaging and neurophysiological evidences suggest that the model of creditions may be justifiable from a neurophysiological point of view in as much as certain cerebral processes appear to be compatible with the concept of creditions. Specifically, cognition-based perspective taking and emotion-based perspective taking engage different closely adjacent, but functionally different nodes within large-scale cerebral circuits involving the medial frontal cortex" (Seitz and Angel 2012).

Function of Credition

1. The enclosure function

This function is a cognitive process constituting or modifying "bab-configurations," which can be understood as *emotionally shaped propositions*, such as vague ideas, confirmed knowledge, values, moral claims, and intuitions. In this sense, bab-configurations are those subsets of *mind-sets*, which are activated when a process of believing starts. Any vague or doubtful (acoustical, optic, olfactory, sensual) perception of an external or even of an internal event can be understood as a "bab," which may be included

or excluded into someone's bab-configuration. If someone does not trust the quality of drinkable water offered in a glass, the qualification "drinkable" might become a "bab." It is due to the enclosure function whether this "bab" will be enclosed into the bab-configuration of the agent. If it is to enclose then the action will be directed toward "drinking," and if it is not to enclose it is unlikely that the water will be consumed. Notably, it is not presupposed, that all processes of believing reach consciousness (Wegner 2002; Teske 2007). In order to accommodate subliminal processes (or even subliminal persuasion) "nonconscious babs" were designated as blobs which, nevertheless, are effective by influencing affects, motivation as well as actions. The nonconscious existence of an exaggerated hygienic "worriedness" (concern) might function as blob in a bab-configuration. As a result its influence onto the enclosure process will lead to the exclusion of the bab "drinkable" – with further result, that the agent will refuse to drink the offered water. Furthermore bab-blob-configurations are characterized by babs/bobs of different "mightiness" (e.g., mini-babs or mega-babs), which means that in a bab-blob-configuration of identical propositions big differences might exist according to the "mightiness" of the enclosed babs/blobs. As every single bab (and blob) is not fully conceived without its (generally changeable) emotional loading also the interrelations between the babs/blobs within a bab-blob-configuration are not to be understood without affects and emotions, and their relation might be expressed in terms of statistics.

2. The converter function

The second function of creditions is activated when bab-configurations are transformed in action. For example, when in a given bab-configuration of an agent exists the bab "cats are divine animals," then in case of a fire, the agent will be prepared to rescue the cat from the fire first. This preparation process is interdependent with several systems, as for instance the predictive system which provides the individual with information about the feasibility of deployable actions and, in consequence, modulates the

preparation of actions (Delevoeye-Turrell et al. 2010). The impulses coming from the bab-configuration will not provoke single acts: rather, the converter function is preliminary to the concrete act sketching out a *space of action*. The term space of action is introduced to mark a middle stage between motivation (cats are divine animals) and action (rescue the cat). Creditions support via the converter function the preparation of actions by reducing the number of choices and abbreviating the time of decision-making. This transformation is complex and all the problems discussed in theory of mind might be relevant for this concept.

3. The stabilizer function

While the enclosure process has the function to produce bab-configurations, the stabilizer process has the function to maintain them. The stabilizer function calms the bab-configurations, which are continuously modified by new experiences of the subject, and reduces the volatility of irritating impulses, which are sent by the enclosure process to the converter function. Therefore, the stabilization of bab-configurations is an inevitable precondition for consistent “spaces of action.” The stabilizer function brings creditions into touch with attitudes and mind-sets. Many complex challenges of everyday life, as for instance decision-making, planning, or (re-) building of trust, are only possible on the basis of a coherently shaped space of action. Most likely these functions are implemented on different stabilized neural circuits.

4. The modulator function

This function of credition highlights in a specific way the differences of individuals and the differences of situations, in which a creditive process can occur. Obviously, creditions are interrelated with the individual’s body, his or her memory, gender, health, disability, or psychic integrity. They are bound to the individual state of cognitive and/or emotional development, be it conscious or nonconscious. When regarding the modulation function on the levels of cells, for example, we might see the influence of neural synchronizing processes. On the other hand, the course of creditive processes might be modulated

by actual bodily states as stress, loss of trust, arches and pains, sadness, or sexual arousal. It is an intriguing perspective in which way emotions and appraisal influence the modulation of creditions. In addition: It may be discussed whether the modulator function should be regarded more as a general principle that influences the three other functions in a specific mode.

Since creditions are purely mental processes, they will follow their specific courses independently from outside influences, which, nevertheless, will influence the contents of these processes. This kind of learning is not specific to religious beliefs, but might in a comparable way also occur in secular belief processes such as in faiths or in social or moral convictions. Therefore, creditions play a role not only in interreligious dialogues, but also in politics, economy, education, human rights, minority protection, or anti-discrimination. They are relevant to understand the diversity of man on the one side and similarity on the other. As a process-orientated approach to faith, to trust, and to belief the concept of credition may integrate divergent philosophical, psychological, neurophysiological, and other conceptual aspects. It can be used as a starting point for further interdisciplinary research questions and be fruitful for the discussions described above as for many others.

Cross-References

- [Biology of Religion](#)
- [Cognitive Psychology](#)
- [Cognitive Science of Religion](#)
- [Cognitive Science Psychology](#)
- [Emotion](#)
- [Faith and Belief](#)
- [Neuroimaging](#)
- [Neuropsychology](#)
- [Philosophy of Mind](#)
- [Philosophy of Religion](#)
- [Psychology of Religion](#)
- [Religiosity](#)
- [Theory of Mind](#)

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Criminology

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Description

Criminology is an academic discipline devoted to the scientific study of crime and criminal behavior. Although contemporary criminology is multidisciplinary, encompassing a variety of fields such as anthropology, biology, economics, law, political science, psychiatry, and psychology, the sociological approach to criminology is especially dominant. While the central focus of criminology is to examine the causes and consequences of crime and criminal behavior, contemporary criminology also contains a number of other subareas of inquiry. The sociology of law is a subarea concerned with the role of social forces in the creation, modification, and application of laws. The specialty area of criminal statistics and crime measurement focuses on developing reliable measures of criminal activity. Victimology is a specialty area concerned with the role of the victim in the criminal process, and especially how society responds to the needs of victims. Finally, criminologists are also involved in examining social control mechanisms in society; penology is the study of the punishment and treatment of criminal offenders. Recent developments in criminology concern the development of new criminological perspectives that

challenge the assumptions of traditional criminology. Often these perspectives are postmodern approaches that reject scientific rationality as the method for studying crime and criminal behavior. The emphasis of postmodern approaches is to “deconstruct” assumptions of traditional criminology. Some approaches offer humane alternatives to traditional methods of crime control. Restorative justice, for example, focuses on the needs of the victim, offender, and the community by emphasizing remedies and victim/offender reconciliation rather than offender punishment and victim neglect.

Self-Identification

Science

Contemporary criminology self-identifies as a science. Its emphasis is on empirical research and scientific methodology. However, in its early development in the mid-eighteenth century, criminology was not grounded in science but rather in social philosophy. Known as the classical school of criminology and based on utilitarian principles, the classical school asserted that individuals have free will to make their own choices to act, that decisions are rationally made based upon seeking pleasure and avoiding pain, and that the role of punishment is to deter criminal behavior. The use of scientific method to study crime and criminal behavior developed in the late nineteenth century with the emergence of the positive school of criminology. The positive school attributed internal and external influences outside of the individual’s control as the cause of criminal behavior. Positivists assumed that behavior is both determined and measurable and offered biological, psychological, and sociological explanations as the causes of criminal behavior. In the twentieth century, sociological positivism became the central scientific explanation of crime and criminal behavior and the primacy of sociological explanations continues today. Sociological criminology contains a number of theories of crime causation, but traditionally, sociological criminology is divided into explanations which are social structural as contrasted

with explanations which emphasize social interaction. Sociological criminologists use both quantitative and qualitative methodologies, although quantitative methods provide the primary research approach.

Characteristics

There is a related discipline of criminal justice which is also concerned with crime and criminal behavior. However, the study of criminal justice concerns the system of law that is directly involved in the apprehension, prosecution, defense, sentencing, incarceration, and supervision of those suspected of or charged with criminal offenses.

Relevance to Science and Religion

Criminology examines the role of religion in criminal behavior. Criminological theories identify the basis for hypothesizing a negative relationship between religion and law violation. Criminological research generally identifies religion as an independent variable with variations in criminal behavior as the dependent variable. This research indicates, for the most part, that religious beliefs and activities are negatively related to violating the criminal laws of society. However, criminological research also recognizes that religious extremism can provide motivation and support for criminal behavior by misusing religion to justify criminal acts.

Criminologists also investigate the positive role of religion in rehabilitation and treatment programs, focusing on religious practices among prisoners. Finally, criminologists also recognize the biblical basis for the restorative justice approach in criminology.

Sources of Authority

Criminologists submit both theoretical papers and empirically based research papers to

peer-reviewed journals in their discipline where the papers are subject to blind review. In addition, professional organizations such as the American Society of Criminology recognize outstanding scholarly contributions to the discipline.

Ethical Principles

The ethical principles that guide criminologists concern research ethics. Criminologists are obligated to report all sources of financial support and other sponsorship of research. Ethical principles also require the full reporting of research findings and fully recognizing the contributions of colleagues. In addition, criminologists also have ethical responsibilities concerning research subjects. They are obligated to ensure that the physical, social, and psychological well-being of an individual participating in research is not adversely affected by participation in the research, and they must protect the privacy of human subjects and confidentiality of the data collected.

Key Values

Criminologists value the advancement of knowledge about crime and criminal behavior. They are committed to the free and open access to knowledge and to public discussion of findings. They value objectivity and professional integrity in performing and reporting research. While values regarding science and scholarship predominate, criminologists are also concerned with the application of their findings. Social policies concerning crime and criminal behavior should be linked to findings of sound criminological research.

Conceptualization

Nature/World

The world is conceptualized as human society and human society is a socializing/civilizing agent.

Human Being

Human beings are social as well as biological beings. Both internal (biological, psychological) and external (social) factors explain human behavior.

Life and Death

Criminologists focus on social life – life after birth and before death. There is no specific conceptualization of the origins of life or the meaning of death.

Reality

Criminology conceptualizes reality in terms of the norms, customs, values, and ideologies of a society. Its focus is on the social reality created by human beings through social interaction.

Knowledge

For traditional criminology, knowledge is the result of the scientific and empirical study of social reality. For postmodern criminology, knowledge derived from the scientific and empirical study of social reality is only one way of knowing; there are a number of equally valid ways of knowing.

Truth

Truth in traditional criminology would be the ability to use the scientific method to understand crime and criminal behavior with certainty which is not possible. Criminology has an empirically based but imperfect understanding of crime and criminal behavior. In addition, postmodern criminology would challenge the assumption that it is possible to reach an objective truth concerning crime and criminal behavior.

Perception

Perception is a research variable. Criminologists examine the role of perception in crime and criminal behavior.

Time

Time is considered a dimension for measuring changes in societal definitions of crime and criminal behavior. Time is also a dimension used for

determining how long an individual may be held liable for a criminal offense (statute of limitations) and how long an individual may be punished for an offense.

Consciousness

In order to be held criminally responsible for committing crimes, individuals must be conscious of their actions. The elements of a crime are *mens rea* (guilty mind/criminal intent) and *actus reus* (wrongful act). While a limited number of offenses are strict liability offenses and only require the *actus reus*, most crimes require both *mens rea* and *actus reus*.

Rationality/Reason

Reason/rationality is important in criminology for two reasons. First, it forms the basis for scientific positivism and therefore it forms the basis for knowledge in traditional criminology. Second, classical criminology and rational choice theory, the modern-day version of classical theory, holds that criminality is the result of conscious choice and predicts that individuals choose to commit crime when the benefits outweigh the costs of disobeying the law.

Mystery

Mystery is not a concept that appears in criminological literature; it does not appear in criminological theory and it is not a variable in criminological research.

Relevant Themes

It is important to recognize that criminology consists of many theories of crime causation. Typically these theories emphasize empirical research and scientific methodology and posit either biological, psychological, or sociological explanations. Sociological theories predominate and generally are classified as (1) social structure theories, (2) social interaction theories, or (3) social conflict theories. Postmodern criminology challenges the assumptions of traditional criminology.

Cross-References

- ▶ [Critical Theory](#)
- ▶ [Determinism and Indeterminism](#)
- ▶ [Deviance and Social Control, Sociology of](#)
- ▶ [Forensic Psychology](#)
- ▶ [Knowledge, Sociology of](#)
- ▶ [Social Psychology](#)

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Criteriologic Problem

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The idea of a criteriologic problem generates from what seems to be an indisputable fact, namely, that religious sentences are criteriologically problematic in that there does not seem to be any ordinary method by which they could be shown to be true or false. By an "ordinary" method is meant one that in some way relies on empirical standards, and since the central sentences belonging to religious traditions and systems of belief would seem to be interpreted as aiming to say something about a nonempirical object, the conclusion is drawn

that the sentences are problematic from a criteriologic point of view.

Of course, some of the sentences used and uttered in religious contexts, such as perhaps historical ones about the birth, the life, and the death of such important leaders as Siddhartha Gautama, Jesus Christ, or Mohammad, could, at least in principle, be tested by ordinary empirical and scientific methods. But the central sentences in various religious traditions, for example, “God loves all people” or “The goal of reincarnative existence is moksha,” do not rely on empirical references. Let us call such sentences “belief sentences”! The criteriologic problem, then, could be said to arise from the supposed fact that there seems to be no ordinary method by which belief sentences could be shown to be true or false.

The crucial question, though, could be said to be one that sets focus upon what is to be judged as a “criteriologically problematic” sentence. Which standards could be used, and are there standards with universal extension? Could sentences from one context, such as religion, be evaluated and tested by the same criteria that are used in another, such as science or everyday life?

In modern ► [analytical philosophy of religion](#), a great deal of the discussion on the criteriologic problem has started in a verificationist interpretation of it, which, in its turn, falls back to the Vienna Circle and the antimetaphysical logical empiricism of the 1920s. The logical empiricists set up strictly formulated criteria to differentiate between “meaningful” and “meaningless” sentences. These criteria were built around the concept of empirical observation, initially expressed in terms of conclusive verification, but later on in milder versions, verificative and falsificative. The basic idea for the logical empiricists was that meaningful sentences, with some empirical method, at least in principle, could be shown to have a truth-value. Since what we have called “belief sentences” were judged to fail to pass this test, they, together with other metaphysical sentences, were doomed to lack meaning and, consequently, truth-value (Diamond and Litzenburg 1975).

Despite the philosophical death of logical empiricism, the demand for empirical verificative or falsificative tests to ensure the possible truth-value of sentences has continued to live a rather vivid life, not the least in the field of philosophy of religion. Even if the standards of meaningfulness formulated by the logical empiricists showed to be all too rigid and untenable, the basic idea that there has to be some usable method by which belief sentences can be sanctioned “true” or “false,” if these sentences could be said to be relevant for the empirical world and the lives of its human beings, has survived.

The main line of divergence in relation to this demand, at least in the 1950s and the following decades, can be identified to separate reformative verificationist approaches from a Wittgensteinian one, according to which belief sentences have their own standards of meaning and truth found in the religious contexts or, using the terminology of Wittgenstein, “language games,” where they are used, and that there consequently does not exist a “criteriologic problem.” Such a problem presupposes that there are general, and perhaps universal, standards of comprehending and testing sentences from all kinds of contexts of human life, but since there are no such standards, there is not any problem of a “criteriologic” kind. Language is a matter of pluralism concerning uses and rules and meanings, and to raise any universal demands in order to obtain non-pluralistic expressions of meaning and truth is doomed to fail (Wittgenstein 1978).

This is, of course, a response which, at its fundamental level, few today would oppose to. The pluralism of language, the differences between various areas of human enterprises and domains of life, and the many-faced picture of methods and criteria to be used to interpret and test the semantic expressions of those differentiated contexts – nothing of this seems to be all too surprising or, for that matter, problematic to anyone familiar with the philosophical discussion related to semantic and epistemological topics today. After the postmodern era, with its criticism of traditional ideologies and religions and its rejection of universal standards for applications of presumably homogeneous concepts such as

“meaning” and “truth,” the aim to find definite criteria in order to separate “meaningful” sentences from “meaningless” may seem to be a project of a strictly historic interest.

The question, then, is if the criteriologic problem is to be judged as one of those “obsolete” obstacles from the history of philosophy. Is the demand for usable criteria in order to test the actual or possible truth or falsity of belief sentences to be declared misguided and, perhaps, unreasonable?

There are, at least, two reasons why the suggested lack of a definite method for testing the truth and falsity of belief sentences would seem to be of a more profound interest than being reduced to a historic parenthesis. First, the basic idea that sentences that seem to propose or state something about an existent reality, if such a proposal or statement is to be in any way relevant to people living their lives in relation to this reality, is in itself independent of specific methodological constructions, like the verificationist ones. Even if all methods hitherto presented have shown to be misguided or unreasonable, this fact would not constitute a conclusive reason to negate the demand for criteria which could be used to judge belief sentences as “true” or “false.” Second, the global world, with its increasing space of communication across not only geographical but also cultural and religious frontiers, actualizes the question in which respect it is possible to keep an epistemological dialogue concerning disparate religious claims alive. When people representing different religions and traditions come together debating questions touching about all kinds of subjects where claims of truth are presented with reference to religious authorities of various forms, the question how it would be possible to settle disputes concerning reasons for and reasons against those claims respectively arises. Are such disputes really to be left without at least a try to – by some attended criteria – solve them, not perhaps definitely, but through handling them, perhaps in terms of some probability calculation or at least some evaluative procedure of an epistemologically relevant kind?

Commenting first on the initial reason mentioned, one could elaborate a philosophical

perspective which sets focus upon the epistemological question why religious people seem to be anxious to talk about their beliefs in terms of “truth” while, at the same time, they seldom express the same kind of anxiety for the project to show in accordance with which criteria their belief sentences could be established as “true.” Looking back through the decades where the criteriologic problem has been discussed, believers generally seem to have been rather uninterested in taking part in the discussion. The demand for a criteriologically satisfying method for testing religious sentences was of a philosophic kind, and perhaps its relevance for practicing believers did not become clear. Why bother about philosophical criteria of truth when the presence of truth in the personal belief is experienced as so vivid and so lively? Even the most debated criteriologic challenge during the decades after the 1950s, namely, the one formulated by the British philosopher Antony Flew, then probably one of the most well-known critics of religious truth claims, seems to have been most reflected, not by religious believers but by philosophers of religions which aimed to formulate a theoretic response to meet the challenge. According to Flew, building his argument around a falsificative criterion of meaning, believers faced with evil in the world still continue to hold on to sentences about “God’s existence” and “God’s love” even though there is so much that would count against the truth of these sentences. If the sentences had a definite meaning, they would have been accepted as falsified: an existing and loving God would not allow all the pain that people are forced to experience in life. But believers refuse to accept this: instead, they keep their belief in the truth in the sentences and thereby, Flew states, make the claims of them compatible with anything that would happen – that is, they make them say nothing of relevance to the empirical world since not anything in this world is allowed to count against their truth (Flew 1966).

Many philosophers of religion have tried to meet this challenge by formulating criteria which would save the empirical relevance of the sentences, sometimes in terms of verificationist

fundamentals and sometimes in other ways, for example, John Hick and Basil Mitchell, respectively, just to mention two examples. Common to them all is that they accept the challenge of Flew as a real challenge and that the criteriologic problem really is a problem to be handled and taken care of. Even though none of these philosophic responses have shown to be overwhelmingly convincing, they can be considered as serious efforts to develop a line of argumentation for how belief sentences, in spite of their nonempirical character, could be established as relevant to people who live their lives in the empirical world. In some way, these efforts can be interpreted as projects where tools to make the nonempirical relevant to the empirical, and vice versa, are being looked for and elaborated (Franck 1988).

As to the second reason mentioned above, why the criteriologic problem should not be considered as a strictly historic one, here it also has to be pointed out that the multicultural and multireligious communications in today's world make it interesting to reflect upon the epistemological presuppositions and consequences of intercultural and interreligious dialogue. When, for example, conservative believers in the name of some religious authority or according to some interpretation of a supposed holy book argue against the democratic rights of women or homosexuals or propose that creationism is a theory which ought to be taught in school alongside evolutionary theory and when liberal believers together with nonbelievers oppose to these claims, does it not seem clear that a refreshing investigation of the criteria for proposing belief sentences as "true," at some point in the discussion, has to be performed? The criteriologic problem seems here to be most vivid and demanding. Is it possible to claim that "God forbids women to live in exactly the way that men do" or that "God opposes to every kind of sexual activity except for those that are of a heterosexual kind" express "true" sentences? It seems to be reasonable to meet such claims with the standard epistemological question: "How do you know that?" And when this question is posed, the criteriologic problem has been semantically incarnated once again.

The challenge which the criteriologic problem poses is, however, today one is seldom met by projects where one tries to establish a more precise methodological standard in order to evaluate the truth-value of this or that belief sentence. Rather, today's colleagues of the philosophers of religion of the last decades of the twentieth century, generally speaking, are more interested in interpreting, analyzing, and, when this is thought possible, classifying the central beliefs of different religious traditions and the semantic expressions of them, in terms of the realist–non-realist distinction. One of these colleagues is the Swedish philosopher of religion Eberhard Herrmann, who has dedicated a great deal of his latest work to an analysis of questions related to this perspective (Herrmann 2004). The focus has shifted from penetrating the question how verificative or falsificative criteria could be found to anchor a satisfying test of belief sentences to a dedication to relating the fundamentals of religious belief to a perspective where questions concerning meaning and reference are put in the center. Here, the project is managed within a broad frame of reference to philosophical theories and positions: the criteriologic problem is not seen as especially unique to religious contexts; rather, it is one instance among many when it comes to the question how language, religious or nonreligious, could be interpreted in relation to semantical, epistemological, and ontological criteria of meaning and truth.

The criteriologic problem, then, is still alive and continues to attract an important interest, but the ways of trying to come to terms with it have changed. When belief sentences from a religious point of view is said to be "true," the question "How do you know?" is, of course, relevant today precisely as it has been for all times. Philosophers of religion in our days do, however, seldom take part in enterprises where specified verificative or falsificative criteria are tried to be constructed. Rather, they choose to analyze the language of religions in terms of realist or non-realist theory and try to investigate how different philosophical theories on truth conditions could be applied to religious sentences such as belief sentences.

Cross-References

- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Critical Realism in Theology and Science](#)
- ▶ [Evil, Problem of](#)
- ▶ [Faith and Belief](#)
- ▶ [Philosophy of Religion](#)
- ▶ [Realisms in Philosophy of Religion](#)
- ▶ [Religious Experiences](#)
- ▶ [Truth](#)

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Critical and Cultural Theory

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Related Terms

[Critical theory](#); [Critique of enlightenment](#); [Critique of reason](#); [Culture theory](#); [Frankfurt school](#)

The term “critical theory,” due to its inner ambiguity, is to be understood in two senses. In a broad sense, it covers those disciplines within the social sciences, which offer a critical account of society, knowledge, and culture (including political systems, arts, and literature, among others). Since the 1970s, reacting to New Criticism in literary theory, these disciplines have overlapped, particularly in the English-speaking world, leading to a broader paradigm of criticism. On this basis, the definition of critical theory includes queer theory, the theory of communicative action by Jürgen Habermas, feminist theory, critical legal theory, psychoanalysis, neo-Marxian theories, and many others.

In a narrow sense, “critical theory” refers to different generations of the Frankfurt School and, in general terms, not only to the members or followers of its circle but also to its surroundings. Given that the Frankfurt School has been traditionally recognized as the most influential source of critical social sciences – and critical theory of society, in any sense – this entry will mostly refer to it. The work of Frankfurt School writers and researchers develops around the Institute of Social Research (*Institut für Sozialforschung*) in Frankfurt am Main (Germany) and seeks to adapt Marxist theoretical and practical tools in order to analyze twentieth-century capitalist societies. This includes political, economical, and social evolution. The institute was created in 1923 by relevant researchers, such as Felix Weil (1898–1975), Kurt Albert Gerlach (1886–1922), Friedrich Pollock (1894–1970), Karl August Wittfogel (1896–1988), and Carl Grünberg (1861–1940). After a short period of economical and social studies, Max Horkheimer (1895–1973) takes the lead, breaking ground for a new project and becoming representative of the group. He also helped to create the official publication of the institute, the well-known *Review of Social Research* (*Zeitschrift für Sozialforschung*). In the next years, several authors would publish their work on it, including Leo Lowenthal (1900–1993), Theodor W. Adorno (1903–1969), Walter Benjamin (1892–1940), Herbert Marcuse (1898–1979), and Erich Fromm (1900–1980).

From a highly interdisciplinary approach, the school elaborated a materialist social theory, capable of recovering the value of emancipation and transformation of society through the analysis of different forms of domination in advanced societies. With the rise of Adolf Hitler and National Socialism, the institute disbanded, and many of its members were forced to exile, were captured, or even murdered. Particularly relevant during this period of exile was the USA where Adorno and Horkheimer stayed until the 1950s, when they returned to Germany and kept on with the activities of the institute. The influence and powerful attraction of the Institute of Social Research has been proved by the extraordinary emergence of thinkers and researchers over the last 40 years, including Axel Honneth (b. 1949), Claus Offe (b. 1940), Oskar Negt (b. 1934), Alfred Schmidt (b. 1939), Albrecht Wellmer (b. 1933), and Jürgen Habermas (n. 1929), who ranks as one of the most prolific and influential philosophers of his generation.

The questioning about religion as critique has been important in two different senses: Firstly, an increasing number of critical theorists (in the broadest possible sense) have looked for Theology as a likely way out of its own antinomies – the impossibility of thinking under the constraints of global markets and massive cultural industries. Secondly, critical theory has recognized but also diminished the theological field at the same time. That is to say, it has rediscovered its critical value once immersed in a fully secularized world. Like art, religion knows both sides of modern societies: (1) its scope is wider than those of natural and social sciences, and (2) pays increasing attention to social pathologies. The recent debates between Jürgen Habermas and Pope Benedict XVI (then Joseph Alois Ratzinger) have focused on the role of reason and religion in a free society.

Springing from the Marxist diagnosis on modernity and its unsolved problems, critical theory is to be originally understood as a theoretical fight against ideologies, serfdom, and domination, and also as a quest for a critical use of reason and emancipation. But what Horkheimer and the others undertook was

also a profound revision of basic principles of traditional Marxist theories: social evolutionism, lack of attention to ideological and cultural details of domination, and the controversial Marxist faith in the working class (*das Proletariat*) as the historical subject of social change. Opposite to this, critical theory recovers a dialectical comprehension of society and links theoretical, critical, and practical uses of human reason. Thus, critical theory makes up an emphatic concept of social reason far beyond merely methodical or scientific uses of rational faculties and, therefore, relives its practical power – then again, named as critical autonomy or suppression of the sphere of domination. They argue that technical and scientific outcome from social reasoning (certainty of the relationship with nature, increase of welfare) must add to the political overturning of conditions of social irrationality in order to establish a rational fair order of things. From the beginning, the Institute of Social Research tries to clarify the reasons why Enlightenment has not fulfilled its moral content, paying special attention to bourgeois societies and their mechanisms for socializing and appropriate driving of social response.

When this line of thought becomes central, the Frankfurt School spreads social and cultural criticism to the realm of foundations of reason and mechanisms of thought, adding to critical theory of society and economy a deep analysis of different forms of rationality, speech, and experience. According to this, the traditional model of *critique of ideologies* – the process according to which knowledge of unfairness unmasks false consciousness – is surpassed by *critique of reason* – yet to be understood as the report of those limitations which reason finds when attempting to deny current social conditions. Therefore, critical theory remains aware of its social function and finds itself apparently open to social change. This is where Horkheimer arrives when stating his highly influential distinction between *traditional theory* and *critical theory* (“Traditionelle und kritische Theorie,” 1937). In this writing, Horkheimer deploys the term *traditional theory* to designate classical theoretical models, at least

since Descartes, which look for constant relations between objects – those that can imply technical involvement with reality – and attach to restrictive methodological and analytical procedures. Traditional theory distinguishes itself from other theories for a rampant reductionism that restricts processes of knowledge by avoiding value-instances and inner bounds between objects and their historical and social frame. It is precisely in this way – according to Horkheimer – how sociology confronts its objects as something to be figured out and then commanded. It confines itself to success in prediction. But, as Horkheimer notes, “there is likewise no theory of society, even that of the sociologists concerned with general laws, that does not contain political motivations; and the truth of these must be decided not in supposedly neutral reflection but in personal thought and action, in concrete historical activity” (Horkheimer 1982b, p. 222). If *traditional theory* seeks to put reality in order and build up a permanent notion of truth, critical theory is aware of the relationship between human sciences, interest, and social procedures. Therefore, it makes social change an inner goal: “For all its insight into the individual steps in social change and for all the agreement of its elements with the most advanced traditional theories, critical theory has no specific influence on its side, except concern for the abolition of social injustice. This negative formulation, if we wish to express it abstractly, is the materialist content of the idealist concept of reason” (Horkheimer 1982b, p. 242).

The gathering of thinking and acting, knowledge and praxis, puts critical theory against Max Weber’s notion of value-neutral sociology for it would allegedly conceal the problem of its social position from concrete theoretical work: “Beyond doubt, such work is a moment in the continuous transformation and development of the material foundations of that society. But the conception of theory was absolutized, as though it were grounded in the inner nature of knowledge as such or justified in some other ahistorical way, and thus it became a reined, ideological category” (Horkheimer 1982b, p. 194). Also,

early Frankfurt School works are devoted to an open rational Enlightenment from an interdisciplinary scope. Within this, intellectual realm studies on working-class attitudes in Weimar Republic and the *Studies on authority and family* (*Studien über Autorität und Familie*, 1936) are particularly relevant.

The experience of exile and Nazism had a huge impact upon different members of the Frankfurt circle, albeit not only biographically speaking. In the field of theory, the Frankfurt School experienced a significant turn toward radical reports of the destructive power of social rationalization and its outcome. Historical facts such as the political drift of the Soviet Union, the explosion of European Fascism, the cultural dominance of the USA or the increasing working-class tendency toward integration and a certain welfare state, forced Horkheimer and the rest of the Frankfurt circle into rethinking the certainty of revolutionary processes in advanced societies. Besides, they had to rethink whether the interpretation of historical facts was to be undertaken through categories such as *class consciousness* or *class struggle* or not. Not only the increasing expansion of marketing, advertising, and consumer society but also the totalitarian path taken by the Soviet Union led the school to determine that Nazism was not unique or a barbaric state of exception. It was not an exception in history. In this new stage, Frankfurt School writers begin to talk about Nazism as the main symptom of something bigger: the clearest of modern societies’ tendencies, that is to say, inclination toward control of both men and things. At this point, Frankfurt School writers – Adorno, Horkheimer, and Marcuse in particular – will tend to overcome Marxist materialist procedures in order to track in human history those social and psychological elements which explain how the Enlightenment has become a social order of reification of both human critical resources and aspirations. These writers feel that concepts such as progress and rationality must be redefined. Their attitude toward philosophy, then, links them with the Marquis of Sade, Hobbes, Nietzsche, or Freud. Consequences of this move were clear: after

their common materialist dialectical framework is gone, the Frankfurt group disbands philosophically, and critical theory itself relates, from this moment on, only to the works by Horkheimer and Adorno.

Year 1942 is when this change becomes ultimately clear. Horkheimer writes and publishes *The Authoritarian State* (*Autoritärer Staat*, 1942). Highly influenced by the work of Walter Benjamin, Horkheimer traces the different forms of domination in advanced societies (including National Socialism, socialism, and capitalism). Horkheimer stresses non-economical forms of fastening and submission, and states that social change, less plausibly steady as the century goes, must become more of a break-up with historical logic than a powering of it. Thus, social reality is to be understood under the philosophical category of *totally administered world*. This designates a certain political evolution turning into the victory of the technical dimension of rationality, absolute codification of life, and the closure of social and political alternatives. Collective conscience is generated and put under control by mass instruments, and the subject is reduced to the point zero of being mere part of the production process. At this point in time, Frankfurt School representatives are devoted to cultural criticism, cultural theory, and social analysis of modern capitalist societies.

This is where *Dialectic of Enlightenment* (*Dialektik der Aufklärung*, 1947) points at. Written by Adorno and Horkheimer during the 1940s and published in 1947, this work still ranks as the landmark for critical theory and, moreover, among the most influential books of the century. Here is presented a relentless critique of historical progress by showing the relationship between myth and Enlightenment, reason, and domination, stating that “in the enlightened world, mythology has permeated the sphere of the profane” (Adorno and Horkheimer 2002, p. 21). Therefore, the myth is already Enlightenment – myth is to be understood here between its ancient Greek meaning of true story, which unveils the origin of something, and its present meaning as a false popular belief – and Enlightenment turns once more into mythology.

An insight in mythical, irrational, and violent aspects of modern reason reveals the particular dialectic of Enlightenment, according to which rational power, increasing freedom, and autonomy are slowly substituted by a model of rationality that does not only administrate the order of things without questioning it but also gives up when it comes to making this order appear reasonable.

Nazism became a paradigm for this process, for it showed how rationality and human horror can team up in perfect harmony. The model these societies adopt is that of instrumental reason – one-dimensional reason, says Marcuse – being its main features (1) an inner ambiguity and (2) an empty case: (1) instrumental reason can fully cooperate with human advance by helping its means being more efficient, but at the same time, it is not capable of proposing any end (to these means) at all. (2) *Instrumental reason* is just *particular reason*. Universal aims are out of its range. Due to certain dark points in Horkheimer and Adorno’s book, it has been said that what they propose is the return of irrational-sentimental-human motifs in western culture. This point is not clear, though. What Adorno and Horkheimer seem to defend is the fulfillment of the critical agenda of Enlightenment: they look for a culmination of *practical* reason, not for a collapse of reason. The expectations of enlightened practical reason can only be assumed after the recognition of a failure in modern advanced societies: technical rational procedures, even the most successful, do not entail the suppression of barbarism. The argument for the conversion of Enlightenment into myth eventually alludes to the process of socially executed domination through consciousness-oriented patterns and authoritarian role models only to be overpowered by radical social and philosophical criticism.

This diagnosis needed two more works to be developed, both by Horkheimer: *Eclipse of Reason* (1947) and *Critique of Instrumental Reason* (*Zur Kritik der instrumentellen Vernunft*, 1967), being the second an extended version of the first one. In both of them, Horkheimer depicts two dominant modes of reason in the western

world: (1) objective reason, whose activity leads to a still hierarchical order, and (2) subjective or instrumental reason. This leads to a sophisticated process of strategic choice of means to a previously determined end. Within the critical philosophy of the Frankfurt School, subjective reason is regarded as the most representative corruption of practical reason. Due to its inability to suppress its mythical content, Enlightenment has allowed reason to construct rationally inhuman orders – then again, Horkheimer has Nazism in mind when writing this. In terms of ends, Enlightenment has been living in denial; it has pushed everything but instrumental management into the background, but without stating to which ends were those means acceptable. The victory of the model of one-dimensional reason blocks critical thinking by eluding measuring the value of existence today.

Around this argument, Adorno and Horkheimer build an ideological and cultural critique of society that soon became one of the Frankfurt School main hallmarks. The central element of this argument is the critique of power and its interest in homogenization and integration, arranged by what Adorno has named the *cultural industry*. The analysis of ideological reproduction in advanced capitalist societies stresses how a distorted perception of reality and the high pressure on private ways of living relate to the disappearance of genuine aesthetic experiences and any conflict whatsoever between culture and society. Thought and culture are mass controlled, and they do not discern anything different beyond the current cultural horizon. The entertainment net, as well as knowledge itself, reaffirms a still approach to social reality.

Loyal to the critical-negative configuration of their theory, Adorno and Horkheimer do not present a positive model of collective practical reason, but it is also relevant to note that general assumptions of critical theory point at a total recovery of creative-critical reason. Therefore, reason perverts itself as long as it does not think the best out of itself. For Adorno and

Horkheimer, it is not about absolute intellectual security but about a model of critical thinking enabled to generate a whole set of practical human ends.

Critical theory then charges the hard core of its critical thinking with *negation*, alongside the dialectical tradition of western philosophy. Philosophy is to be understood as the struggle for not subduing. But negation, as Horkheimer himself has argued, offers two different sides: on one side, it is the negation of ideology. On the other, it is negation of the insolence of reality. This negative position finds its highest expression in Adorno's late work *Negative dialectic* (*Negative Dialektik*, 1966). In Adorno's view, dialectical thinking does not have to lead to a new ultimate system of thinking but to the recognition of the perennial character of contradiction, difference, and contingency. Against those who comprehensively close the system – namely, the thinkers of *identity* – Adorno's philosophy accounts for complexity and antagonism. Totality and harmony are just not compatible. Even though Adorno is insistence on this position, it has been argued that critical theory has put too much weight on its interpretation of this *closed totality*, which seems to define the whole social, economical, cultural, and juridical system. All these institutions are regarded as totalitarian means to a totalitarian end, and therefore, Adorno and Horkheimer would have misunderstood inner differences between contemporary social systems (liberal democracies and the Soviet Union, particularly). What cannot be disdained, though, is Adorno's definitive closure of the possibility of making reality more rational by developing specific policies. Social transformation, he argued, needs to be thought in terms of a *redemption* which at the same time cannot be mentioned in any way but the negative way. This point of view of redemption or *negative theology* has been interpreted by many scholars and religious thinkers in terms of resignation before the definitive judge on systematic thinking and modern empathic reason: Adorno has famously put this as the fact that philosophy's survival

has to do with the fact that the moment of its realization was missed.

Providing ground for many of these arguments stands the work of Walter Benjamin, whose intellectual presence in Adorno's work is invaluable. Although his philosophical exchange with Horkheimer never proved fruitful, Benjamin's attention to cultural detail, religion, time, history, and historicity did have an impact upon Adorno's negative dialectics. Also, Benjamin developed a highly influential theory of experience, according to which modernity and mass media entail an impoverishment of experience (in social and cultural terms) but not necessarily the annihilation of critical thinking. Adorno and Benjamin shared a vivid interest in a theory of interpretation of modern capitalist culture as part of a whole attempt to understand modernity. This attempt is not only about cultural forms. It is about the work of art itself in modern times. Summarizing, Benjamin brings modernity and spatializing together. That is to say, there is no science if we do not trace the extremes of our object: its history. No insight into the realm of art can possibly avoid the completion of the history of its objects. This idea is also relevant in terms of Adorno's critique of music. In his *Philosophy of new music* (*Philosophie der neuen Musik*, 1949), he argues that we can only get to know our objects (musical works of art, that is to say, works in which duration plays a major role) when going through their extremes. Only these extremes guarantee the recognition of their truth content. This approach gets back to certain hermeneutics of cultural forms of capitalism or, in other words, to a physiognomy of history in terms of hermeneutics of the (hidden) natural history of cultural objects. Adorno, not far from Benjamin, argues that the origin of the artwork is to be grasped in its pre- and post-history. The extremes of the artwork are the sign of its main features: it reflects the rest of the world – the whole capitalist system. Its essence is not pure history but natural history.

The natural life of the artwork, its inner history, develops clearly as a kind of relationship according to which its nature is historical and its

history natural. Pre- and post-history means to extract the historical dimension registered in the idea of the artwork. In terms of Adorno's book on new music, it is not about different styles and periods but about the procedural constellation in which the work emerges. This is extremely coherent with Benjamin's claim that art criticism is actually mortification of the work of art. To mortify a work of art means to approach a hermeneutical mediation toward a materialistic theory of interpretation. To put it another way, to mortify is to obtain the *dialectical image* of the work. Both Benjamin and Adorno twist nature and history in order to challenge the usual approach to natural history, that is to say, the very idea that natural history means taxonomy, nature as something that is always previously given to us. Right now, Benjamin and Adorno are placing natural history where the only dialectical bound between nature and history is no more opposition but transience (passing-through). Among Benjamin's major works are to be found *The origin of German tragic drama* (*Ursprung des deutschen Trauerspiels*, 1925), *One-way Street* (*Einbahnstraße*, 1928), "The work of art in the age of its mechanical reproduction" (*Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit*, 1935), *The Arcades Project* (unfinished, *Das Passagen-Werk*, 1927–1940), and the "Theses on the Concept of History" (*Geschichtsphilosophische Thesen*, 1940).

Another key figure within the Frankfurt School is Herbert Marcuse, even though his work cannot be assimilated to the work of Adorno and Horkheimer. His philosophical background, far from being strictly dialectical, was oriented toward Husserl's phenomenology and Heidegger's ontology. Marcuse attended the well-known Freiburg lectures by the latter. After this formation period, from which comes his relevant work *Hegel's Ontology and the Theory of Historicity* (*Hegels Ontologie und die Grundlegung einer Theorie der Geschichtlichkeit*, 1932), Marcuse found in Marxist philosophy a possibility for more social content for his theory. After Heidegger's *Being and Time*, Marcuse gets increasingly closer to some Marxist

principles. In his remarkable *Reason and Revolution* (1941), Marcuse inserts Hegel in the realm of Marxist thinking by underlining the notion of *praxis* in his work. Marcuse's standpoint is opposed to that of Adorno and Horkheimer, regarded as overrated theoreticism, and pays special attention to the action of social forces and shows steady faith in the final reconciliation of mankind and reality. The writings of young Karl Marx and Freud are also relevant sources from which Marcuse develops his liberation project. This would consist of putting *the great denial*, that is to say, the withdrawal of alienating forces by promoting gratification instincts, the fair use of technology and the political action of the worst off. His works have also been influential for its utopian charge. These are particularly interesting: *Eros and civilization* (1955), *Soviet Marxism* (1958), *An Essay on Liberation* (1969), and above all, *One-dimensional man* (1964).

Also, a very well-known critical intellectual next to the Frankfurt School was the psychoanalyst Erich Fromm. In the beginning, Fromm added to the common Marxist background of the group his strong interest in anthropological and spiritual issues. It is in this sense that Fromm finds human alienation only to be disrupted by a suppression of violence and depersonalization. Fromm revised this position in the 1940s with strong consequences: now far from Frankfurt, Freud's presence diminished and the stress on humanitarian aspects, ethical life, and oriental religions was increased. But Fromm always kept the concept of human nature and the road toward emancipation in mind. His main works are *Escape from freedom* (1941), *Psychoanalysis and Religion* (1950), *The Art of Loving* (1956), *Psychoanalysis and Zen-Buddhism* (1960), *The Anatomy of Human Destructiveness* (1973), and *To Have or to Be?* (1976).

Summarizing, the Frankfurt School presented a model of critical thinking and radical enlightened critique of reason and Enlightenment itself. Besides, in the surroundings of the Institute, many political and economical researchers could publish and present their contributions.

Some of them were ostracized and others never got along with the Institute of Social Research's patterns. *Behemoth*, a study of National Socialism written by Franz Neumann (1900–1954) in 1942, and *Punishment and Social Structure* (1939) by Otto Kirchheimer (1905–1965) and Georg Rusche have also been influential in historiography and social sciences. The work of these authors highlights the weak points in critical theory: the lack of accuracy and critical development of political, institutional, and economical categories; also, it has been said that, up to a point, the Frankfurt School never got rid of certain cultural elitism and theoreticism. This arguably misled Adorno and Horkheimer, and got them progressively further from social problems and politics. Different generations of the Frankfurt School have later tried to solve these issues, being Jürgen Habermas its main representative. Habermas' research manages to transcend the philosophical edges that limited Adorno and the first generation's work without letting its critical hardcore slip. He has also tried to inscribe critical theory in the realm of language, communicative action, and the normative foundations of the state. His work has been widely discussed both in the USA and overseas, specially his works *Theory and Praxis* (*Theorie und praxis*, 1963), *Knowledge and Human Interest* (*Erkenntnis und Interesse*, 1968), *Theory of Communicative Action* (*Theorie des Kommunikativen Handelns*, 1981), and *Faktizität und Geltung* (1992). One of Habermas's students, Axel Honneth, has also developed a strong interest in power, recognition, interpersonal relations, and justice. Honneth's philosophical exchange with Nancy Fraser and his work on recognition have proved very fruitful. Honneth's research program focuses on the paradoxes of capitalism and its structural social transformations, and remains the last stage in the Frankfurt School's history so far.

Religious debates involving critical theory have arisen in the last 20 years, particularly after the tearing down of the Berlin wall and the dissolution of the Soviet Union. The debates about Fukuyama's "end of history"

argument have had religious implications. The secularization processes, the pessimistic views on mankind's ability to cope with technique, and the idea of history as an evolutionary process drew out in the early 1990s strong debates about religion's role in a democratic-liberal closed world, as Fukuyama had projected. In the last decade, some political philosophers have argued that radical Islamism (Fukuyama himself) constitutes the kind of menace that fascism and communism were from the early 1920s onward. Critical theorists like Perry Anderson (or even Jacques Derrida, both in different senses of the terms *critical* and *theory*) have been extremely reluctant to Fukuyama's claim, arguing that the end of history can only be about either getting rid of Marx (Derrida) or, as Anderson has criticized, about imposing an existing order *sub specie aeternitatis* (which would consist of a world permanently based on strong liberal democracies in a peaceful environment). Many scholars and intellectuals are currently discussing related issues, including (1) the problematic relationship between religion, rights, and immigration (France, the USA, the UK, etc.); (2) the links between religious practices and contemporary art; and (3) the philosophical implications of political theology (Carl Schmitt, Johann Baptist Metz) in the range of critical theory, society, and ecology. Also, there is (4) an ongoing discussion about the relationship between Freud's and Lacan's psychoanalytical approach, the Christian neighbor with the otherness that entails, and the critical theory of Benjamin and Adorno. Horkheimer himself argued, in the mid-1960s, that thinking about Kant was thinking about reason defending itself against its new enemies by means of reason. It is in the sense of this huge task that one might argue that the Frankfurt School and critical theory in a broader sense, which includes Robert Kurz, Heinz Steinert, Perry Anderson, Fredric Jameson, Terry Eagleton, Judith Butler, Seyla Benhabib, Slavoj Žižek, Ernesto Laclau, Bob Jessop, Antonio Negri, David Harvey, or Moishe Postone, among others, are about both a new

philosophical agenda but also about new perspectives on different scientific traditions.

Cross-References

- [Aesthetics \(philosophy\)](#)
- [Critical Theory](#)
- [Experience](#)
- [Knowledge, Sociology of](#)
- [Metaphysics](#)
- [Myth](#)
- [Negative Theology](#)

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Critical Discourse Analysis

- [Conversation Analysis](#)

Critical Realism in Theology and Science

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Related Terms

[Theological critical realism](#)

Description

The term *critical realism* (CR) figures widely in philosophy, theology, and the dialogue between theology and science. It turns up in different contexts, sometimes independently of earlier uses. Hence, it is not surprising that its uses vary substantially. Nevertheless, it is possible to point out some core ideas which apply to most, if not all, kinds of CR described below.

Generally speaking, CR is the view that it is possible to acquire knowledge of an external, mind-independent reality. This view contrasts with phenomenism, which holds that knowledge is, or should be, restricted to the description of phenomena (or perceptions) and their relations. CR presupposes metaphysical or ontological realism, which holds that there exists a mind-independent reality. Thus, it denies metaphysical idealism, which holds that reality has, or essentially has, a mental nature. For these reasons, CR is called *realism*.

The qualification *critical* distinguishes CR from so-called naive realism, which claims that reality is as it is perceived. CR acknowledges that we have no direct access to reality. Knowledge of reality is always mediated by the human mind. Therefore, it is constrained by the limitations of human perception and cognition. As a consequence, alleged knowledge of reality is at best partial or approximate, and it will always be possible to subject it to criticism and improvement. The critical nature of CR is often

elucidated with reference to Immanuel Kant's concept of critique as reason's recognition of its own possibilities and limits, which entails criticism of knowledge claims that disregard those limits.

In the various kinds of CR, reality is primarily specified as the natural or physical world. However, reality may also be held to include history, the social world, or God. Further, the mental mediation of knowledge may be regarded as a feature of individual cognition, but also as connected with the social nature of knowledge and its historical transmission. Finally, in its most elementary sense, CR is just the view that it is possible to acquire knowledge of external reality. However, it often involves methodological considerations as part of a justification of the realist bearing of scientific or other beliefs. The concept may even be extended to encompass a full-fledged philosophy including ontological and even ethical tenets.

Critical Realism in Philosophy

The term CR appeared for the first time in German philosophy. Since the end of the nineteenth century, it here designates those positions that take account of Kant's critical epistemology but deny that the mental nature of perception and cognition totally prevents us from acquiring valid knowledge of the external world as it is in itself. More specifically, the term refers to the view of C. Stumpf and others that reflection on sense-data can convey knowledge of certain features and relations of the external world.

In the 1920s, CR became the name of a movement in American philosophy, which was represented, among others, by Roy Wood Sellars (1880–1973) and A.O. Lovejoy (1873–1962). This movement sought to integrate insights of idealism and new realism. New realism was a reaction to nineteenth century idealism, against which it claimed that there exists an external, physical world and that perception and cognition convey direct access to it. American CR agreed with new realism that it is possible to

acquire knowledge of the external world, but disagreed with the thesis of direct access, which it regarded as a form of naive realism. It pointed out that our access to the external world is mediated by mental representations of its objects, which cannot be identified with the objects themselves. Only by recognizing this, error, illusion, and perceptual variation can be accommodated.

Through the work of Wilfrid Sellars (1912–1989), Roy Wood Sellars' son, American CR influenced scientific realism (SR), which arose in the 1950s in opposition to the positivist view of science. Although SR only seldom is designated as CR, it is discussed here because (1) it shares the general characteristics of CR so that it may be regarded as an elaboration of CR in respect of the philosophy of science and (2) it has exerted substantial influence on CR in the dialogue between theology and science.

SR opposes the positivist ideal of science as consisting merely of propositions about observables. For positivists, scientific theories that transcend the phenomenal world (e.g., by positing unobservable entities such as electrons) do not refer to real structures and entities of the external world. Such theories may be useful instruments for the ordering and prediction of the phenomena, but they have no realist bearing. In opposition to this view, SR states that successful scientific theories tell us something about real structures and entities of the world. Often SR includes the idea that progress in science gives us an increasingly reliable picture of reality. According to Stathis Psillos (b. 1965), one of its principal advocates, SR comprises three theses: (1) The world has a definite, mind-independent structure (metaphysical realism). (2) Scientific theories are descriptions capable of being true or false relative to the reality they intend to describe (semantic realism). (3) Mature and predictively successful scientific theories are approximately true and the entities posited by them inhabit the world (epistemic realism) (Psillos (1999)). The idea of truth approximation revives Karl Popper's notion of verisimilitude. Ilkka Niiniluoto (b. 1946) has given a formalized version of this notion, which

plays a central part in his account of SR (which he calls "critical scientific realism").

The main argument in favor of SR is that the best explanation of the empirical success of science is that its theories are approximately true. This argument has been accused of being viciously circular in that it argues for the truth of scientific theories by means of the very kind of reasoning (i.e., abductive inference) upon which those theories are based. Abductive inference is a mode of reasoning to find plausible scientific hypotheses. According to C.S. Peirce (who coined the term) it has the following form: The surprising fact, C, is observed; But if A were true, C would be a matter of course; Hence, there is reason to suspect that A is true. Moreover, the objection has been raised that empirical success does not warrant a theory's truth. The reason is that the phenomena may permit different theories because the latter are underdetermined by the former. In this connection, critics point to the fact that many once successful theories have been abandoned now. The advocates of SR reply that the circularity of the argument is not a vicious one, because its conclusion does not rest upon the presupposition that scientific theories are true. Further, they argue that SR is not a global view of science but has to be established for each theory in particular. Empirical adequacy is not a sufficient criterion here. It has to be supplemented with criteria such as consistency, coherence with other accepted theories, and long-term fertility. Finally, they emphasize that SR does not claim that successful scientific theories are true, but only that they are approximately true.

In 1975, Roy Bhaskar (b. 1944) presented a general philosophy of science named "transcendental realism," which was followed in 1979 by a philosophy of the human sciences named "critical naturalism." Gradually his followers designated these philosophies together as CR. Bhaskar has accepted this designation, arguing that "critical" rightly suggests affinities with Kant's epistemology while the ontological denotation of "realism" indicates the differences from it.

With Thomas Kuhn and others, Bhaskar emphasizes the social nature of science, but, in

opposition to “postmodern” relativism, he contends that science conveys knowledge of an independent reality. Starting from the phenomena, through modeling, experimentation, and other empirical control, science discovers causal laws. Such laws should not be considered as constant conjunctions of events (as does positivism) but as expressions of generative mechanisms that are part of the real world. Since these mechanisms may be explainable in terms of more fundamental mechanisms, the world is to be regarded as a stratified whole. Higher levels emerge from deeper ones but are not necessarily reducible to them. Consequently, each level demands its own specific method of scientific investigation.

In his “critical naturalism,” Bhaskar applies these ideas to the human, especially the social sciences. “Naturalism” indicates that there is a fundamental similarity between the social and natural sciences in that both are concerned with the discovery of intelligible connections in the real world. At the same time, Bhaskar stresses the specificity of the human sciences resulting from emergent properties of the social world. These properties relate to the fact that society, in contradistinction to nature, is the condition as well as the outcome of human agency, which both reproduces and transforms it. Hence, social systems are intrinsically open. As a consequence, unlike the natural sciences, the social sciences rely exclusively on explanatory (and not also predictive) criteria for theory assessment. Further, they enable scientific criticism of social structures that produce false beliefs, which involves the incitation to remove or transform those structures. Thus, Bhaskar’s CR entails the claim that it dissolves the traditional fact/value and theory/practice dichotomies, and passes into ethics. Here, “critical” no longer merely refers to epistemological critique but also to substantial criticism of beliefs and social structures.

In what he called “dialectical CR,” Bhaskar developed these ideas to a general theory of identification and elimination of “absences” (deficiencies) for the sake of socialist emancipation. Obviously, this theory draws from Marxist wells. At the same time, “critical” now also

signals affinity with the critical theory of the *Frankfurter Schule* (Archer et al. (1998)).

Critical Realism in Theology

Bruce L. McCormack has characterized Karl Barth’s (1886–1968) theology as a “critically realistic dialectical theology.” He justifies this characterization (which does not stem from Barth himself) with reference to the fact that Barth grounds theology in the reality of God as He reveals Himself in Jesus Christ. At the same time, Barth’s theology is critical in the sense that it presupposes the validity of Kant’s epistemology and critique of metaphysics. Due to the limits of reason, according to Barth, knowledge of God is possible only by God redirecting our cognitive apparatus through which He makes us participants in His knowledge of Himself.

In the Catholic tradition, Bernard Lonergan (1904–1984) developed a theory of knowledge, which he named CR. On the basis of an analysis of actual knowing, he concludes that cognition involves experience, understanding, and judgment that tests understanding. Combined properly, these elements convey objective knowledge of the real world. At the same time, they constitute the transcendental foundation of the methods of all sciences, natural as well as human. In the designation “CR,” “critical” indicates the similarities with Kant’s critique of reason, while “realism” refers to the realist bearing of proper cognition. Having extended this CR with the notion of decision, Lonergan used it to define the method of theology. In conformity with the demands of cognition and morality, the theologian has to make responsible decisions as to which traditional doctrines should be taken up for systematic understanding and translation into the cultural milieu. In this connection, Lonergan stresses the importance of intellectual, moral, and religious conversion (Dunne (2005)).

Several biblical scholars have incorporated critical realist ideas into New Testament

hermeneutics. Inspired by Lonergan, Ben F. Meyer (b. 1927) states that interpretation should concern itself with the intended sense of the text and the realist truth claims involved in it. N.T. Wright (b. 1948) bases a critical realist hermeneutic on the thesis that knowledge of the real world always is framed by a worldview, of which stories are an essential part. Cognition proceeds through testing hypothetical stories on their “fit” with stories already in place, which may give rise to modify them or formulate new stories. With regard to the interpretation of the New Testament, a critical realist hermeneutic recognizes the subjectivity of both the author and the reader, but claims at the same time that this subjectivity does not necessarily preclude an understanding that gives access to the external realities dealt with by the text. Moreover, it takes seriously the theological view of reality as a whole, including God (Wright (1992)).

Critical Realism in Theology and Science

The term CR was introduced into the dialogue between theology and science by Ian G. Barbour (b. 1923) in 1966. Inspired by SR, Barbour uses the term to denote a realism that acknowledges the creativity of the human mind but also takes seriously the cognitive claims of both science and religion. He connects CR especially with the role of models in science and religion – e.g., the atomic model and the image of God as a father. Such models are systematically developed metaphors which can tell us something about unobservable aspects of reality, though only in partial and inadequate ways. On the other hand, Barbour also stresses the differences between scientific and religious models due to the fact that the latter relate to existential questions of ultimate concern.

CR was elaborated for the science-theology relationship by Arthur Peacocke (1924–2006). Peacocke asserts that, similar to science, Christian faith depends ultimately on experience, viz., religious experience of God as the all-encompassing reality. Moreover, both the

scientific and the Christian communities serve to secure continuity of reference, the latter by transmitting the initial experiences of God and linking them to new ones. Theology has the task to interpret religious experience in connection with reflection on the world, using metaphors and models as science does as well. Theology and science are, or should be, interacting approaches to reality. At the same time, it is the hallmark of theology that, by virtue of its concern with reality as a whole, it constitutes the highest level of integration (Peacocke (1984)).

John Polkinghorne (b. 1930) developed CR somewhat differently. According to him, CR considers intelligibility a guide to ontology. Therefore, the progress of scientific understanding gives us increasing verisimilitudinous knowledge of the world. Science and theology are engaged in a common quest for understanding. There is, however, an important difference with regard to the role of models. While models in science merely have a provisional, heuristic function and often are replaced by mathematical theories, theology can only speak of God in a variety of models using symbolic language. Nevertheless, because it contributes to the intelligibility of the world, also theology can legitimately claim to convey verisimilitudinous knowledge. Polkinghorne even parallels the development of the Christological doctrine in the early Church with the development of quantum physics, though recognizing that the former merely led to a delimitation of the range of discussion, not to the formulation of a positive theory.

During the last quarter of the twentieth century, CR was the dominant epistemology in the dialogue between theology and science. However, from the 1990s onward, the transfer of CR from science to theology has met with growing skepticism. The main reason was the consideration that this transfer does not sufficiently take account of the differences between theology and science. The criticism of Ernan McMullin, a prominent representative of SR, was of seminal importance. McMullin points out that alleged evidence in theology (e.g., religious experience) not by far has the intersubjective strength of

empirical evidence in science and that there is no consensus about the criteria of theory assessment in theology, as there is in science. Moreover, theology cannot appeal to an explanatory success similar to that of science, the success of which is the main argument for SR. Therefore, the fact that the objects of both science and religion are beyond literal description is not a sufficient reason to transfer CR from science to theology (McMullin (1985)).

In 2002, Alister E. McGrath's (b. 1953) "scientific theology" introduced Bhaskar's CR into the field of theology and science. McGrath draws his main inspiration from Thomas F. Torrance (1913–2007), who, on the basis of Barth's Christocentric realism and in dialogue with the sciences, developed a theology of incarnation and creation. In the same vein, starting from God's revelation in Christ, McGrath's scientific theology explores God's relationship to the created world, taking account of scientific insights. This theology incorporates Bhaskar's ideas that scientific investigation is a response to an independent reality, that reality is stratified, and that the method of a specific discipline must be determined by the nature of its object. A Barthian view of theology is combined with Bhaskar's CR. One consequence is that God, as the one who causes all else to exist, is considered the most fundamental stratum of reality, and theology, being the study of God, is placed at the base, not at the apex, of the sciences (McGrath (2002)).

Cross-References

- [Classical and Quantum Realism](#)
- [Concept of God in Contemporary Philosophy of Religion](#)
- [Epistemology](#)
- [Experience](#)
- [Hermeneutics, Theological](#)
- [Ontology](#)
- [Perception](#)
- [Philosophy of Science](#)
- [Realisms in Philosophy of Religion](#)

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Critical Theory

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Related Terms

[Frankfurt school](#); [Marxism](#)

Description

Critical theory is a school of thought that stresses the examination and critique of society and culture, drawing from knowledge across the social sciences and philosophy. Critical theory aims at explaining and transforming the circumstances that enslave human beings, as Max Horkheimer defined the term in his now famous 1937 article *Traditional and Critical Theory*. Critical theory in most of its main form

has at least two main elements. Firstly, it is held that empirical study and philosophical analysis should be brought together to form a detailed and correct understanding of a phenomenon under study. Secondly, it is held that the normative basis for the critical research and critique should be founded on the needs, longings, and moral demands of the people living under the conditions of the system or structure that are criticized.

The above definition leads to two different ways to articulate critical theory: one a narrow sense and the other a broad sense. Critical theory, in the narrow sense, points to a several generations of long tradition of German philosophers and social theorists in the Western European Marxism known as the Frankfurt School. According to these theorists, a “critical” theory may be distinguished from what they call a “traditional” theory according to its specific purpose: a theory is critical to the extent that it seeks human emancipation.

Because such theories aim to explain and transform all the circumstances that enslave human beings, many “critical theories” in the broader sense have been developed. They have emerged in connection with the many social movements that identify different dimensions of the domination of human beings in modern societies. In both the broad and narrow senses, a critical theory provides the descriptive and normative bases for social inquiry aimed at decreasing domination and increasing freedom in all their forms. In this sense, any philosophical approach with similar practical aims could be called a “critical theory,” including feminism, critical race theory, and some forms of postcolonial criticism.

Critical theory, in the narrow sense, has had many different aspects and quite distinct historical phases that cross several generations. The Institute for Social Research (founded in 1928) saw the arrival of the Frankfurt School theorists (Erich Fromm, Theodor W. Adorno, Friedrich Pollock, Walter Benjamin, Herbert Marcuse, Leo Löwenthal, Jürgen Habermas, Axel Honneth) after Horkheimer gained the directorship of the Institute in 1930. Its distinctiveness as

a philosophical approach that extends to ethics, political philosophy, aesthetics, psychology, philosophy of language, and the philosophy of history is most apparent when considered in light of the history of the philosophy of the social sciences.

Critical theorists have long sought to distinguish their aims, methods, theories, and forms of explanation from standard understandings in both the natural and the social sciences. Instead, they have claimed, in line with Horkheimer’s 1930 inaugural lecture, that social inquiry ought to combine rather than separate the poles of philosophy and the social sciences: explanation and understanding, structure and agency, and regularity and normativity. Such an approach, critical theorists argue, permits their enterprise to be practical in a distinctively moral (rather than instrumental) sense. They do not merely seek to provide the means to achieve some independent goal, but rather seek human emancipation in the circumstances of domination and oppression. This normative task cannot be accomplished apart from the interplay between philosophy and social science through interdisciplinary empirical social research.

A critical theory is considered adequate only if it meets three criteria: it must be explanatory, practical, and normative. These criteria should be met all at the same time. That is, a critical theory must explain what is wrong with current social reality, identify the actors to change it, and provide both clear norms for criticism and achievable practical goals for social transformation. Any truly critical theory of society has as its object human beings as producers of their own historical forms of life. In light of the practical goal of identifying and overcoming all the circumstances that limit human freedom, the explanatory goal could be furthered only through interdisciplinary research that includes psychological, cultural, and social dimensions, as well as institutional forms of domination. Given the emphasis among the first generation of critical theory on human beings as the self-creating producers of their own history, a unique practical aim of social inquiry suggests

itself to transform contemporary capitalism into a consensual form of social life. A capitalist society could be transformed only by becoming more democratic in a rational society where all conditions of social life are controlled by human beings. The normative orientation of critical theory is, therefore, directed toward the transformation of capitalism into a “real democracy” in which such control could be exercised.

The focus on democracy as the location for cooperative, practical, and transformative activity continues today in the work of the second generation’s main philosopher Jürgen Habermas, as does the attempt to determine the nature and limits of “real democracy” in complex, pluralistic, and globalizing societies. Axel Honneth, who is the main theorist of the so-called third generation, has further developed the first and the second generations’ theories into what he calls the theory of recognition. As might be expected from such an ambitious philosophical project and form of inquiry, critical theory is rife with tensions within the same generation and between the different generations of the tradition.

Cross-References

- [Critical and Cultural Theory](#)
- [Epistemology](#)
- [Existentialism](#)
- [Political Theory](#)
- [Truth](#)

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Critical Thinking

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A scholarly norm applied across the board in all academic fields represented in the modern university including Religious Studies. The critical thinker applies reason and logic to everything under examination; weighs evidence; considers counter positions; draws tentative conclusions based on carefully examined available evidence; considers the source and validity of all information; is careful to acknowledge sources of information with a cognizance of their limitations; is attentive to the soundness and logical progression of argumentation ; and approaches any and all subjects objectively, in an unbiased, fair, reasonable manner.

Cross-References

- [Logic, Informal](#)

Critique of Enlightenment

- [Critical and Cultural Theory](#)

Critique of Reason

- [Critical and Cultural Theory](#)

Cross-Cultural Psychology

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Related Terms

Comparisons; Cultural diversity; Cultural variations; Global psychology; Multiculturalism; Relativism cultural; Universality

Description

Psychological science consists of a number of perspectives and methodological approaches to research and modes of inquiry. These include the developmental, experimental, quantitative, qualitative, and other modes. One of the other approaches that has enjoyed growing popularity during the past several decades is cross-cultural psychology.

Sometimes called culture-comparative psychology or multicultural psychology, the main aim of this approach is to expand psychology's horizons by "extending the range of variation" of psychological variables so that psychology will become increasingly inclusive and enriched by examining virtually any theory or finding in the discipline to determine their generalizability (Berry et al. 2002; Matsumoto 2001; Matsumoto and Juang 2008). For instance, do the laws of learning and memory and cognition established largely in Western cultures hold true everyone around the globe? If not, why? And what might be done to rectify the situation? The same could be asked of perceptual processes, intelligence and abilities, personality development, psychopathology, and many other approaches to studying the nature of individuals who often grow up in strikingly different cultural contexts. Social psychological perspectives, mixed with cultural inquiries, are especially prevalent in contemporary cross-cultural psychology (Smith et al. 2008). Largely, then, cross-cultural psychology

can be considered as a psychology "writ large" – that is, it encompasses all human thought and behavior, doing so by using the traditional tenets of psychological science.

Relatively recent developments include the founding in 1970 of the *Journal of Cross-Cultural Psychology*, the formation of the International Association for Cross-Cultural Psychology in 1972, the publication of hundreds of books in the area, and additions to psychological curricula throughout the world that features the psychological study of culture.

The *Journal of Cross-Cultural Psychology* (JCCP) is exclusively devoted to the publication of research in which culture plays a critical role. JCCP recently published a special issue entitled "Religion and Culture: Perspectives from Cultural and Cross-Cultural Psychology". This is an important development because religion, at least to some extent, is part of culture. It interacts with other components of culture and thus plays a role in many aspects of the psychological functioning of individuals and groups across the globe. It is for this reason, either explicitly or implicitly, that religion is of particular interest for cultural and cross-cultural psychology. Differences and universals across religions may parallel, if not contribute to and explain, cross-cultural differences and universals in other domains of functioning. The way groups (cultural-ethnic and/or cultural-religious ones) differ or resemble each other on their religious beliefs, emotions, and practices may reflect, or have an impact on, the way these groups' members deal with most if not all the psychological aspects of their life. These include how "self" is defined with respect to cognition, emotion, motivation (Markus and Kitayama 1991), values, morality, interpersonal and intergroup relations, life span development, health, and social behaviors related to work, marriage, leisure, economics, and politics (Smith et al. 2008).

Self-Identification

Science

Cross-cultural psychology identifies itself as a science in exactly the same way that its "parent"

discipline identifies itself as a science. It does so by using essentially the same tools of methodological inquiry, while at the same time having to deal with special methodological problems such as sampling and issues of equivalence. There is no reason for it not to self-identify as a totally independent science.

Characteristics

It is distinctive among the others because it explicitly focuses on culture as an important factor in all topics within psychological science.

Relevance to Science and Religion

Cross-cultural psychology, as a subdiscipline, is interested in the area called “science and religion” only to the extent that religion, as an important phenomenon for millions of people, helps to shape many and, perhaps for a great number, all facets of their lives. However, many psychologists (including cross-cultural psychologists) have little or no interest in studying religion by employing the canons and methods of science. An exception, however, is the study of values, beliefs, and attitudes, which represents a sizeable portion of cross-cultural psychological research. One could argue that religions largely consist of a set of beliefs, an assortment of values, and a number of attitudes. As noted earlier, the *Journal of Cross-Cultural Psychology*, which is the flagship journal of this specialized approach, recently published, for the first time, a special issue on religion and culture.

Sources of Authority

The sources of authority include the massive amount of psychological knowledge that has accumulated for many, many years – even going back to the early Greeks and the scholars and philosophers they influenced. The main contemporary authorities are the leading theorists and

methodologists in the area. The references below provide a sampling of authoritative readings.

Ethical Principles

The ethical principles used are exactly those used in “mainstream” psychology. However, special attention is given to the sensitivities of people from other cultures, under the belief that it would be unethical to exploit them for any reason other than to help understand the nature of their cultures. This rationale is identical to reasons psychologists study individuals and groups in their own milieu.

Key Values

The key values are the values that any scientist holds in studying the subject matter objectively and carefully. For cross-cultural psychologists, it is important to them not to exploit other cultures for their own professional reasons (e.g., to add to their list of publications). Culture-oriented psychologists simply wish to know how other cultures and their inhabitants function. The numerous methodological arrows in their quivers require careful consideration of what they are doing in the realm of ethics and decency.

Conceptualization

Nature/World

The discipline generally subscribes to the premise that nature, including human nature, and the nonhuman world as phenomena that can be understood by using the depth and rigors of the scientific method. Realizing that the challenges are many and endless, cross-cultural psychology endeavors to contribute to these challenges in any way that makes good, solid sense.

Human Being

Like most scientists who study human behavior, the Darwinian perspective, as well as various

related biological and medical sciences, is believed to be adequate to study most of the mental and physical processes of all people, regardless of culture. Studying religion scientifically may be beyond the realm of the “objective” and “nonspirit” world. Note also that it is not necessary for psychologists to address studying religion “scientifically,” but they can do so if warranted.

Life and Death

Cross-cultural psychologists may occasionally and selectively approach issues of life and death primarily because they are universal aspects of being human and because they can be profoundly affected by culture. That is, beliefs and attitudes about life and death are often part of socialization processes in growing up in different societies and cultures.

Reality

Since most psychologists are empiricists and imbued professionally with a sense of scientific objectivity, “reality” is that which can be measured and understood by careful research. Cross-cultural psychologists, like nearly all psychologists, respect and expect reports of “reality” to vary across cultures.

Knowledge

To psychologists and other scientists, knowledge gained through the use of the scientific method is cumulative. As such, the pool of knowledge expands greatly and continuously, and cross-cultural psychologists use it in their research.

Truth

All scientists believe that “truth” can be somewhat ephemeral, elusive, and tentative. Today’s truths can be tomorrow’s falsehoods and such is the nature of scientific inquiry. “Truth” observed and understood across cultures may be more ephemeral and evasive in a broad range of cultures because of methodological problems that must be solved wherever research involving other cultures takes place.

Perception

It is axiomatic and widely established that perception (visual, auditory, tactile, etc.) can be, and usually is, affected by both culture and ecology. Variations in perception are usually understood by a cross-cultural psychologist to mean that these processes are adaptive because of cultural conditions and the nature of the ecological forces to which individuals adapt and function. For instance, culture and ecology affects the perception of visual illusions, sensitivities in hearing, the perception of time, and so on.

Time

As indicated above, time (e.g., the passage of time, accuracy in estimating the passing of a minute, or the construction of a “calendar”) is usually treated objectively by cross-cultural psychologists. If time is meant to mean eons and geological eras, then the way time is used by cross-cultural psychologists can be different – as in Darwin’s theory. The study of time (e.g., accuracy in the perception of the passage of time) and space (e.g., the estimate of distances and size relationships) have been studied over the years by culture-oriented psychologists.

Consciousness

Consciousness has been studied by the ancient Greeks, empirical psychologists and psychoanalysts (such as Freud), and others for many years. The idea of “stream of consciousness” (a term coined by William James more than a century ago) is part of psychology’s scientific legacy. These cross-cultural psychologists can, and occasionally do, use the idea of consciousness in their research. William James’s well-known treatise on the varieties of religious experience is squarely in the realm of studying consciousness. Numerous cultural and medical anthropologists have studied altered states of consciousness that are often part of religious rituals. Some of this literature has influenced cross-cultural psychologists, especially in the mental health field (Ward 1989).

Rationality/Reason

Psychologists assume that as sentient beings, people throughout the world and across historical epochs have the capacity to think, to reason, and to solve problems – in general, to act “intelligently” in various cultural contexts. Psychologists interested in studying rationality and reasoning across cultures often construct tests and other devices to help them understand variations around the world.

Mystery

The word “mystery” is often used in psychology somewhat inquisitively, such as in the “mystery of the human brain,” the “mystery of the development of the self,” and the “mystery of human creativity.” In other words, how does the complex brain work, how do we develop a sense of self, and why are some people highly creative and others not? Mystery, in cross-cultural psychology, is not used as an epiphenomenon or as something associated with “not knowing” or beyond humankind.

Relevant Themes

All of the above covers a lot of ground. Generally, the juxtaposition of the words “science” and “religion” tends to raise eyebrows or hackles. This is because these two important words embrace, separately, different parts of an immense world of facts, beliefs, attitudes, methods of inquiry, and of course a bottomless pit of questions. These two words, when used together in intelligent and rational discourse, can be important to cross-cultural psychologists as they consider the nature and scope of their research.

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Crowd

- ▶ [Collective Behavior](#)

Cultural Adaptiveness/Adaptation

- ▶ [Evolutionary Psychology](#)

Cultural Diversity

- ▶ [Cross-Cultural Psychology](#)

Cultural Evolution

- ▶ [Ecological Psychology](#)
- ▶ [Evolutionary Psychology](#)

Cultural Psychology of Religion

- ▶ [Psychology of Religion](#)

Cultural Studies

- ▶ [Ethnology](#)
- ▶ [Popular Culture and the Mass Media, Sociology of](#)

Cultural Turn

- [European Studies](#)

Cultural Variations

- [Cross-Cultural Psychology](#)

Culture Industry

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A very characteristic term by Th. W. Adorno, culture industry gives title to the third chapter of his book *Dialectic of Enlightenment*, cowritten by M. Horkheimer. When analyzing popular culture, Adorno and Horkheimer diagnose that this consists of standardized cultural goods being distributed by mass media (radio, film, press, magazines, etc.). Particular aims of the culture industry, a term that Adorno always writes in singular, are to dominate and to control masses under a state of permanent consumption of enchanting goods and liquidation of critical thinking. This process of psychological, economical, metaphysical and social domination would end with a negation of true art and the impossibility for the right life, happiness, and social change.

Culture Theory

- [Critical and Cultural Theory](#)

Curved Space

- [Space](#)

Cyberethics

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Related Terms

[Computer ethics](#); [Computer science](#); [Information ethics](#); [Internet ethics](#)

Description

Cyberethics is a branch of applied ethics that examines moral, legal, and social issues at the intersection of computer/information and communication technologies. This field is sometimes also referred to by phrases such as Internet ethics, computer ethics, and information ethics. The expression “Internet ethics” is somewhat narrow in scope and thus unable to capture the range of cyber-related ethical issues that arise independently of the Internet and networked computers per se. Because “computer ethics” connotes ethical issues affecting either computer professionals or computing machines, it also can easily fail to include a cluster of relevant issues that fall under the heading “cyberethics.” The expression “information ethics,” on the contrary, is too broad because it can refer to information-related ethical issues that are beyond the scope of cybertechnology. Additionally, “information ethics” as a field of applied ethics can be easily confused with a methodological framework that Floridi (1999) and others call Information Ethics or IE. (Floridi’s IE framework is intended as a “macroethical framework” for analyzing specific issues in cyberethics.) Thus, the term “cyberethics” best describes the set of ethical issues arising from the convergence of computer/information and communication technologies (Tavani 2004a, 2011).

An excellent historical account of key developments in this field of applied ethics can be found in Bynum (2008), beginning with his analysis of some insights in Norbert Weiner’s work

on cybernetics in the 1940s and 1950s that anticipated many of the issues that would eventually comprise the field of cyberethics as it is known today. Typical issues examined in cyberethics include, but are not limited to, personal privacy, intellectual property, cybersecurity, cybercrime, and the digital divide. In the final section of this entry, we briefly analyze a specific cyberethics issue involving privacy in the context of bioinformatics research.

Self-identification

Science

Cyberethics does not identify itself as a science, although, as an academic field, it does examine moral, legal, and social issues that arise in some scientific disciplines – viz., computer science and information science. Insofar as cyberethics employs empirical observation as an essential step in its overall framework for assessing relevant ethical issues, it incorporates a key element of the scientific method in its approach. However, other aspects of the methodological framework used in cyberethics are conceptual or analytical in nature, rather than empirical.

Religion

Similar to one aspect of religion, as an academic discipline, cyberethics is concerned with identifying, analyzing, and evaluating moral issues, including concerns involving social justice. The main difference is that cyberethics uses a philosophical method to approach moral issues rather than one based on religious authority, such as the Divine Command theory. Although cyberethics issues can be approached from the perspective of religious ethics, most of the current literature analyzes those issues from the point of view of one or more of three principal frameworks: philosophical ethics, professional ethics, or sociological/descriptive ethics (Tavani 2011). Some cyberethics authors, such as Spinello (2006), also use the framework of natural law theory, which has its roots in theological writings (most notably in the works of St. Thomas

Aquinas). An alternative to traditional ethical theories such as utilitarianism and deontology has been proposed by Gert (2004), who analyzes cyberethics issues from the perspective of his system of “common morality” (developed more fully in Gert 2005, 2007).

Characteristics

This question refers to what has been described as the “uniqueness debate” in cyberethics (Tavani 2002; Himma 2003). Some argue that cyberethics has unique ethical issues or properties that distinguish it from other areas of applied ethics (Maner 2004). Other ethicists, whom we can call “traditionalists” (following Johnson 1994), argue that there is nothing novel about ethical issues involving cybertechnology. It would seem that both groups offer a valuable insight into the nature of the issues examined in the field; however, both groups make some erroneous inferences. Traditionalists correctly point out that no genuinely new ethical issues have emerged because of cybertechnology; but these theorists also underestimate the fact that some moral issues affecting the use and development of cybertechnology pose a challenge for our traditional ethical frameworks.

Defenders of what we can call “the uniqueness view of cyberethics” correctly point out that cybertechnology has some unique technological features (e.g., in terms of its malleability and speed). However, they incorrectly go on to infer that the ethical issues associated with this technology must also be unique. Essentially, they commit the “CyberEthics Is Unique (CEIU) Fallacy,” which reasons as follows: Cybertechnology has some unique technological features; cybertechnology raises some ethical issues; therefore (at least some), ethical issues affecting cybertechnology must be unique (Tavani 2011). This reasoning is fallacious because it mistakenly assumes that features or properties that apply to a technology, X, must also apply to ethical issues associated with that technology.

Relevance to Science and Religion

Although cyberethics is not directly interested in many questions affecting science qua science or religion qua religion, it examines some issues and controversies that are of interest to researchers in both disciplines. Along with questions examined by some researchers in religion, for example, cyberethics asks questions such as “What does it mean to be human – i.e., in an era where nanotechnology and bioimplants can extend alter the conventional sense of ‘human’” (Moor 2005; Weckert 2006)? With regard to questions affecting scientific research, cyberethics asks whether the development of cybertechnology (as in the case of any new technology being developed) is “neutral,” i.e., value free, or biased in any way (Brey 2004; Friedman et al. 2008).

Sources of Authority

There are no “sources of authority” per se in cyberethics, but the field is guided by some empirical constraints similar to those in science, and it deals with some abstract issues that might be viewed as classic in moral analysis involving religion as an academic discipline. As far as a widely recognized source or figure in the field of cyberethics, the insights of James Moor (1985) in his classic article “What Is Computer Ethics?” have helped to guide research in computer ethics and cyberethics. In his seminal work, Moor introduced three important terms that have since structured and influenced the research of many philosophers in the field: “policy vacuum,” “conceptual muddle,” and “logical malleability.” Moor argues that because computer technology is logically malleable, it makes possible some novel ways of acting. This, in turn, creates some “vacuums” or voids in our policies and legal framework. However, before we can fill these voids by either creating new policies or revising existing ones, we sometimes first have to clarify muddles that arise. In this sense, Moor (1998, 2001) believes that cyberethics is justified as an independent field of applied ethics (independent of

the question of whether any cyberethics are unique ethical issues, as discussed above).

Ethical Principles

There are no specific ethical principles that guide cyberethics. Rather this field examines a range of ethical principles – from utilitarianism to deontology to natural law theory to contract/rights-based theories to virtue ethics, and so forth – to see how the various principles can be applied to ethical issues that arise at the intersection of computer/information and communication technologies. So, unlike some fields of applied ethics (such as biomedical ethics) that have a set of “received principles” guiding them, cyberethics is still at a point in its development where the ethical principles themselves are debated.

Key Values

Cyberethics has no key values as such. Rather, one of its principal tasks is to examine a range of values affecting professions, such as computing and information-technology professionals, as well as values affecting the discipline of computer science itself. So, an important task of cyberethics is to identify and analyze (implicit and explicit) values in relevant professions and disciplines affecting cybertechnology (see, e.g., Brey 2004).

Conceptualization

As a discipline, or a sub-field of applied ethics, cyberethics has no agreed-upon definitions or conceptualizations of terms such as Nature/World, Life/Death, Reality, Knowledge, Truth, Perception, Time, Consciousness, Rationality/Reason, and Mystery. In many ways, it employs standard philosophical accounts of reality, knowledge, and reason. The notion of reality has been challenged by research in virtual reality technology, and our standard conception of consciousness has been challenged by some of the

developments in artificial intelligence (AI). However, other notions such as nature, truth, time, perception, life and death, and mystery are not explicitly examined in cyberethics.

Relevant Themes

Issues/themes and concepts affecting “the good,” right/wrong, permissible/impermissible, obligatory/supererogatory, and justice are critical to cyberethics as a discipline. Also, concerns about gender issues affecting computers and cybertechnology have been examined extensively by Adam (2005).

A Specific Cyberethics Controversy Affecting Bioinformatics and Personal Privacy

As noted earlier, a wide range of moral, legal, and social issues are examined under the heading *cyberethics*. We also noted that these issues generally include concerns affecting personal privacy, intellectual property, cybersecurity, and cybercrime. Some recent controversies have also emerged in connection with convergent aspects of cybertechnology and non-cybertechnologies. For example, elements of cybertechnology have converged with biotechnology and nanotechnology to form new fields such as bioinformatics and nanocomputing, respectively. These fields, in turn, introduce concerns that pose additional challenges for some classic cyberethics issues such as privacy. We next briefly describe some ways that developments in bioinformatics threaten personal privacy, via a specific case example involving genetic databases.

What Is Bioinformatics?

Although there is no univocal definition of *bioinformatics*, the field incorporates principles and techniques from the broader field of *informatics*, which involves the “acquisition, storage, manipulation, analyses, transmission, sharing, and visualization of information on a computer” (Goodman 1998). So, *bioinformatics* can be

understood as the application of the informatics model to the management of biological information; its objective is to make that information more understandable and useful. Sometimes bioinformatics is used in ways that are synonymous with a sub-field called *computational genomics*; however, the latter field is more specialized since its primary use of informatics techniques and computational modeling is to analyze genetic/genomic data per se as opposed to broader biological data in general (Tavani 2006).

How Does Bioinformatics Research Threaten Privacy?

Bioinformatics research, particularly in the area of population genomics studies, has employed data-mining technology to analyze genetic information and “discover” patterns in DNA sequences affecting various populations and groups. Consider the case of deCODE Genetics (in Iceland) whose use of data mining illustrates the kinds of privacy concerns that arise in bioinformatics research. Many Icelandic citizens, who had been encouraged by their government to donate samples of their DNA to deCODE, assumed that information about their personal genetic data would be protected by either the company’s privacy policies or Icelandic privacy laws. However, Vedder (2004) points out that the kind of privacy protection that applies to personal information about individuals *as individuals* does not necessarily apply to that information once it is collected, aggregated, and cross referenced with other information. So the personal genetic information stored in deCODE’s genetic databases, once cross-referenced with information in that company’s databases containing nongenetic information (such as medical/health and genealogical information), was not entitled to the same kind of legal protection accorded to “individually identifiable personal information.”

Although data mining has helped researchers at deCODE and elsewhere to identify disease genes, this technology is controversial because it also generates *group profiles* (Custers 2006). Some groups can be constructed on the basis of profiles that are not obvious to the individuals who comprise them. For example, Custers notes

that a person who owns a red car may have no idea that he or she belongs to a group of individuals likely to have or to contract colon cancer (merely because of a statistical correlation that associates people who own red cars with colon cancer). Thus, a decision to deny an individual health insurance could be based simply on the “discovery” that the applicant owns a red car and would thus likely have a higher-than-average probability of contracting colon cancer. Analogously, a person could also be denied employment or life insurance based on similar kinds of group profiling that used arbitrary associations and correlations (generated by data mining), linking trivial nongenetic information (such as the color of one’s car) with sensitive information about one’s genetic data. Furthermore, many people who become identified with these (nonobvious) group profiles will have no chance of correcting any inaccuracies or errors that could easily result from their group identification (because they may have no idea that they have been associated with a group whose existence is unknown to them).

Bioinformatics and the Informed Consent Process in Genetic Research

The process of informed consent used in bioinformatics research involving data mining has also been controversial. For example, it is questionable whether the consent process used by deCODE in getting permissions from human research subjects met the required conditions for “valid informed consent.” Consider that even if the human subjects agreed to have their personal data used in a specific context by deCODE, it is not clear that they fully comprehended the process of how their genetic data could be used in secondary or subsequent contexts (e.g., when it was cross-referenced with information in nongenetic databases). Furthermore, it might not even have been possible for deCODE to inform these subjects in advance about all of the potential secondary uses to which their genetic information could be put in future research (Tavani 2004b).

O’Neill (2002) argues that the informed-consent process is ethically important because it

enables human research subjects to protect themselves against both “coercion and deception.” She also argues that for this to be achieved, the consent process must be open or transparent. But we can reasonably ask whether her “transparency requirement” can be satisfied in research practices where data-mining techniques generate data that can be used in subsequent applications without additional consent from the human subjects affected. Thus, it would seem that the kind of conditions required for “valid informed consent” are extremely difficult, if not impossible, to achieve in cases that involve secondary uses of personal genetic information made possible by data-mining technology in bioinformatics research.

Concluding Remarks

We have considered only one case example – i.e., our brief analysis of deCODE Genetics – to illustrate a recent cyberethics issue affecting personal privacy in the context of bioinformatics research. Of course, numerous case examples could have been devised to illustrate the many different kinds of controversies that arise within the field of cyberethics. However, our main objective in this brief overview of the field has been to identify, describe, and elucidate some of the foundational elements and key principles of cyberethics.

Cross-References

- [Cyborgs](#)
- [Deontology](#)
- [Ethics](#)
- [Utilitarianism](#)
- [Virtue Ethics](#)

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Cybernetics

- [Control Theory \(Cybernetics\)](#)
- [Cyborgs](#)

Cyberspace and Religion

- [Online Religion](#)

Cyborgs

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Related Terms

[Biomedical systems](#); [Computer science](#); [Cybernetics](#); [Human-machine organism](#)

Overview

The term “Cyborg” arises as a short form of “Cybernetic Organism,” which is an entity made up of both biological and technical elements. Initially it was used to describe any system of this mixed type (Clynes and Kline 1960); however, it has more recently been employed for entities where the biology and technology are integrally attached, thereby removing people riding bicycles or wearing glasses from the definition.

To be called a Cyborg it is normally the case that the entity has abilities above and beyond those exhibited by either their biological or technological parts alone. This has possibly come about due to fictional stories in which the cyborg has mental and/or physical capabilities which are far beyond those of humans. A counter example to this is the use of the expression, probably by the media to hype the story line, to describe an amputee who has been given an articulated leg or arm, or a patient suffering from a neurological disorder who has received a stimulating neural implant.

While potentially broader definitions are acknowledged, in this text the common understanding of a “Cyborg” is taken to be appropriate. So the focus here is on humans or animals that are enhanced mentally and/or physically over and above the “norm” with integral technology, rather than where technology is merely worn and/or is employed purely for restorative or therapeutic purposes or even to enhance an individual in comparison with their own problematic state. It has to be pointed out, however, that there is by no means a clear division between enhancement and therapy in this situation.

Before continuing, it is worth pointing out that this entry is concerned with actual cyborgs. Hence, it does not deal with cyborgs in art, in popular culture (such as Science Fiction), or social cyborgs, which are directed toward road or city networks. What follows is a look at cyborgs in different contexts, in particular medicine and sport, with subsequently a discussion of animal-based (rather than human-based) cyborgs,

which can give an indication of what might also one day be possible in terms of humans.

Medicine

Although primarily aimed at restoring an individual back toward their original capabilities by means of replacement limbs or functions, some technologies also offer the possibility of taking things further and extending performance past the original.

There are now many human individuals who exist with the aid of integral technology. This can range from an implanted pacemaker to artificial/replacement hips to implants to assist hearing and even to an artificial heart. As in the latter case, the implant may possibly be merely a holding state, to keep the patient alive until a transplant is available. Conversely, it may be an attempt at either a direct replacement of a malfunctioning biological original or as an aid to try to ensure that the biological original continues to perform its duties reasonably well.

Perhaps part of the cyborg family are some people with artificial legs or arms. For example, the C-Leg system is an artificial leg used to replace a human leg that has been amputated. The leg contains a number of sensors such that, under microprocessor control, the leg can alter its gait to best replicate the natural gate of the user. There is no reason why such a leg could not ultimately outperform the original in terms of speed of operation or power.

As far as artificial arms are concerned, the i-Limb hand is a five-digit hand with individually powered fingers that can be controlled by myoelectric signals generated by muscle movements in the remaining part of the person's limb. A better example in this category perhaps is the work of Todd Kuiken at the Rehabilitation Institute in Chicago (Kuiken et al. 2009). Where an individual has had an arm (or two) amputated, leaving functioning nerve fibers to the arm in place, but no longer useful, then these nerves can be redirected in order to control a replacement bionic arm (or two).

The surgical technique involves grafting some of the nerves, which were originally controlling the amputated arm, to functioning muscles so that these muscles contract when the subject thinks about using their amputated hand. Electric signals from these muscles can then be used to control the artificial hand via the traditional myoelectric route using externally positioned electrodes.

If only the lower part of the individual's arm has been amputated, then muscles higher up in the arm can be used for this purpose. Conversely, if the entire arm has been removed, muscles in the upper chest can be employed, with external electrodes positioned on the chest to monitor appropriate muscle movements in order to translate these signals into control signals for an articulated arm replacement. The first person to benefit from this technology was Jesse Sullivan a power worker who, in 2001, received replacement bionic arms when he had both his original arms amputated at the shoulder following an electrical accident.

Research is currently being conducted by several groups in the area of retinal microchip implantation, to replace malfunctioning visual input in humans. As an example, microchips, which contain up to 5,000 solar cells have been implanted into the back of the eye. When light strikes the solar cells, it is converted into electrical signals that travel through the optic nerve to the brain and are interpreted as an image. The silicon in this way acts as a replacement for a malfunctioning retina. The replacement retina has a diameter of 2 mm. The 2-h operation is done through an incision in the sclera (the white part of the eye), and the chip is inserted into a pocket beneath the retina.

The device displays only black and white images and works best in well-lit rooms, but it is hoped that the addition of more solar cells on the chip will improve results. Much of this technology relies on the ability of the human eye to accept silicon chip implants. Numerous patients have now tested this device over a number of years and all report improved vision. However, at present, this is far from a restoration to anything like normal vision

and is certainly not at the stage of experimentation on supervision incorporating a wider-frequency spectrum.

Other research is more formative and is yet to show similar practical results. For example, a different retinal prosthesis is being developed by a group led by Joseph Rizzo (Jensen and Rizzo 2007). Rather than being positioned near the photoreceptors, the chip will be positioned near the ganglion cells, which send nerve impulses to the brain. The prototype uses a camera mounted on a pair of eyeglasses to capture and transmit a light image to the chip. The light and images are converted into electrical impulses, which are transmitted to the brain along the optic nerve. It has to be said though that this is all rather speculative.

Already well developed and commercially available are cochlear implants. These are surgically implanted electronic devices that provide a sense of sound to a person who is profoundly deaf or severely hard of hearing. A cochlear implant does not amplify sound, but works by directly stimulating any remaining functioning auditory nerves inside the cochlear with an electric field. External components of the cochlear implant include a microphone, a signal processor, and a radio-frequency transmitter. A radio-frequency receiver is implanted beneath the skull's skin. The receiver relays the incoming signal to the implanted electrodes in the cochlea. The implant even now gives recipients additional auditory information, enabling the ability to understand speech in quiet environments. It is quite possible though for the normal auditory sound input frequency range (in humans typically up to a maximum of 20 KHz) to be extended in the future.

Over 150,000 people worldwide have already received cochlear implants, the vast majority of these being in developed countries due to the high cost of the device, surgery, and post-implantation therapy. A small but growing number of the recipients have bilateral implants (one implant in each cochlea). Once an implant is in place, the recipient has to train themselves to recognize the signals now being received via their auditory input, a feat which may involve learning to

understand signals with frequencies not previously entertained.

Another type of implant that is now widely used is that employed for deep brain stimulation. This has, thus far, mostly been used to overcome the effects of Parkinson's disease, by sending electrical impulses into the globus pallidus or subthalamic nucleus regions of the brain. Although the present technology involves the application of a continual stimulation signal, research is ongoing to predict when Parkinsonian conditions (tremors, dystonia) are shortly to occur such that a stimulating signal is only applied to stop the effects before they start.

This research requires accurate modeling of the relevant part of the brain such that a computer is employed to predict what the human brain is going to do some time before it actually does it. The same type of stimulator can be used in constant stimulation mode to overcome the effects of clinical depression, Tourette's syndrome, and Epilepsy; however, the novel predictive technique opens up the possibility not only for the treatment of a variety of neurological disorders such as these but also for its use in a plethora of ways where signals within the brain can be monitored and used to infer what will subsequently be decided by the brain.

Brain-Computer Interfaces

A small number of research groups have experimented with implants positioned in the brain of humans more for communication purposes. Although the humans involved have, in most cases, been in a relatively poor medical condition, the technological potential of such experimentation is possibly much wider than that already discussed.

One line of research has been focused around patients who have suffered a stroke, resulting in paralysis. The most relevant is the use of a brain implant which enables a physically incapable brain stem stroke victim to control the movement of a cursor on a computer screen (Kennedy et al. 2004). Functional Magnetic Resonance Imaging (fMRI) of the subject's brain was initially carried

out to localize where activity was most pronounced while the subject was thinking about various movements. A hollow glass electrode cone containing two gold wires was then implanted into the motor cortex, in the area of maximum activity.

When the patient thought about moving his hand, the subsequent activity was detected by the electrode, then amplified and transmitted by a radio link to a computer where the signals were translated into control signals to bring about movement of the cursor on a computer screen. The subject successfully learnt to move the cursor around by thinking about different hand movements. Eventually the patient reached a level of control where no abstraction was needed – to move the cursor he simply thought about moving the cursor. This could, therefore, be regarded as replacing some of the recipients' original functions or as giving the individual the ability to move the cursor by neural signals alone.

Some of the most impressive human research to date has been carried out using a microelectrode array, consisting of 100 electrodes. The individual electrodes are only 1.5-mm long and taper to a tip diameter of less than 90 μm . Human tests are at present limited to two reported studies. In the second of these, the array was employed in a recording only role (Donoghue et al. 2004). Activity from a few neurons monitored by the array electrodes was decoded into a signal which enabled the recipient to position a cursor on a computer screen, using neural signals for control combined with visual feedback.

The first use of the microelectrode array has though considerably broader implications way beyond the concept of therapy and which gives the best reflection of a practical cyborg to date.

As a step toward a broader concept of human-machine symbiosis, in the first study of its kind, a microelectrode array was implanted into the median nerve fibers of a healthy human individual in order to test bidirectional functionality in a series of experiments. A big difference between this and the studies already discussed is that signals could be both input to and output from the nerve fibers. A stimulation electric current

directed into the nervous system allowed information to be sent to the user, while control signals were decoded from neural activity in the region of the electrodes. In this way, a number of experimental trials were successfully concluded (Warwick et al. 2003), in particular:

1. Extra sensory (ultrasonic) input was successfully implemented and made use of.
2. Extended control of a robotic hand across the Internet was achieved, with feedback from the robotic fingertips being sent back as neural stimulation to give a sense of force being applied to an object (this was achieved between USA and UK).
3. A primitive form of telegraphic communication directly between the nervous systems of two humans was performed.
4. A wheelchair was successfully driven around by means of neural signals alone.
5. The color of jewelry was changed directly as a result of neural signals – as indeed was the behavior of a collection of small robots.

In these studies, there was no therapeutic, restorative need for the implant. The individual's nervous system was plugged directly into the Internet, thereby allowing for the remote control of technology by neural signals alone and also for the input of remote sensory stimulation. Essentially the individual involved had their nervous system extended across the Internet – a true cyborg, a human with integral technology, exhibiting a number of powers not available to regular humans.

Sports

At the present time, some of the physical aspects of cyborgs are starting to raise questions regarding human sporting value judgments drawn, particularly in athletics. It is already the case that the world record time for completing a marathon in a wheelchair is much lower than that for completing the same distance on two legs, but it is difficult to regard the wheelchair itself as being an integral part of the body, hence classifying such individuals as cyborgs is perhaps outside the scope.

What is more pertinent is the use of artificial/ technological legs as a replacement for biological legs. As an example, Oscar Pistorius is a South African double amputee (both his legs were removed from half way between knee and ankle) who competes in sprint races with J-shaped carbon fiber add-ons called the “Cheetah Flex-Foot.” The general ruling from the International Amateur Athletic Federation is that Pistorius and other would be cyborgs can compete with regular humans as long as they do not employ “any technical device that incorporates springs, wheels, or any other element that provides a user with an advantage over another athlete not using such a device.”

Clearly the ruling is a precarious one and opens up arguments as to which differences present an advantage and which do not. For instance, it has been alleged that the “blades” Pistorius uses are longer than is necessary, allowing him to cover more ground in each stride. It has also been claimed that the Cheetahs return more energy per stride without ever becoming fatigued or requiring the same “investment of energy” and that they are not subject to the lactic acid build up that slows down human athletes.

It is anticipated that many other sports will soon face problems of dealing with cyborg participants when they wish to compete with regular humans.

Animals

Nonhuman animal studies can be considered to be a pointer for what is potentially achievable with humans in the future. As an example, in one particular animal study, the extracted brain of a lamprey, retained in a solution, was used to control the movement of a small-wheeled robot to which it was attached (Reger et al. 2000). The lamprey innately exhibits a response to light reflections on the surface of water by trying to align its body with respect to the light source. When connected into the robot body, this response was utilized by surrounding the robot with a ring of lights. As different lights were switched on and off, so the robot moved around its corral, trying to position itself appropriately.

Meanwhile in studies involving rats, a group of rats were taught to pull a lever in order to receive a suitable reward. Electrodes were then chronically implanted into the rats' brains such that the reward was proffered when each rat thought (one supposes) about pulling the lever, but before any actual physical movement occurred. Over a period of days, four of the six rats involved in the experiment learned that they did not in fact need to initiate any action in order to obtain a reward; merely thinking about it was sufficient (Chapin 2004). The same team also carried out studies in which rats, with implanted electrodes, were controlled remotely to negotiate a maze. An operator at a computer terminal could cause the rat to turn right or left at a junction merely by pressing a button.

In another series of experiments, implants consisting of microelectrode arrays have been positioned into the frontal and parietal lobes of the brains of two female rhesus macaque monkeys. Each monkey learned firstly how to control a remote robot arm through arm movements coupled with visual feedback, and it is reported that ultimately one of the monkeys was able to control the arm using only brain-derived neural signals with no associated physical movement. Notably, control signals for the reaching and grasping movements of the robotic arm were derived from the same set of implanted electrodes (Nicolelis et al. 2003).

In another project, rat neurons were separated using enzymes and then cultured/grown on a flat multi-electrode array. The neural culture, a self-contained biological brain, was electronically stimulated via the electrodes (inputs) and its electronic response witnessed on other electrodes (outputs) (Marks 2008). The project involved networking the biological brain with a robot mobile platform. The input (sensory) signals to the brain were solely the signals obtained from the wheeled robot's ultrasonic sensors, thereby giving the brain a sense of distance. The output from the biological brain meanwhile was used to drive the robot around. The overall cyborg, with a physical body and biological brain then learned to move around in a corral without hitting into objects. The research is aimed at understanding

basic functioning of the brain, particularly memory, and hence this cyborg is useful as a test bed for research into diseases such as Alzheimer's disease. It is anticipated that before long, human neurones will replace the rat neurones in this study.

Others

At present, there are a range of other studies and technologies that could be seen, by some, as being indicative of cyborg technology. It is felt to be worthwhile taking a brief look at each in turn.

RFID – Radio Frequency Identification Devices, when employed as implants, certainly can give the recipient a variety of abilities not exhibited by humans. While they do not alter any functions within the human body and are not themselves affected by any bodily activity, when activated they do send a personal identifying signal to an external receiver which can be used to carry out functions (e.g., open doors automatically, switch on lights) for that specific individual without the individual having to press a button or flick a switch.

Magnetic implants – small magnets can be placed under the skin, allowing objects to be magnetically attached to the body. One purpose is for sensory experimentation, in which the movement of the implant in the presence of magnetic fields can be felt by the individual.

EEG – Electroencephalography is perhaps the most studied noninvasive interface, mainly due to its ease of use, portability, and low setup cost. Unfortunately, it is susceptible to noise, requires extensive training, and has relatively low resolution with poor repeatability. A number of groups have used the output from external scalp electrodes measuring EEG to drive a computer cursor or vehicle. Often the process is extremely slow, requires months of training, and is highly unreliable. Although individuals wearing such electrodes can appear “cool” for a media image, especially when linked with the term “cyborg,” the technology is certainly not integral with an individual and it is difficult to claim that the person is doing something that they could not

otherwise do, in most cases a lot more effectively, in an easier way.

Ethical Standpoint

If the application of technology is limited to therapeutic means then there may be a few who grumble, but on the whole this is widely accepted. When it comes to human enhancement, however, the picture is less clear. Surely any individual should be allowed to upgrade themselves if they want, otherwise the all important value of freedom of the individual comes into question. Conversely the upgrading of a few humans could realize a new sect and even, ultimately, a new species with abilities well beyond those of humans. So shouldn't such technological progression be curtailed?

But therapy and enhancement cannot be simply separated with a thick line between them. For example, a new ultrasonic sense could provide a person who is blind with the ability to detect objects and move around much more rapidly on their own and thereby regain dignity. Who could deny that? On the other hand, exactly the same technology in an individual with normal vision would give that person an extra sense. Is it right for some individuals to have more senses than others? But on the other hand, if the technology is available it seems a little stupid to restrict its use to a small group of individuals – particularly if there is commercial gain, with jobs and livelihoods to benefit.

It is apparent that the whole area of cyborgs raises enormous ethical and societal topics that are not at all clear. Even addressing issues as to what animal research is carried out and whether or not human neurons should be cultured in a robot body can stir up a variety of feelings. Historically it is often commercial and military aspects that carry most weight and here the picture is clear that enhancement will take place quite simply because the available technology provides a distinct advantage. At this point in time, as this entry has shown, the age of the cyborg is merely at its beginning, but it is clearly in the ascendancy.

Cross-References

- ▶ [Artificial Intelligence, General](#)
- ▶ [Bioinformatics, Computational](#)
- ▶ [Brains, Artificial and Computational](#)
- ▶ [Cognitive Neuroscience](#)
- ▶ [Cognitive Science](#)
- ▶ [Complex Systems](#)
- ▶ [Cyberethics](#)
- ▶ [Dementia](#)
- ▶ [Intelligence](#)

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D

Da Vinci Code

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The title of a novel by author Dan Brown, and subsequent motion picture, that was extraordinarily popular in the beginning of the current millennium. The theme of Brown's thriller was that early Christianity had been a form of goddess worship based on ancient Gnosticism, a "secret" which the Catholic Church had gone for centuries to extremes in order to suppress. While Brown's novel had an equally tremendous impact on the general public's interest in Gnosticism, it was based on highly dubious and largely fanciful historical information that has confused more than illumined responsible research into who the Gnostics actually were.

Daoism

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Related Terms

[Taoism](#)

Description

► [Daoism](#) is the major Chinese autochthonous tradition next to Confucianism. Throughout history, it has played a major role as a philosophy as well as a religion.

Daoism does not fit well into the established Western categorization, which considers philosophy and religion as separate entities; consequently, there has been much debate in China and in the West about the relation of Daoist philosophy of the pre-Qin period (before 221 BCE), also termed "philosophical Daoism," and the Daoist religion, whose first known institutions go back to the second century CE. This entry will consider both, religion and philosophy, as integral parts of "Daoism."

The common ground of philosophy and religion, as well as among the many different strands of religious traditions that considered themselves "Daoist," is the reference to "Dao" as origin of teaching and aim of cultivation and the transmission of knowledge of this Dao. "Dao" 道, literally "way," is conceived in Daoism as the origin and regulating force of the universe and of all being.

Important foundational conceptions of Daoism go back to a short and in many ways enigmatic text of about 5,000 characters, purportedly written by Laozi 老子 in the fifth century BCE: the *Daode jing* 道德經, the *Classic of the Way and its Power*, as A. Waley (1934) translates, or else *The Classic of the Way and the Virtue*, as many other translators render the title.

The history of the booklet is shrouded in mystery. The received version of the text relies on the text commented by the famous scholar Wang Bi (226–249). However, an older version of the text, excavated in 1993 in the Guodian tombs in Hebei, written on Bamboo slips, confirms that in spite of several differences with the received version, the text existed already in 300 BCE.

The *Daode jing* was probably conceived, just like the teaching of Confucius, as a guideline for the ruler to govern well. It proposes that in order to achieve supreme power, the ruler should align himself with Dao.

Dao is a central theme in the *Daode jing* and gives the name to “Daoism.” It is the ontological ground of all being and at the same time the originator and regulator of all being and of all natural processes.

There was something formless yet complete,
That existed before heaven and earth;
Without sound, without substance,
Dependent on nothing, unchanging,
All pervading, unailing.
One may think of it as the mother of all things
under heaven. . . . (ch. 25, Waley 1934)

As ontological ground and origin of all being, Dao embraces all being. This poses an epistemological problem, since anything that embraces all possible being must be “not-being,” in a sense that it cannot have any definable characteristic, because any such characteristic would exclude its opposite and, thus, only “not-being” is able to embrace all being. Dao therefore cannot be described by means of language:

The Way that can be told of is not an Unvarying Way;
The names that can be named are not unvarying names.
It was from the Nameless that Heaven and Earth sprang;
The named is but the mother that rears the ten thousand creatures, each after its kind. . . . (ch. 1, Waley 1934)

Just like Dao cannot be described in words because it transcends any definable characteristic, its functioning cannot be pinpointed to a definite activity and is therefore described as “not-doing” (*wuwei*) in a sense of “not actively

interfering”; however, this “not-doing” entails “nothing that is not done” (*wubuwei*):

Tao never does; Yet through it all things are done. . . . (ch. 37, Waley 1934)

Human beings should strive to imitate this Dao in their dealings with the outer world. The term *wuwei* 無為, not actively interfering, is used also to describe the ideal behavior of human beings and in particular of a ruler. By letting things run their natural course, it was believed that they would by themselves become perfect.

“Kingdoms can only be governed if rules are kept; Battles can only be won if rules are broken.” But the adherence of all under heaven can only be won by letting-alone. . . .

Therefore a sage has said: So long as I “do nothing” the people will of themselves be transformed. . . . (ch. 57, Waley 1934)

As guideline for individual self-cultivation, the proposition of imitating the ways of Dao was taken one step further: The individual should strive to unite with Dao and thus become part of the eternal, which meant to become immortal. Since Dao is not only regulator, but also origin of all being, Daoist adepts sought to “return” to Dao by retracing the process of becoming, by which Dao brought forth being, backward. Where the process of becoming, the change from nonbeing of Dao to being and the 10,000 things, implied ever-increasing multiplicity and complexity, the process of return would imply ever-diminishing complexity, until the adept reaches ultimate oneness in Dao:

Learning consists in adding to one’s stock day by day; The practice of Tao consists in subtracting day by day. Subtracting and yet again subtracting; Till one has reached inactivity. . . . (ch. 48, Waley 1934)

The text of the *Daode jing* always had offered itself to multiple level readings. Its vagueness allowed many different interpretations, and thus, the booklet was venerated and studied by different groups of people throughout the centuries. Its interpreters read it variously as a guide for ruling, as a philosophical reflection on ontology and cosmogony or as an instruction for reaching longevity or immortality.

Its underlying conception that Dao is all embracing furthermore has an exceptional potential for integration of different concepts and ways of thinking and believing.

Thus, in the course of time, many different directions of thought and teachings emerged from this teaching or referred themselves back to it, from immortality seekers and alchemists to war strategists, from philosophers to recluses and monks.

The author of the *Daode jing* is called Laozi. Modern scholarship tends to doubt that he ever existed or that the booklet was put together by one man. However, for more than two thousand years, the name of Laozi has been associated with the booklet of the *Daode jing*, at times as the philosopher who authored the book, at times as the deity who revealed the book.

The earliest references to Laozi we find in the writings of Zhuangzi (369–286 BCE), an important philosopher who is also counted among the Daoists, who relates stories of a meeting between a person called Lao Dan and Confucius (ch. 14 and 33).

About a century later, the philosophical texts *Han Feizi* (ca. 280–233 BCE) (ch. 38) and *Huainanzi* (180–122 BCE) (ch. 11) associate quotations from the *Daode jing* with Laozi.

In 104 BCE, the historian Sima Qian (ca. 145–86 BCE) composed a biography of Laozi contained in his *Shiji*, *Record of the Historian*. This biography relates how Laozi, holding a minor official position in the sixth century BCE under the Zhou dynasty, was disappointed with the government and decided to leave the lands of the Zhou. When he was about to cross the border toward the West, Yin Xi, the guardian of the Louguan Pass, stopped him and asked him to leave some instruction. Laozi thus wrote the *Daode jing* and left it with him. Sima Qian speculates that the Lao Dan praised by Zhuangzi might have been Laozi.

This biography of Laozi became the basis for a rich mythology, developed through the centuries. The myth begins at the “border crossing” – when Laozi leaves for the West. In a text from the first century BCE “The Lives of the Immortals” by Liu Xiang (*Lie xian zhuan*, 77–6 BCE), we

find an elaboration of the theme of going West, where Laozi and the Guardian are portrayed as seekers of longevity.

As of the second century CE, documents from different social environments show that by then Laozi was conceived as a deity. Emperor Huan (r. 147–167 CE) built a palace on the traditional site of Laozi’s birthplace and authorized veneration and sacrifice to Laozi. The *Laozi ming* (Inscription on Laozi) written by Bien Shao in c. 166 CE as a commemorative marker for the site presents Laozi as an embodiment of Dao and also as having the capacity to metamorphose and incarnate at will – often as advisor to the sage kings of China. Texts from a popular environment, like the *Laozi bianhua wuji jing* (“*Scripture on the Transformations of Laozi*”), document that millennial cults of the second century CE believed in Laozi as a messianic savior.

In Sichuan, the sect of the Celestial Masters based their teachings on an alleged revelation of Laozi to their leader Zhang Daoling in 142 CE and revered Laozi as *Lao jun* (Lord Lao) or *Tai Shang Lao Jun* (Lord Lao Most High) as their highest deity.

This sect established the first known social organization of Daoist religion.

Followers were organized into 24 dioceses, each headed by a priest called *jijiu* (libationer). Priests of this sect to this day live in the family and are not celibate. Adherents had to pay a tax of five bushels of rice; thus, the sect was also called five bushels of rice sect (*Wudoumi dao*). Another designation of the Celestial Master’s sect was *Zhengyi dao* (Way of Orthodox Unity), and under this name it continues to exist today along the monastic *Quanzhen* (Complete Perfection) sect as one of the two main religious organizations of Daoism.

The Celestial Masters sect spread from Sichuan first to northern China and then in the fourth century CE also to the south. There they met a different tradition, which claimed its origin in “Dao”: longevity seekers and alchemists, related to the ancient traditions of the “*fangshi*” (Masters of Esoterica). Furthermore, also Buddhism had gained a foothold in the area since the end of the third century. From the interplay of all these

religious movements in the Jiangnan area of southern China emerged two important traditions, based on scriptures allegedly revealed by immortals: the *Shangqing* (Highest Clarity) scriptures between 364 and 370 CE and the *Lingbao* (Efficacious Jewel) scriptures around 400 CE. While originally competing, these and other traditions were eventually integrated into a hierarchically organized Daoism, which comprised ritual practice as well as individual self-cultivation, often with the aim of reaching longevity. The growing scriptural lore was organized in a proto-canon reflecting the hierarchical organization of the developing religious organization. Competition with Buddhism and also Confucian teachings for influence in the imperial court led to further consolidation of originally disparate movements, and by the Tang dynasty (618–906), Daoism became the official state religion.

Yet, even institutionalized as a state religion, Daoism remained a rather open system, interacting with Buddhism and different local cults and co-opting elements from both.

Daoism during northern (960–1127) and southern (1127–1279) Song dynasty enjoyed imperial protection of several emperors. In 1119 CE the carving of the blocks for the first print edition of the Daoist canon began (Schipper and Verellen 2004: 28).

This period also saw the rise of “inner alchemy,” techniques of meditation which aimed at creating longevity by interiorizing the alchemical process. In 1170, Wang Zhe (1113–1170) founded the *Quanzhen* sect. He specialized in “inner alchemy,” and his focus on meditative practice entailed the establishment of celibate monastic communities. The *Quanzhen* sect survives today as monastic Daoist tradition.

Quanzhen Masters obtained imperial patronage in 1197, and the sect grew in importance during the first part of the rule of the Mongolian Yuan dynasty (1271–1368). However, acrimonious debates with Buddhists led emperor Kublai Khan (1215–1294) to turn against Daoism and in 1281 order the destruction of the Daoist canon. The following Ming dynasty (1368–1644) changed the course of Daoism’s development again, favoring Daoism of the *Zhengyi* tradition.

The last dynasty to rule China, the Manchurian Qing dynasty (1644–1911), saw increasing contacts with the West, from the early Catholic missions to the gunboat policy and the Opium Wars. The apparent weakness of China in front of the Western powers led many Chinese to study Western culture, science, and technologies and to reject traditional Chinese culture and values.

The fall of Imperial China in 1911 intensified this trend; the Nationalist as well as the Communist government promoted “rational” and modern culture; Daoism was relegated to the field of superstition; it was considered reactionary and suppressed together with other religions. The height of suppression happened during Cultural Revolution (1966–1976).

Religious policies changed with China’s opening and reform policies after 1978, and as of 1980, Daoism has come to light again, with a fast growing number of renovated and new temples and official representation through the “Daoist Association of China” (*Daojiao xiehui*) as one of the five recognized religions of China. In addition, Daoism has seen some internationalization, carried originally mainly by practices like *Qigong* or *Taijijuan*, which have become popular in the West. Since the 1970s, Daoist temples have been established in some Western countries, in particular in the USA, and more recently Daoist Associations have been founded in several countries, like in the UK (1996), the USA (2000 and 2004), Spain (2001), Switzerland (2007), and others.

With China emerging as a major global economic power, growing self-confidence leads also to regained confidence in its autochthonous culture, in traditional Chinese values and thinking. After the promotion of New Confucianism in the first decade of the twenty-first century, also Daoist philosophy is praised again by some influential academics in China as a possible source of inspiration for the solution of the most pressing problems of humanity – in particular the ecological crisis.

Self-Identification

While, in the twentieth century, Daoism was denigrated and even persecuted as a “superstitious”

religion in China, a British scholar, Joseph Needham (1900–1995) in his monumental work *Science and Civilisation in China* (Needham 1956) claimed that Daoism was foundational for China's ancient scientific development. While this particular theory was refuted later by the American scholar Nathan Sivin (1995), Needham's theory that associated Daoism with science remained influential, especially after its translation into Chinese was published in 1990.

One important impetus for Sivin's critique of Needham's theory was that since the late 1960s a big change had occurred in Daoist studies. Where previously scholarly accounts of Daoism focused on ancient Daoist philosophy and ignored the Daoist religion that had developed after the first century CE, Daoist studies after the 1960s focused on this Daoist religion, and eventually the scholarly vision of Daoist history was rewritten. Where Daoism previously, also in the writings of Joseph Needham, designated a rather vague philosophical trend, it now was recognized as a religion associated with a definable social group, the Daoists.

Sivin argued that most persons accredited with important developments in the history of science in China were officials, but not Daoist priests or monks.

Since the beginning of the twenty-first century, the question of an association of Daoism as philosophy and as religion with science has been reopened by Chinese Daoist or philo-Daoist academics. These intellectuals claim that Daoism – as it is expressed in the *Daode jing* or the *Zhuangzi*, but also in the alchemical teachings and writings of the seekers of longevity of later Daoists – is science.

They emphasize that Daoism has a “scientific” outlook because it emphasizes the importance of observation of natural processes, and they point out the scientific contents and achievements in Daoist writings on medicine, alchemy, astronomy, cosmogony, and cosmology.

Compared to Needham and the earlier discussion on the relation of Daoism and Science, there is an important new element: the religious dimension of Daoism is explicitly recognized and valued.

With a globalizing world facing crises like the ecological crisis, Western culture has been criticized widely as part of the problem. Asian cultures, China in particular, are regaining economic power and influence on the world stage and are searching in their own heritage for solutions to the pressing problems of the twenty-first century.

Daoism and Science are discussed in three important contexts:

First, Daoism is promoted as autochthonous Chinese way of thinking with aspects and elements that can be called scientific. Daoism is therefore proof that Chinese traditional culture did develop scientific thought, challenging the assumption that Western civilization is the only source of scientific thought (Jiang Shen and Tang Weixia 2002/2010).

In response to the global ecological crisis, scholars and Daoists have emphasized the potential of Daoism, with its special affinity to and concern for nature, to contribute to find solutions for this crisis. This debate was initiated by scholars at an international conference in Harvard on Daoism and Ecology in 1998 (Girardot et al. 2001).

Acknowledging that in order to find solutions for a global world, far-reaching cultural changes will be needed, Daoism is hailed as a way to combine spirituality or religion and science, thus overcoming the separation of religion and science current in the Western cultural sphere, which is deemed dangerous because it neglects not only spiritual but also ethical and moral dimensions (Hu 2006).

A prominent advocate of this connection between Daoism and Science is Jiang Shen, professor at Shandong University and director of the Institute of Religion, Science, and Social Studies (IRSSS) founded in 2002 at Shandong University, which offers also a doctoral program “Daoism and Science” and runs a research project “Daoism and Science: Past and Present” and a state-planned research project called “The History of Science and Technology in Taoism.”

Another major promoter is Hu Fuchen, professor at the Institute of Philosophy at the renowned Chinese Academy of Social Sciences (CASS) in Beijing. He proposes a “New Daoism,” which he presents as a strategic ideological possibility for

the global world, for all humanity, to address the most urgent problems of our planet, many of which have been, in his view, ultimately caused by developments driven by Western values (Hu 2006). This New Daoism movement has to be considered not only as an answer to Western culture but also as an answer to the New Confucianism movement, which has gained much adherence and attention in China since the end of the twentieth century.

The claim that in Daoism religion and science are harmoniously united plays an important role in the promotion of New Daoism:

The unlimited transcendent ontology nature of the Dao can be regarded as the ultimate religious belief and the Dao can be seen as the converging point for rational science and philosophy and non-rational religion. This is of unrivalled significance to the development of human civilization. (Hu 2006)

It is not quite clear yet to what extent this movement, which originated in a rather academic environment, will be supported and promoted also by the Chinese Daoist Association and by wider groups of Daoist practitioners.

Characteristics

Daoism is an autochthonous Chinese tradition and religion. It differs from Confucianism in as much as its teaching focuses on the ultimate origin and rule of being and on individual cultivation, whereas Confucian teachings tend to focus on the social community. Furthermore Daoism has many explicitly religious elements, like the veneration of a multitude of deities, rigorous self-cultivation in order to transform the individual being, and a strongly developed ritual and liturgical practice.

In these respects, Daoism shows some similarities and overlaps with Buddhism. However, Daoism differs from Buddhism in the conception of transcendence and in its soteriology. Where Buddhists seek salvation in Nirvana, which implies liberation from the cycle of birth and death and transcending this world of being, the aim of Daoist self-cultivation is to unite with Dao, a return to the origin of all being. Daoism

conceives of the ultimate as immanent; Dao is the origin, ontological substance, and rule of all being, and salvation lies in uniting with this origin of being.

Sources of Authority

The sources of authority of Daoism are firstly the pre-Qin dynasty writings of the Daoist philosophy and religion, in particular the *Daode jing*, but also the *Zhuangzi*.

These ancient texts have been a reference and authority for more than two millennia not only in circles of religious adepts but also among students of philosophy in China.

Their authority derives mainly from the ancient origin and the status as a classic. The classics were considered as repository of knowledge and ultimate truth.

Historically speaking, Daoism has seen many texts appear that claimed to have been revealed by various deities. These generally gained authority among the adherents that believed in the particular deities – often based on local preferences. One important argument throughout history to legitimize newly revealed texts was the claim that they originated in the distant past, but were hidden in the heavens until the time of revelation.

In the contemporary discourse, which different from the past involves intercultural and global elements, there is an additional emphasis on the fact that these texts represent the autochthonous Chinese tradition in opposition to the Western culture and to the fact that they do show some convergences with modern Western scientific concepts and attitudes. In the context of the latter discourse, the fact that they are compatible with conceptions of science, also the writings of later Daoists on medicine or alchemy, like Ge Hong (283–343) or Sun Simiao (581–682), are at times cited as authority.

For religious adherents and practitioners of Daoism, in addition to the ancient texts, also the teaching of the masters, often personal masters and those of their lineage of teaching have much authority. Transmission of teaching, truth, and

Dao through personal masters in a master-disciple lineage has been an important element in Daoism since ancient times and continues to be of importance for religious practitioners.

Ethical Principles

Dao, origin and regulator of all being and of all natural processes, is considered as good; however, it is beyond conventional human concepts of good and bad. The major ethical principles expressed in the classics of Daoism are based on the concept of emulating the Dao, which implies also to emulate the characteristics of Dao. Of particular importance are being soft, yielding, and not interfering in the natural processes of life. Since Dao is origin and regulator of nature, ethics include respect for nature and the noninterference in natural processes. Living and acting in accordance with nature are considered as good, whereas forceful striving of all kinds, including the strife for knowledge and profit, is considered detrimental for individual life and society.

Key Values

The key values of Daoism are the values derived from characteristics of Dao. Of particular importance is the concept of naturalness, letting things follow their natural course without forceful interference. Along with this comes a mistrust in the manmade culture, including wisdom and knowledge, conventional morals, and selfish longing for profit and gain. Furthermore, Daoist values emphasize female attributes, like being yielding and nurturing, which derive from the concept of Dao as mother of all being.

Conceptualization

Nature/World

Dao brought forth one, one brought forth two, two brought forth three and three brought forth the ten thousand things. . . . (Daode jing 2011 ch. 42)

Daoism conceptualizes nature and the world of being as evolved from Dao, in a progressive division from an original one into increasing complexity. Therefore, Dao is ontological substance of the world and nature, and the world ultimately partakes in Dao. In this concept, Dao represents original oneness; two represent the two opposing forces of Yin and Yang, variously defined as sunny and shady side of a mountain, male and female, light and dark, or, in another interpretation also, Heaven and Earth. Dynamic interaction of these two opposing elements then creates being and regulates all natural processes. All being, nature as well as human beings, emerged from Dao. Nature preserves its original nature, which is Dao, better than human beings because it is not influenced by feelings and cognition or by human morals and manmade conventions.

Human Being

Like all other being and the whole world, human beings are brought forth by Dao. Yet, in all ancient Chinese philosophy, human beings are conceded a special role in the world, since the realm of man is conceived as a third fundamental realm, in addition to the ones of heaven and earth.

In addition, Daoism shares with other ancient Chinese ways of thinking the conception that the human being is seen as a microcosm, which corresponds to the macrocosm of the universe. This conception finds its expression in Daoism in a conception of the human body as a landscape, the so-called inner landscape, inhabited by deities, which correspond to stellar deities (Pregadio 2008:75f).

Life and Death

Daoism maintains that all life is brought forth by Dao. Dao is life creating and life sustaining. The interpretations of death vary in the early phase of Daoist philosophical thinking. Where the *Daode jing* seems to advocate long life and immortality and contemporaneously depict death as something to be avoided, *Zhuangzi* in many of his anecdotes relates life and death as parts of the natural process and advocates a mystic experience that goes beyond valuing life and fearing death. However, since the earliest times, seekers

of longevity and immortality called their goal of cultivation “reaching Dao,” interpreted as avoiding death and reaching immortality in this world by uniting with the eternal source of life.

Knowledge

Daoism regards knowledge as negative or at least as something associated with low stages of spiritual cultivation. Knowledge implies distinctions and multiplicity, and the aim of self-cultivation is to overcome distinctions and multiplicity to return to the original unity of Dao. Epistemologically, Dao cannot be grasped by knowledge, but only by “discarding knowledge” (*Daode jing*, 2011, ch. 19) and returning to natural simplicity, since Dao is beyond distinctions.

Cross-References

- [Cosmology](#)
- [History of Medicine](#)
- [Ontology](#)
- [Religion, History of](#)
- [Transcendence and Immanence](#)
- [Worldview](#)

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Dark Energy

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So-called empty space possessing energy. It is believed to arise from the continual popping into existence of virtual particles - a process permitted by Heisenberg's uncertainty principle. We do not see this energy, and for this reason it is called dark energy. However we do see its effects. It produces a repulsive force. This force is causing the distant galaxy clusters to accelerate away from each other as the universe expands.

Cross-References

- [Energy in Physics](#)
- [Space](#)
- [Time](#)

Darwinian Theology

- [Evolutionary Theology](#)

Darwinian Theory and Anthropology

- [Biological Anthropology and Human Ethology](#)

Darwinism

- ▶ [Evolution](#)
- ▶ [Metaphysics, Darwinian](#)

Das Heilige

- ▶ [Mysterium Tremendum et Fascinosum](#)
- ▶ [Numinosa](#)

Das Heilige, Concept of

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Related Terms

[Idea of Holy](#)

From a historical point of view Rudolf Otto's work *Das Heilige* (*The Idea of the Holy*), which appeared in 1917, is one of the crucial points of transition in European thought about revelation and alterity. It could be argued that conceptually and in argumentative style it laid basis for much of what followed. Martin Jay (2004, Chap. 3) has noted that Otto's body of work in general and *Das Heilige* in particular is embedded in the tradition that struggled to find in religious experience a source of knowledge and belief that could supplement the full blown rationalism of modern empirical and critical philosophies. To do just that, Otto found inspiration from the examples of concrete religious experiences in non-European cultures. The philosophies of Friedrich Schleiermacher and Johann Jacob Fries were also central to his formulation of the lineaments of a new theology.

In *Das Heilige* Otto held fast on the experiential, in some sense even irrational, dimensions of religion. These dimensions were ignored even by

neo-Kantianism which was very vibrant at the time. Even though Otto praised Immanuel Kant he simultaneously saw that only Schleiermacher was able to get rid of the Enlightenment rationalism which in Otto's eyes left humanity at a loss. The Enlightenment rationalism had, while claiming to have proved the existence of God, extinguished the *sensus numinus* (also *das Numinose Gefühl*). *Sensus numinus* for Otto was the essential spirit of any religion, and it was something different from intellectual perception of some metaphysical thing or observance of ordinances, as philosophers were used to argue. The recovering of this dimension of religion was Otto's fundamental mission.

Sensus numinus is the experience of the wholly other (*das Ganz Andere*) in fear and trembling. Otto's thinking stresses the categorical difference between human and divine. Concept of the wholly other tries to capture this point in the same manner as Kierkegaard's "infinite qualitative difference" of the divine as the "truly 'mysterious' object that is beyond apprehension and comprehension not only because our knowledge has certain irremovable limits, but because in it we come upon something inherently 'wholly other,' whose kind and character are incommensurable with our own." Otto was also able to anticipate the critique of subjectivism that broke out later during the Weimar period. For Otto *Numinous* is something that is felt as objective and outside of the self.

The experience of the numinous has a double structure. It is the same structure that the object of this experience (*mysterium*) has. First of all the object is a *mysterium tremendum*, an object that is faced with fear and awe. And in this aspect the *mysterium* is at the same time more fascinating and interesting than any other object. In this aspect it is *mysterium fascinans*. This double structure, the "strange harmony of opposites" that Otto opens up in his work, is for him the most central and at the same time the most peculiar thing in the whole history of religions. With the close analysis of this structure Otto draws the dynamic of the history of religion in a global scale.

The *mysterium tremendum* has three further elements that Otto investigates more thoroughly

in his book: (1) Shuddering (*das Shauervollen*), (2) Majesty (*majestas*), and (3) Energy (*energicum*). The element of *Das Shauervollen*, which at first shows itself as strangeness, shuddering, and demonic threat, changes with the cultivation of experience to religious and mystic awe. In this element *numen* is seen as absolute non-approachability. The element of *majestas*, or complete pre-eminence, produces the *Kreatur Gefühl*, the feeling of one's insignificance, which is the basis for religious subservience. The living aspect of *numinose* is seen in the *energicum*, which is expressed symbolically as passion, will, power, and activity.

In the introduction to the English translation of the *Das Heilige* from the 1923, Otto made it clear that his argument is not as one sided as it first seems to be or as dialectical theologians had argued. His translator John W. Harvey described this by saying that Otto is not open to the critique of isolating the transcendent Otherness because "God is not for him, so to speak, *wholly* 'wholly other.'" Even though other "is *felt* as objective" the viewpoint that someone (subject) is doing the feeling opens up. This shows how deeply Otto is still connected to the neo-Kantian framework, while the development of his ideas, when seen in the light of the central findings of his work, points toward a direction that goes well beyond neo-Kantianism.

In *Das Heilige* Otto goes on to argue that the Holy is an a priori category. In one sense we might read this as a response to the full rationalization of the Divine in the work of Hermann Cohen, the famous neo-Kantian Jewish thinker. Otto seems to be reaching for the original project of Kant who was famously trying to make room for faith through reason. For Otto, Kant was not able to save the finite perception of the infinite and that is why he needed the help of the work of Schleiermacher and Fries, who both tackled the problem of the subjective "inkling" (*Ahnung*) of the Divine.

But this is the very point the critics quickly exploited. Either the divine is genuinely other (*the wholly other* as the most central of Otto's findings stated) and in this sense the possessive experience of the self cannot capture it at all, or it is not really other in the end. Already in 1929

Friedrich Karl Feigl formulated the problem by saying that "either God is in some absolute sense 'wholly other,' and we cannot experience or say anything about him, *including that He is wholly other*, or we experience something of God, which means God's essence cannot be determined as 'numinous.' *The numinous as category* – whether 'category' is understood in transcendental-logical or with Otto a psychological sense – is a *contradictio in adiecto*." Leo Strauss had made the similar argument in 1923. The point was clear that with the concept of the wholly other Otto was pointing beyond his own premises and this was why Strauss saw it praiseworthy.

Cross-References

- [Hermeneutics, Theological](#)
- [Religion, theory of](#)
- [Religious Experiences](#)

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Data Protection

► Information Security

Data Structure

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A data structure may be a built-in programming construct such as an array or simply a term corresponding to the manner in which information is organized. The idea is that a data structure is capable of holding multiple items. Some authors define a data structure to be only those frameworks that are implementation dependent (e.g., the array and the linked list), whereas others define a data structure to be implementation independent (e.g., a stack or a queue). Here, we define a data structure to be an implementation of an abstract data type. In other words, the data structure is a usable form of an ADT.

Day of Judgment

► Eschatology

Death

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Related Terms

[Dying](#); [End of Life](#); [Finitude](#)

Death

Scientific/Biological-Medical Dimensions

From a biological and medical perspective, death is as complex and mysterious as life. Death is neither the absence of life nor the second of two mutually exclusive categories: life and death. There is not a sharp distinction between life and death at any level of organization from cell to tissue to organ to whole person. Almost all definitions of death, like all definitions of life, fail because of exceptions. A four-cell embryo of a human being is considered clinically alive, that is, not dead, even if frozen. In some religious traditions, these four cells are even considered to have personhood, which means when the cells die a person dies. In other religious traditions, a human embryo is not a person who can die because life is conferred only at the time of birth or at the time of the baby's first breath. Clinical death, no matter how it is defined, is not the same as legal death, which is determined by law. Under ideal circumstances legal death is pronounced by an authorized medical practitioner or coroner, who signs and then issues a death certificate. Under certain very unusual

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circumstances, death of a person can be determined legally even in the absence of a body.

Imagine a situation in which an adult human being, who has massive brain damage from an automobile accident, is brought into an Emergency Department of a hospital. Basic bodily functions can often be “maintained,” with or without the aid of a mechanical respirator. The patient’s heart is beating, the liver, kidney, and many other bodily organs are working. The body remains warm. If at such time it is determined that there is no demonstrable electrical brain activity in the cerebral cortex on an electroencephalogram (EEG) and the patient does not respond to any type of stimulus, upon the agreement of usually more than one physician in complex cases, the patient can be considered “brain dead.” Depending upon the legal jurisdiction, such a patient might be considered legally dead and transplant organs could then be “harvested.” However, there are lots of moral and end of life ethical issues at this point including actions that deliberately end another human’s life (euthanasia.) The issue gets even more complicated clinically, morally, and legally when persons appear to be alert but are in what is called “persistent vegetative states” (Caplan et al. 2006).

Human death can have many causes. Physicians and coroners categorize the causes of human death into one of four categories: (1) “*natural*,” which includes disease, (2) *accident*, (3) *suicide*, and (4) *homicide*. In some cases, the cause of death can only be listed as “unknown.” The causes of human death vary across time and across nations. Within some nations, there are large differences in frequencies of the causes of death depending on age, sex, racial, or ethnic origin. Infectious diseases – especially malaria, tuberculosis, and AIDS – are the primary causes of human death in the developing world. All of these illnesses are exacerbated by malnutrition. The primary causes of human death in the industrialized world are heart disease and cancer both of which are affected by lifestyle issues and choices. Even if the cause of death is not attributed to anything discussed above, human beings eventually die “naturally” from single or multiple organ failure in senescence.

In any species, including human beings, death of an individual, from whatever cause, is a part of the continuation of life. Were there no individual death there could not be evolution of life by natural selection. Without natural selection, species, including the human species, could not adaptively configure to changing environments. The average age at death, which takes such things as infant mortality into consideration, has steadily risen in the developed world based primarily on decreases in infant mortality and modern health care. In the developed world, life expectancy, which is the number of years of life left at a given age, is always lower for males than for females. This number has varied over historical times and varies today across different countries.

Death can occur by *natural means*, which includes the result of disease. Many of the diseases that kill human beings today in middle and old age in the developed world would not have been factors in human mortality in prehistoric time when most humans did not live past their 30s. The average human life expectancy at birth in the world today is in the 60s. In the developed industrialized world, life expectancy at birth is extended another 10 or 20 more years (Lopez 2002). When death is caused by disease, there is sometimes a point in time in which further treatment aimed at a cure for the disease is no longer possible. Many patients at this stage receive what is called palliative care usually in a nursing home, a hospice, or at home. The objective of such care is to allow the person to die with dignity with a minimum of suffering.

One of the most curious things about human death is that although it is almost always avoided, some human individuals, like individuals in several other species such as bees, kill themselves as a result of their own behavior and for a variety of reasons (Lester 1992). If the behavior is intentional, rather than accidental, in human beings this act is called *suicide*. Some definitions of suicide require that the individual taking his or her own life be aware that he or she is going to die as the result of his or her actions. This is probably not the case in a bee who dies for the good of the colony after stinging someone. However, self-awareness of death prior to the behavior that

ends one's own life is not as important from the biological and evolutionary perspective as the actual life-ending act and its consequence. From an evolutionary perspective, it is difficult to understand how suicide, especially in humans, could have evolved in the context of natural selection.

An evolutionary explanation of human suicide is possible through kin selection theory (de Catanzaro 1981). Human individuals, like stinging bees, would kill themselves for a potential benefit that could accrue to their kin. There are more of one's genes in one's kin than there are in one's self. Human persons who do kill themselves are rarely happy and successful. They are often old, sick, suffering, and utilizing the family's limited resources. When younger they frequently are suffering from psychiatric disorders, most commonly depression and substance abuse or dependence. An exception is China, where suicide is more common among women, especially young rural women (Canetto and Lester 1995). Across nations, and for reasons that are not understood, there is an inverse relationship between homicide and suicide rates. In addition, measured average intelligence correlate positively with the rate of suicide and negatively with the rate of homicide (Templer et al. 2007).

Homicide is being deliberately killed by another member of one's own species. A common type of homicide is infanticide, which is present in a number of species, including primates and including human beings (Hausfater and Hrdy 1984). Among mammals, the only two species in which males live in patrilineal, male-bonded communities, and in groups deliberately kill other males in other groups over territorial disputes are human beings and chimpanzees. The chimpanzee is our closest living relative with whom we last shared a common ancestor about 6–7 million years ago. Ironically, homicidal behavior does not occur at all in our second closest primate relative, bonobos (Wrangham and Peterson 1996). The demographic characteristics of who kills whom among human beings is predicted quite well by evolutionary theory (Daly and Wilson 1988). In some human societies, the state or those persons who govern, with or without the consent of the people, kill members of the

society who transgress certain laws or violate certain moral principles or in nondemocratic states, threaten the continuance of power of those currently in power. Despotic regimes have also engaged in genocide in which men, women, and children of the out-group, defined in various ways, have been slaughtered in mass and then disposed of in inhumane ways.

In all societies, *accidents* are a major cause of death. According to the United States National Vital Statistics Report (2010) and for all ages, after heart disease, cancer, stroke, and chronic lower respiratory disease, accidents are the next most common cause of death. Motor vehicles are the primary means of accidental death with unintentional poisoning and falls coming next. However, in most of the developed world, for persons in their teens and 20s, accidents are the leading cause of death followed by homicide and suicide. At that age, natural causes of death are rare.

Compared to any other extant species, humans bury or cremate their dead in ritualistic ways. There is no human culture known in which other than in some extenuating circumstances, such as warfare, the dead are allowed to simply stay in place where they died. However, the same has been seen with our closest living relative, the chimpanzee. Females in the wild have been known to carry juveniles who have died with them for several days. There is some evidence that *Homo neanderthal*, our nearest known human relative who became extinct about 30,000 years ago, buried their dead and placed flowers that left evidence of pollen upon the bodies.

As a summary of human death, Mark Graves (2008) equates the life of a person ending when a human system ceases to have effect. He breaks death down into several components: "Physically, when decomposed. Biologically, shortly after death when all cell function ceases, such as brain death. Psychologically, when autonomous sentience-response-animation ceases, such as brain death. Culturally, when no cultural system responds to the person, which may occur before or after individual death. Transcendently, a person may never live, or if continued in the interpretation of the community, never die."

Anthropological Religious Dimension

Religious studies have often pointed to a strong connection between death and religion. It could even be suggested that religion emerges as a result of “death management,” or a social form aimed at coping with the problem of finitude. Some studies deduce the need of a “terror management” function deriving from the unique human awareness about the inevitable end (Becker 1973). Religion appears better suited than other social structures to provide fitting answers to this demand. This theoretical approach probably puts too much weight on death perception and fear, and, as a consequence, builds a case for functional religious coping that is debatable. Indeed, an alternative explanation could invert the order of variables: it would be religion – or at least some religious expressions – that confers a particular salience to death, eliciting a greater awareness of its risks and threats (judgment, hell. . .), which otherwise could be ignored or perceived as less threatening and distressing.

In any case, the suggested link is evident when the historical record of world religions is reviewed under this light. Even if not all religions appear as related in the same way and intensity with death, in most cases, many religious forms emerge as trials to deal with death-related anxiety. Social systems theory furnishes an interesting – always functional – approach to the suggested link. Luhmann explains the function of religion in terms of “management of residual contingency,” or the unavoidably negative and unmanageable aspects of individual and social life (Luhmann 1977). Death clearly applies in this case, since there is no way, through “technical treatment,” to avoid that “contingency.” This theoretical approach does not preclude other “functions of religion”: religion is not confined to “death management.” Furthermore, the functional approach appears as somewhat reductive and unable to highlight important aspects of religious mind and behavior.

In any case, it can be justified, from a methodological perspective, to try to understand religion from the point of view of “death management,” and to qualify the beliefs and behavioral system so built as dependent in good

measure from that pressing need. The historical testimonies supply several strategies to cope with death in religious terms.

- In some cases, no direct involvement of religious ideas and practices with death is the rule; the morbidity associated with that negative experience is concealed and its definitive “solution” postponed. A paradigmatic case is offered by ancient ► [Judaism](#). Religious faith in this case served to protect life and to ensure its right length and enjoyment, not to “overcome death,” which was left to an indeterminate time and a future revelation.
- Death is the beginning of a “long journey,” a process of reconstruction of a new life, more or less connected with the former one. Ancient Egyptians developed an elaborate “guide” disclosing an ► [afterlife](#) universe that prolongs the proofs and struggles of present life. Many archeological remains in different cultures express that sense of an almost symmetry between both lives that death separates.
- Death as a “return to the origin,” or as a regression to an undifferentiated time and world. Initiation cults and primitive religious forms point to this structure, conceiving life as a cycle, and death as a new origin, in a different dimension, evoking nevertheless better or not yet satisfied possibilities. In a similar way, death means the end of a state of painful “separation” and the possibility of everlasting unification (Eliade 1957/1987).
- Death becomes another link in the long chain of life. This is characteristic of Eastern religions, like Hinduism and Buddhism. Life and death become closely entrenched through dynamics of *karma*, a link calling nevertheless to a break and definitive interruption.
- Death as a condition of possibility of a process of “redemption” or human reconstruction. This is the case for Christian representations, in which life is seen as limited and negatively conditioned, and death means the end of that imperfect state, and the beginning, sometimes through ways of purification, of a full life with plenty of joy.

Religious death management includes – besides beliefs about afterlife – practices aimed

at expressing deep expectations and representing a state of transition and social transformation. Most religions perform funerary rituals at different stages: to accompany the burial or cremation of a dead person, to intercede for her, or to remind us of her presence or ask for her assistance. The almost universal character of such rituals reveals a constant concern about the need to fill the gap left by the deceased person and to recompose the social harmony disrupted by such perceived absence (Hertz 1907/2004). These rituals have been seen as “rites of passage,” necessary to assume a new awareness and to adapt to a new social frame, after the absence of a member, which represented a link in the system, a knot in the net. Inversely, some ► [rites](#) of passage or social initiation are described in many religious settings as ways of “dying” from a former life and being born into a new one. In all these practices, a similar pattern can be revealed. Religion helps to dynamize communities despite the disrupting effects of death; and pushing for transition and restabilization despite big changes in the life cycle for individuals and collectives alike.

Beyond particular religious beliefs and practices, a more abstract principle can be perceived in the described link. Religion can be thought of as operating in a binary communication code – as do all social systems – that distinguishes between immanence and transcendence, between profane and sacred. Such a distinction knows other “modalities”: between damnation and salvation, between relative and absolute, or between death and life.

A religious modality can perform a type of linkage among several of these distinctions: transcendence with salvation, with absolute, and with eternal life, or with overcoming death. In this representation, death becomes an important element in the semantic that constitutes the religious code; however, it is not the central one, or one providing more “semantic intensity” or meaning. The distinction life-death appears as one helping to extend the core of a potential “religious grammar,” supplying a further explanatory element and broadening its semantic meaning. In any case, the distinction between life and death appears as so radical, as so fundamental or original in human

cultural origins, as to evoke or even become contiguous with the most radical ways of thinking. It provides a very powerful symbol that is able to inspire reversed versions – from death to life – and a symbolic universe born from the absence and void that death induces.

The possible modulations of religious grammar are manifold, as can be confirmed in the plurality of religious traditions dealing with death, and placing it inside their respective “code.” Each religion loads “death” with different meanings, corresponding to the position this concept finds inside each religion’s own code. Furthermore, inside a religious tradition, significant nuances – and sometimes contrasting values – positive versus negative – are perceived between more mystical perceptions of death, and more ascetic or worldly orientations.

Religion is not the only way to deal with death, and religion is not established only – or predominantly – in relationship to death. To be sure, other means compete to fill that function, especially in more secularized societies. Even if some evidence points to slightly better results with ► [religious coping](#) than with alternative means to allay death anxiety (Vail et al. 2010), under any circumstances it can be said that religion provides the only “program” for coping with death. Secular therapeutic, meditative, aesthetic, and life-fulfilling resources appear as clearly “functional” in this new context, lacking more pervading religious references. By the same token, religion in advanced societies does not reduce its scope to “death terror management,” since most religious forms today point to intensifying life experience, instead of “preparing for a good death.”

Another important point to consider is in which measure religious beliefs and behaviors reduce the weight of death and its [dys-] function regarding many aspects of life. Since religious beliefs usually reduce the negative burden of death, thereby several consequences can be expected in human behavior. This predictable effect can have positive and negative consequences. In the positive side, a lessening of the extent of death’s retroactive pressure could trigger greater generosity and altruistic attitudes, even to the point of risking one’s own life for

the benefit of others. Life expectancy and enjoyment could become a factor determining selfish behavior, since fear of death could deter “spending time” on other people’s interest. The dark side of this principle – from a biological perspective – points to forms of fanaticism that leads to extremes of martyrdom, or still worse, of aggressive religious imposition, and suicidal attacks. In any case, both tendencies appear rather confined in some “religious niches” of the most intense forms of religiosity, and the empirical evidence does not always validate that general expectation.

Death clearly appears as ambivalent in most religious mentalities: as a negative reality, corresponding to its more “intuitive” effects of finitude and social disruption; and as a step opening the way to positive future developments, in accordance with “less intuitive” perceptions, born nevertheless in powerful symbols of everlasting life and longing for complete human flourishing.

Cross-References

- [Afterlife](#)
- [Body](#)
- [Eschatology](#)
- [Forensic Medicine](#)
- [Judaism](#)
- [Neglect](#)
- [Religious Coping](#)
- [Rite](#)

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Deconstructive Theology

- [Religion, Theory of](#)

Deep Brain Stimulation

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Related Terms

[Functional stereotactic neurosurgery](#)

Description

Nowadays functional stereotactic neurosurgery, more precisely, deep brain stimulation (DBS), has gained widespread acceptance as a treatment modality for movement disorders, pain syndromes, epilepsy, and some neuropsychiatric disorders.

There are several developments which have pioneered this technique over the last and next-to-last centuries. First, one of the cornerstones is the breakthrough work from Sir Victor Horsley and Robert Clarke in 1908. Both introduced a new method to implant a needle or a probe into subcortical structures accurately using a Cartesian coordinate system. They first used their new tool in animal models to study lesioning effects of the cerebellum.

The conferment into humans was compassed in 1947 by the neurologist Ernest A. Spiegel and the neurosurgeon Henry T. Wycis at Temple University, Philadelphia calling their new technique “stereoecephalotomy.” The goal was to perform accurate ablative procedures instead of usually undertaken frontal lobotomy in behavioral disorders (Wycis and Spiegel 1947).

From this point on tremendous developments in stereotactic human atlas (Schaltenbrand and Bailey 1959), neuroimaging, stereotactic frame systems (Lars Leksell 1949; Mundinger 1977; Talairach et al. 1949) and electrical devices emerged the use for deep brain stimulation as we know it today.

Self-Identification

Science

Functional neurosurgery as a rapidly growing branch of neurosurgery regards itself a natural science aiming to enhance the knowledge about the pathophysiological aspects behind disorders of the central nervous system. The goal of deep brain stimulation is the reestablishment of physiological function by means of neuromodulation.

Extensive neuroanatomic and neurophysiological investigations and observations made in

animal models elucidated the state of knowledge about neurobehavioral, pain, and movement disorders in the last century.

The application of electrical stimulation as a therapeutic tool can be traced back to 15 AD, where Scribonius medicated gout pain. In the second century Galenos of Pergamon, Galen, applied “neuromodulative” therapy via electrical fish to treat headache and gout pain.

Going further into the eighteenth century there were several works by Christian Gottlieb Kratzenstein, a scientist, who was engaged in electricity research and its impact in the treatment of pain syndromes. In 1744, he published a monograph concerning this issue “*Abhandlung vom Nutzen der Elektrizität in der Arzneiwissenschaft*.”

In the same year, Ewald Georg von Kleist, a Prussian scientist and advocate contrived the “Kleistsche Flasche,” a condenser made electricity useful as medical treatment tool.

Hundred years later, Eduard Hitzig and Gustav Fritsch, both neuroscientists, observed motor response after stimulation of the motor cortex in a dog. In 1874, Robert Bartholow first performed motor cortex stimulation in humans.

The pivotal turning point of deep brain stimulation can be seen in the landmark development of Spiegel and Wycis human stereotactic apparatus in 1947. This reflects the hour of birth of stereotactic-guided deep brain stimulation. Many neurosurgeons, namely, Lars Leksell, Jean Talairach, Philipp L. Gildenberg, etc., visited Spiegel and Wycis in Philadelphia to design stereotactic frame systems after they have returned to their departments.

In this era, chronologically, the first indications of ablative and/or chronic subcortical stimulation were neuropsychiatric disorders followed by intractable pain syndromes and at least movement disorders. Interestingly, deep brain stimulation in behavioral disorders (obsessive-compulsive disorder (OCD), Depression, Tourette Syndrome) reemerged in the last years with preliminary auspicious results. For instance, Spiegel and Wycis started with medial thalamotomies in psychotic patients in 1947. Intraoperatively, neurophysiological patterns by

electrical stimulation means were performed prior to lesioning to confirm the intending targets.

In the coming decades until now expansive growing knowledge in neuroscience (neuroanatomy, neurophysiology, neuropathology, and neuroimaging) and clinical evaluation by prospective, randomized studies conducted deep brain stimulation to a treatment modality which is well established and evidence-based in the treatment of movement disorders and pain, furthermore with promising results in neuropsychiatric disorders.

The growing numbers of societies and scientific journals addressed to deep brain stimulation (WSSFN, ESSFN) reflects the increasing interest in this field and emphasizes the future potential of this subdivision of neurosurgery.

Characteristics

DBS differs from other disciplines in many ways. First the prospects of DBS are strongly linked with the technical development of the applied devices and, therefore, more influenced by the available surgical equipment.

In addition, the authors believe that the growing field of indications in the coming future will pose unexpected neurosurgical challenges. Well-established and newly introduced treatment modalities have to be evaluated carefully, even more in a long-term fashion. Neuroscience-based investigations contributed and will account for this relevant matter.

The main goal of functional stereotactic neurosurgery is to reestablish altered function of motor systems, pain processing, and behavior.

Due to these facts, a patient's treatment should include substantial preoperative evaluation, defined surgical procedure, and close-mesh endorsement in the postoperative course by interdisciplinary means.

Relevance to Science and Religion

As mentioned above, there has been increased interest in behavioral disorders again in the past

two decades after a silent period of nearly 30 years. Great research efforts have been undertaken to lighten the poorly understood pathophysiological background by neuroscientific means.

However, cognition, emotion, and behavior, more precisely, neuromodulation of related disorders delivered through deep brain stimulation, requires interdisciplinarity in every available fashion, and ethical issues have to be taken into account strictly.

Sources of Authority

The sources of authority of deep brain stimulation were already named in part. The authors prefer to summarize this content in a chronological manner.

Deep Brain Stimulation in Neuropsychiatric Disorders

Jose Delgado, neurophysiologist, became known for his work with chronically implanted electrodes which were connected to a subcutaneous receiver (Stimoceiver) which allowed neuromodulation by radio waves in psychotic patients. He researched the effects of neuromodulation in several animal models and humans. In 1969, he published a book titled *Physical Control of the Mind: Toward a Psychocivilized Society*. This fact may reflect the enthusiasm carried out at that time (Delgado 1965).

Carl-Wilhelm Sem-Jacobsen started in the 1950s with a series of 213 patients (123 with neurobehavioral disorders) in whom "depth electrography and depth stimulation" was performed. The main goal was to detect suitable target areas by electrophysiological recording and thereafter to generate irreversible lesions (Sem-Jacobsen 1963).

The thin ethical line of this issue became obvious regarding the contribution of Robert Heath, who was engaged in neuromodulative therapy in patients suffering from schizophrenia, pain, and epilepsy since the 1950s. During an intraoperative stimulation session in schizophrenic patients in the septal area, some patients reported "euphoric" and "pleasant" perceptions

(Baumeister 2000). An example for unethical and dubious practice was the septal area stimulation performed by Heath in 1972 in a homosexual individual aiming to induce heterosexuality behavior.

Based on neuroscientific research, profound ethical considerations and interdisciplinary collaboration DBS was inaugurated in Tourette Syndrome and obsessive-compulsive disorders (OCD) in the last decade of the last century by Vandewalle et al. in 1999 and Bart Nuttin from Leuven (Nuttin et al. 1999). This displayed a turning point and again neuropsychiatric disorders came into interest in the functional community.

Deep Brain Stimulation in Pain and Epilepsy

David Hosobuchi and Guillaume Mazars introduced in the mid-1970s the sensory thalamus and the periventricular/periaqueductal gray as proposed targets for pain relief in patients suffering from deafferentation pain (Mazars 1975; Hosobuchi et al. 1977).

Epilepsy came into focus at the end of the 1970s. Irving Cooper demonstrated a marked reduction in medical refractory seizures due to deep brain stimulation of the anterior nucleus of the thalamus (Rosenow et al. 2002). Ten years later, Velasco published another remarkable series of intractable epilepsy treated by thalamic stimulation.

Nowadays neuromodulation is an essential part of neurosurgical epilepsy treatment concepts.

Deep Brain Stimulation in Movement Disorders

Neuromodulation constitutes a well-established and evidence-based treatment modality for Parkinson's disease (PD), essential tremor (ET), and dystonia.

Neurosurgeon Alim-Louis Benabid and neurologist Pierre Pollak introduced in 1987 and 1993 high-frequency stimulation in the VIM thalamic nucleus and subthalamic nucleus as proposed targets in PD. Undoubtedly, both can be regarded as pathbreaking pioneers in neuromodulation for movement disorders (Benabid et al. 1987; Pollak et al. 1993).

Going back to the days of Spiegel et al. (1947) many neurosurgeons have contributed to this issue. In principle, the common procedure to identify subcortical brain structures suitable as targets was electrophysiological evaluation prior to lesioning.

Natalia Petrova Bechtereva (1925–2008), neurophysiologist, worked in Leningrad and developed the first concept of chronic stimulation as a therapy in the 1960s/1970s. Patients suffering from PD were treated over a time course of 1.5 years with externalized electrodes due to the lack of implantable devices at that time (Hariz et al. 2010).

German neurosurgeon Fritz Mundinger treated patients with cervical dystonia with unilateral chronic thalamic stimulation with beneficial results. Irving Cooper neuromodulated thalamic somatosensory nuclei in various movement disorder conditions. In addition, many stereotactic-guided ablative procedures (thalamotomy, pallidotomy) were performed through the 1970s/1980s. This lesioning surgery precisely the identified targets formed the fundament of later-executed reversible DBS with permanent implantable devices.

Ethical Principles

The Hippocratic Oath modified by the Helsinki declaration (1971) builds the frame for ethic-guided proceedings in neuromodulation. In our opinion further attention has to be addressed to autonomous wishes of patients, psychosocial impact, stimulation effect on patients' personality, and benefit/risk ratio.

Key Values

The key value of deep brain stimulation is to restore distortion of function by motor symptoms, pain symptoms, and neuro-behavioral means. The neuromodulative strategy is based upon substantiated knowledge including neuroanatomy, neuroimaging, and neurophysiology.

Conceptualization

The authors summarize the following issues in the way they are influenced by DBS. This holds true for some issues more than for others.

Nature/World
Human Being
Life and Death
Reality
Knowledge
Truth
Perception
Time
Consciousness
Rationality/Reason

DBS is aiming at improving distortion of motor, pain, and behavior function. Nevertheless, some beneficial effects go together with unexpected alteration related to more abstract issues like mood, behavior, perception/self-perception, and psychosocial interaction with the environment. The above mentioned points could be affected by DBS in a short- as well as in a long-term manner; for that reason, it seems advisable to take those issues into consideration by conducting a multidisciplinary treatment approach in DBS patients.

Mystery

Functional stereotactic neurosurgery and mystery contradict themselves as DBS underlies natural law. Many unexplained issues concerning DBS remain still “mystic” until neuroscience-based investigations highlight our background knowledge.

Relevant Themes

A critical issue in DBS as regards “Science and Religion” is the fact that beneficial results can be associated with non-beneficial effects concerning mood, cognition, behavior, self-perception, and perception of the environment. Thus, careful selection, long-term mentoring, and psychosocial assistance are required to intercept or ameliorate occurring difficulties, especially in younger patients.

Cross-References

- ▶ [History of Medicine](#)
- ▶ [Movement Disorders](#)
- ▶ [Neurology in Europe](#)
- ▶ [Neurosurgery](#)
- ▶ [Pain \(Suffering\)](#)

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Defense Mechanisms

- [Coping, psychology of](#)

Definition of Truth

- [Truth](#)

Deism

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Related Terms

[Argument from design](#); [Enlightenment](#); [Natural religion](#); [Rationalism](#)

Description

On the website of the World Union of Deists we find the following definition of deism: “Deism is the recognition of a universal creative force greater than that demonstrated by mankind, supported by personal observation of laws and designs in nature and the universe, perpetuated and validated by the innate ability of human reason coupled with the rejection of claims made by individuals and organised religions of having received special divine revelation.”

According to this, deism is characterized by four elements: (1) recognition of a universal creative force greater than mankind; (2) centrality of the observation of laws and designs in nature as a basis for belief; (3) fundamental trust in the ability of human reason to know God; and (4) rejection of all claims of special divine revelation. One might ask if all four elements were also essential for classic deism, that is, as it was understood toward the end of the seventeenth and during most of the eighteenth century. Furthermore, what happens with one of the ideas that a great many associate with deism, namely, that which states that God created the universe at the beginning and allowed it to run onward according to laws of nature without ever intervening with its functioning?

The term *deism* was probably first used by Calvinist Pierre Viret (*Instruction chrestienne*, 1564), who applied it with a negative valence to a group of Lyonnaise anti-Trinitarians. Later, in the second half of the seventeenth century, it was appropriated as a self-characterization by those who wanted neither to be atheists nor uncritically accept the tenets of revealed religions, concretely Christianity. For them, human reason was the most adequate way to know God. Thus, natural or rational religion became the criterion to judge revelation. At first *deism* and *theism* were almost synonyms, but soon began to diverge. Almost a century later Diderot (*Ouvres*, ed. by J. Assézat, I, 13, 479) tried to differentiate between them saying the deist denies the possibility of special divine revelation altogether, while the theist allows for it. This is also the way we tend to see it today: the difference between *theologia rationalis* and *theologia revelata* marks in part the divide between deism and theism.

The cradle of deism was England, where it was anticipated by Lord Herbert de Cherbury in *De veritate* (1619; many of the texts mentioned in this paragraph and the following one can be found in Gay 1981). Locke and Newton's ideas paved the way for it. Its most important advocates in the island were John Toland (*Christianity not Myste-rious*, 1696), Samuel Clarke (*A Discourse concerning the Being and Attributes of God, the*

Obligations of Natural Religion, and the Truth and Certainty of the Christian Revelation, 1705–1706), Anthony Collins (*A Discourse of Freethinking*, 1713), and Matthew Tindal (*Christianity as Old as Creation*, 1730). Deism arose in response to the deep transformation European society and culture underwent in the seventeenth century. This transformation had three main vectors: discovery of cultural diversity, which undermined the uniqueness of Christianity; religious conflicts, especially the Thirty Years' War and English Civil War, which fostered the search for natural religious truths that could be universally accepted; and advances in scientific knowledge, which established the laws of nature that the now unified universe strictly obeys in its functioning. This new trust in human reason and its autonomy was extended to the realms of both religion and morality.

Deism then irradiated from England to France, Germany, and North America. In France, it became popular among the first enlightened philosophers, many of whom converted to atheism. In spite of calling himself a theist, the most conspicuous French deist was Voltaire (*Candide ou l'optimiste*, 1759). Also Jean-Jacques Rousseau ("Profession de foi du vicaire savoyard," *Emilio*, Book IV, 1762) is usually considered a deist, although for him religion had more to do with emotions than reason. Deistic ideas also pervaded the German Enlightenment. Leibniz and Wolff played a significant role in their extension, although they formulated them in the frame of a systematic philosophy; the German deist par excellence was Hermann Samuel Reimarus (*Apologie oder Schutzschrift für die vernünftigen Verehrer Gottes*, 1774–1777). The North American "founding fathers" were also profoundly influenced by deism. Its most fervent advocates were Thomas Paine (*The Age of Reason*, 1794) and Elihu Palmer (*Principles of Nature*, 1801).

There was a wide variety of opinions among deists concerning all main points. For example, natural religion and revealed religion were differently related to each other depending on the understanding of the relationship between faith

and reason. Some deists tried to harmonize them and held that Christianity, once expurgated from superstition, was the true natural religion ("constructive deism"); others saw faith and reason as incompatible, championing the replacement of Christianity for natural religion ("critical deism," "decadent deism"). All denied, however, the possibility of miracles and other supernatural events. That must be seen as a consequence of an immanent concept of reason. Still, reason itself was differently understood, ranging from rationalist reason, of a systematic and deductive kind, to enlightened reason, which was above all the abilities to analyze empirical reality. If Herbert of Cherbury still relied on the innate ideas placed in the human mind, the post-Lockean deists gave an increasing relevance to the observation and study of nature as a way to the knowledge of God, at least of His existence. In this context, the development of modern science, especially of mechanics, was of paramount importance (see Gestrich 1981).

The scientific advances of the age gave rise to the *machina mundi* image, that is, the world as a closed, law-determined causal nexus which runs "automatically" obeying such in-built laws and does not need intervention from outside. This seemed to ask for a corresponding image of God as the Supreme Architect or Engineer who creates the world at the beginning and lets it run alone from then on, a sort of Aristotelian God. Such a reduction of divine action to the act of initial creation, even when detached from the *machina mundi* image, is what we usually associate with deism. But neither English nor German deists subscribed to it; on the contrary, their doctrines were a reaction against a world without God, either in the form of a rational pan(en)theism (in England) or through the identification of the *gubernatio divina* with the global act of creation and conservation of the world (Leibniz and Wolff). The popularity of the argument from design or teleological argument must be understood as a consequence of this frame of mind too (see Gawlick 1972). The one author who most clearly denied divine providence and advanced a wholly nonreligious view of history

and human destiny was Voltaire. The pervasive existence of evil in the world was his main stumbling block.

The decline of deism, already started, was almost inevitable once Hume and Kant's ideas were widely received, even though both of them had some affinity with deistic thought. Hume refuted the alleged chronological priority of ethical monotheism over polytheistic cult religion, questioning the validity of natural religion. Kant clipped the speculative wings of reason and showed the impossibility of any rational theology which claims to be theoretically certain knowledge, undermining the teleological argument as well as any other argument for the existence of God (see Byrne 1993). In the last decades, we assist, however, to a revival of deism, above all in the United States. It takes different forms, for example, humanistic, scientific, Christian, spiritual deism, pandeism, and panendeism. In general, it is more modest regarding the ability of reason to define God's attributes and the precise character of his relationship with the world. (That is why it opts for certain vagueness when speaking of God, as it is obvious in our opening quotation.) But lacking a serious confrontation with Kant's objections it still holds to the centrality of the argument from design, as the controversial "conversion" to deism of the notorious atheist Anthony Flew in 2004 clearly shows. Other characteristics of modern deism are its marked critical stance toward revealed religion and the high moral standards it pursues.

As an abstract model of God's relationship with the world, deism plays a secondary but important role in present mainline Christian debates about divine action. In an ideal typology, deism is one of the two conceptual positions against which theism has to be defined as a middle way, the other being either pantheism or occasionalism. In both cases, deism stands for extreme creatural autonomy, while pantheism or occasionalism signals extreme dependence on God. Furthermore, deism is used sometimes against the Anglican theologian Maurice Wiles, who does not allow for special divine actions, as

a stylized reproach for not giving enough room to divine providence (see Struch 1990). However, what he really does is to subsume particular providence within general providence, while affirming continuous creation. In other occasions, as in the debate over the physicist Paul Davies' proposals, deism is used almost as a synonym of natural theology.

Deism exerted significant influence in the configuration of Western modern culture. And such influence can be still perceived today in the requirement of universality in the concept of God, as well as in the not uncontroversial pursuance of coherence between both religion and reason and religion and morality (see Byrne 1989).

Cross-References

- [Divine Action](#)
- [Evil](#)
- [God of the Gaps](#)
- [Natural Theology](#)
- [Naturalism](#)
- [Philosophy of Religion](#)
- [Rationality \(Philosophical\)](#)
- [Revelation](#)

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Dementia

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Description

Dementia is a clinical syndrome often caused by chronically progressive diseases of the brain that are combined with an impairment of higher cortical functions, including memory, orientation, speech, ability to talk, ability to reason, and decision making. The cognitive disturbances in dementia are often accompanied by changes of social behavior, motivation, and emotional control but no disturbance of consciousness is observed. Dementia can have a diverse picture, can be studied separately or as part of other diseases, like Parkinson's disease or multiple sclerosis, and can be rapidly progressing, as in Creutzfeldt-Jakob's disease, or slowly progressing, as in Alzheimer's disease.

Dementia science is providing research into the cause, cure, care, and prevention of dementia. It has grown in importance as populations in the Western world and elsewhere are aging and aging is the most important risk factor for dementing diseases.

According to the clinical picture, the syndrome can be attributed to different etiologies, but a definitive diagnosis of the disease can as of today only be made postmortem. The classification of non-Alzheimer conditions is undergoing major changes, moving away from syndromic toward molecular and gene-based approaches.

Dementia science is dealing with the fundamental problem that aging on its own is not a disease. In the longitudinal and prospective Minnesota nun study, nuns with the same environmental surrounding were followed with neuropsychological testing over several years and their brains were assessed by a pathologist showing that even in individuals with high cognitive

functioning shortly before their deaths multiple pathological senile plaques were present (www.healthstudies.imn.edu/nunstudy). In different statement papers, the categorization of, e.g., Alzheimer's dementia is discussed. Due to the improvement of technologies in imaging, laboratories and neuropathology preclinical "in vivo" stages of dementia can be identified leading to the question where to draw the line and whom to treat. So far the WHO definition of diseases is still relevant: A "disease" including dementia is inextricably associated with signs of malfunction and suffering.

Self-identification

Science

Dementia science has grown out of the need to investigate the cause of this syndrome and to eventually cure and prevent this clinical picture as dementia occurs frequently in an aging population, causing a burden to the patient itself by losing their independence and primary personality, but also to caregivers and leading to social costs exceeding the costs of health insurance expenditures almost by a factor of five in mild and moderate disease stages (Schwarzkopf 2011).

Characteristics

Dementia science relates to adjoining specialties like geriatrics, neurology, and psychiatry. However, dementia science is distinctive to geriatric medicine because it attempts to shed light on the underlying pathology of conditions that go beyond conditions of normal aging, even though some dementias' risks rise with increased age. Dementia science uses the knowledge that neurology offers about the relationship between clinical pictures of deficits and the topography of lesion location within the nervous system. It distances itself from neurology by focusing only on neurodegenerative diseases; included dementia syndromes in neurological conditions like multiple sclerosis or Parkinson's

disease at the same time. Patients with dementia are often treated as psychiatric patients due to their deficiencies in higher cortical functions resulting in changes of social behavior; care of demented patient is therefore often multidisciplinary.

Relevance to Science and Religion

This scholarly area is not the prime object of the research field mentioned as too little is still known about the diseases themselves. But religiosity, faith, and spirituality have been found to be protective, aiding well-being for both patients with dementia and their caregivers.

Sources of Authority

The early authorities in dementia science used to be neuropsychiatrists who were dedicated clinicians with a passionate interest in neuropathology, bridging the gap between brain, in particular the cerebral cortex, and behavior. A first good description of dementia was given by Philippe Pinel (1745–1826) in the late eighteenth century (Torack 1983). Around this time, dementia was mentioned in the *Encyclopédie Française*. Alzheimer (1864–1915) when describing Auguste D. at a conference in his lecture called “About a remarkable illness of the cerebral cortex” in 1906 set a starting point for the research in a new entity of patients with an early onset of behavioral changes later named after the describer himself as “Alzheimer’s disease.” Around this time, the Prague group led by Pick and the Munich group around Kraepelin with Lewy, Alzheimer and Nissl, described several different conditions with dementia, being name giving to several neurodegenerative conditions, like Lewy-body dementia and Pick’s disease.

As shown in the “Minnesota nun study” the “dual clinicopathological concept” of the Alzheimer’s disease might lead to confusion, as patients with “senile” plaques might not present with behavioral changes, not qualifying for the diagnosis from a clinical point of view, new

concepts were described lately by Bruno Dubois from the Salpêtrière hospital in his article “Revising the definition of Alzheimer’s disease: a new lexicon” (Dubois et al. 2010).

The “European Alzheimer’s disease consortium” is a network of over 50 European centers working with Alzheimer’s disease and related dementias, setting up large interventional studies for understanding, prevention, treatment, and management of the disease or its complications.

Ethical Principles

As in all medical disciplines, dementia science is guided by the oath of Hippocrates. For medical research, the Declaration of Helsinki from 1971, provides the ethical principles for human research.

Key Values

The key values of dementia science are to maintain the patient’s dignity and to alleviate suffering resulting from neurodegenerative diseases affecting cortical functions. Dementia science is trying to establish algorithms for prevention of dementia syndromes, supporting curative attempts and therapy options delaying the worsening of dementias (cf. Hellweg et al. 2012).

Conceptualization

Nature/World

Nature is conceptualized as the biotic and abiotic world and spans from the subatomic to the cosmic in scale. In particular it refers to phenomena not created by humans, as an antonym to culture. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological being equipped with a highly developed complex brain, which enables unique functions including speech, abstract thinking, creativity, and the

development of ethical categories such as morality, science, and art. Thus, humans are considered to be distinctive from the rest of the animal world in virtue of the unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body, it includes functioning of the different organs, including the *nervous system*. Death is considered the cessation of such physical functions. A special case, which has raised ethical challenges for medicine is that of so-called “*brain death*,” which is observed in intensive care medicine. Here, non-brain bodily functions are maintained, but there is no evident brain activity.

Reality

Reality is considered the physical world around us which humans can observe with their senses.

Knowledge

Knowledge is the understanding of a subject. This understanding should be based on adjusted true belief. It can be preserved in the cognitive system and can be put into contexts. Disturbances of higher cortical functions like in dementia can inhibit acquisition and retention of knowledge.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal which humans can grasp only partially.

Perception

Perception is the conscious sensation of the forces and influences the external physical world exerts on living beings. Diseases of the human brain may disrupt or impair perception.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time

objectively and perceive it owing to the changes observed in the surrounding environment.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of alertness ranging from drowsiness to full alertness, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally.

Rationality/Reason

Rationality is a foundation of accountable and responsible human behavior and of understanding reason as ultimate authority. It is impaired in mental diseases such as dementia or neuropsychological *disorders*.

Mystery

Mystery is often considered to be contradictory to modern medicine, including dementia science. However, modern medicine in principle acknowledges a place for mystery – i.e., that which is yet unknown, and thus, grants that contemporary knowledge may not have elucidated the entire physiology of human kind. In this view, mystery is understood as potentially explainable after accumulation of adequate scientific knowledge.

Relevant Themes

As in all other medical specialties, a critical issue in dementia science as regards to “Science and Religion” is the notion of subjectivity. As discussed in many statement papers, it is not predictable which individual will develop dementia with a certain outcome. So far dementia research is done on a group statistical level, not being adapted to each individual.

Cross-References

- [Aging](#)
- [Memory](#)

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Demonstration on the Basis of Two Terms

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An inductive reasoning in which two terms only are compared – such as *a minori ad maius*, *a maiori ad minus*, *a pari* or *a simili*, and *a contrario* – opposed to syllogism, in which a conclusion is deduced from a major premise and a minor premise linked together through a common middle term.

Dendrite

► [Neuron](#)

Deontological

► [Deontology](#)

Deontological Ethics

► [Deontology](#)

Deontology

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Related Terms

[Deontological](#); [Deontological ethics](#); [Ethics of duty](#); [Non-consequentialism](#); [Rule-based ethics](#)

Description

Deontology or deontological ethics (the terms stem from the Greek root *deon* meaning “obligation” or “duty”) is an approach to ethics which judges the morality of actions based on their adherence to a set of (most often strict) action-principles or rules. These rules typically divide actions into three moral categories: (1) those that are obligatory (prescribed, required), (2) those that are prohibited (forbidden, illicit), and (3) those that are permissible (neither obligatory nor prohibited). Deontological ethics is commonly contrasted with teleological or consequentialist ethics (e.g., utilitarianism) which holds that the morality of actions is determined by their consequences. Accordingly, deontological ethics holds that it may be our duty to refrain from performing certain actions (like killing and stealing) irrespective of what the consequences of doing so will be – it is, for instance, typically

morally prohibited to actively and deliberately kill someone even when this is the only way to save several others. Likewise it may be our duty to perform certain positive actions (like defending ourselves or helping others) irrespective of circumstance and situation.

A fairly straightforward example of deontological ethics may be the Biblical appeal to the “Ten Commandments” or *Decalogue* as the ultimate moral code. These commandments (“thou shalt not kill,” “thou shalt not steal,” etc.) have historically been understood as strict moral commands and prohibitions which require constant obedience, and similar moral codes can be found in almost all religious traditions. Many deontological codes indeed have religious roots, but it may be noted that the connection to religion is not necessary. A secular example of a deontological code could thus be the United Nations’ Universal Declaration of Human Rights, which may be taken to specify a list of humanistic duties and prohibitions. Of course moral positions need not involve complete catalogs of duties and restrictions in order to be deontological and, consequently, many participants in contemporary ethical debates may be said to hold (nondescript) deontological views. Typical examples may be when debaters claim, for instance, that abortion always is morally wrong, or that euthanasia should be strictly forbidden.

Deontology is probably better seen as general approach to ethics, or as a group (or sort) of moral positions (or codes, theories, traditions), than as a uniform moral position as such. Numerous variations of the appeal to moral action-principles exist, namely, and with widely different characteristics as well. A first dimension of variation is what more precise set of principles that is thought to apply, i.e., exactly what actions are listed as duties or contrary to duty. While the Biblical commandments include a duty to honor one’s parents and the One True God, for instance, it may be noted that the Universal Declaration of Human Rights makes no mention of either – and, conversely, the Declaration suggests that discrimination on the basis of race, color, and sex is contrary to duty, which the Decalogue makes no mention of. Many contemporary ethical

debates are indeed debates between directly opposing deontological camps: whereas some argue that abortion is strictly forbidden, for instance, others stress the absolute right of women to choose. Both of these positions may be deontological in the sense of being appeals to action-principles rather than consequences. Thus while most deontological codes contain a prohibition against the active and deliberate killing of adult human beings, perhaps, many other duties are widely contested.

Different deontological positions may also vary in how stringent these duties are thought to be, i.e., to what extent the rules allow for exceptions for countervailing moral reasons. In the strictest kind of view all duties are absolute, i.e., there are no circumstances or situations in which one is morally allowed to perform a prohibited action or to refrain from performing one’s positive duties. This is sometimes called moral absolutism. However, for reasons discussed below, some proponents of deontology argue that there only can be *prima facie* duties, i.e., duties which under certain (but perhaps only exceptional) circumstances can be overridden by opposing moral considerations. In this way one may suggest, e.g., that it is contrary to duty to steal in normal cases – and therefore also *typically* morally wrong – but that one should not abide by this rule (and so it is not wrong) should, say, the continuation of the entire human species depend on this particular instance of stealing. This view is deontological but not absolutist.

Philosophers and theologians keen on deontological ethics – commonly called deontologists – have long argued that this sort of ethical perspective has a range of characteristics which should make it more appealing than rival ethical theories (e.g., utilitarianism and virtue ethics). Firstly, deontological ethics would seem to fit well with public conceptions of both the structure and point of morality in general. Most people (or at least so it is argued) rather straightforwardly associate morality with as a set of more or less strict rules designed to keep everyone in check and to in this way facilitate social interaction. Indeed the fact that so many religious traditions include deontological considerations

may be taken as an indication of this kind of public support – and perhaps, some suggest, society simply could not work without some kind of deontological moral framework.

Secondly, deontological ethics is often suggested to flow directly from what philosophers call the universal nature of morality. Reflecting on the nature of morality as such, many agree that one of its most basic or essential features seems to be that it goes beyond bias and prejudice and, thus, that it treats everyone the same in some important respect. But from this feature, it is often argued, it would seem that moral rules as such cannot treat separate persons, situations, and circumstances differently but must be more general in exactly the way that deontological principles are. Morality must simply consist in rules that apply to everyone in the same way.

A third and related argument for deontological ethics is that strict action-principles sometimes are thought to be the only way of avoiding so-called slippery slopes in moral thinking. The case of abortion may once again be illustrative here: as soon as one kind of exception is allowed (e.g., for conception by rape) it may seem arbitrary not to allow others (e.g., for pregnancies unwanted for other reasons) and so on and so forth, until one ends up in an unexpected and unwanted moral position (in this case, roughly, that “anything goes”). In this way, it is argued, deontology may be the only cure against an “anything goes” attitude either in society in general or (at least) in ethics in particular. Once again society would be worse off without deontological moral principles.

Not everyone agrees with these arguments, and it should be noted that they all are debatable. The universality of morality can probably be understood in many ways, for instance, and it need perhaps not be taken to imply that ethical principles cannot be sensitive to circumstances. Furthermore, many philosophers have been critical of the kind of loose slippery slope arguments outlined above, since there is the obvious possibility of being able to carve out some plausible middle ground – that is, of having good reasons for allowing a limited set of exceptions while disallowing others. Philosophers and theologians

more keen on rival ethical theories have long argued that deontological ethical thinking not only lacks fundamental justification but, what is more, also has a number of serious drawbacks and problems. And we may say a bit more about these counterarguments here since this discussion is highly illustrative of both deontology and its rivals.

A first problem concerns the kind of moral agents envisioned by deontologists. The writer most commonly associated with deontological ethics is the German philosopher Immanuel Kant, and Kant famously suggests that duty must be done for the sake of duty alone. That is, Kant argues that one should perform one’s obligations only and exactly because they are one’s moral duties – and not, for instance, because one happens to find killing repulsive, or because one happens to like telling the truth. But many critics (especially from the virtue ethics camp) find this idea inherently problematic. Kantian deontologists, they suggest, to some extent seem to hail a form of heartless rule-followers that are far from our ideal of the virtuous person. Suppose, for instance, that your friend comes to visit you in the hospital but, when you ask her why she does this, she simply replies “because I believe it is my moral duty to come.” Few people would probably be impressed by such a reply, and this friend – although she perhaps performs the right actions – seems to lack a further important part of what morality should teach us to have; namely, emotions stemming from virtuous character traits. While deontological ethics may be right about the morality of individual actions, then, the first criticism is that it may be wrong about the morality of character.

Is this criticism correct? In defense of deontology, it should perhaps be said that not all deontologists need agree with the Kantian view above. Indeed it may be noted that Christian ethics puts a lot of emphasis on emotion and virtue, while still reserving a central place for the Decalogue’s strict commandments. Thus it seems entirely possible for deontologists to agree with the critics in that emotion and virtue also are important parts of morality. But, then again, perhaps this is simply adding things to

deontological ethics which was not there in the first place. According to critics, in any case, there is a fundamental discrepancy between deontology's appeal to rigid rules and our folk conception of a virtuous person.

A second and related problem concerns the rigidity of deontological rules as such, and this may be formulated either as a problem internal to deontological thinking or as an external criticism of such thinking. The internal problem is brought out by considering cases of conflicting duties: say, for instance, that I make a promise to you that I will kill your mother. If both killing people and not fulfilling one's promises are strictly forbidden (i.e., always morally wrong) then it would seem that I cannot avoid acting wrongly in this situation, since both killing and not killing your mother are morally prohibited action-alternatives. What is more, it would actually seem that deontological ethics ceases to give me guidance on what to do here, since no action-alternative is held out to be better than the other. These are strange results since we naturally turn to ethics for action-guidance exactly in difficult cases, and most people would probably say that not killing your mother should be my obvious choice. The external criticism is basically a generalization of this last point: it is noted (especially from the utilitarian camp) that there are many situations where deontological rules just seem too rigid, and where we intuitively allow for exceptions. Perhaps killing one to save two is morally wrong, but what about killing 1 to save 20 – or two million? Few individuals, when consulting their own ethical intuitions, would be ready to accept moral rules as rigid as deontological ethics sometimes makes them. And therefore deontology has been accused of not only fostering *heartless rule-following*, but indeed *pointless rule-worshipping*.

As noted above, some deontologists try to avoid these problems by adjusting the stringency of (some) duties or rules. Thus it is often suggested, for instance, that the prohibition against killing is more stringent than the prohibition against breaking one's promises (although some deontologists actually have it the other way around). Furthermore, it is sometimes conceded that there may be exceptional cases where

the rules are overridden by countervailing moral considerations; for example, when the lives of great many people are at stake, or when one is in a practical dilemma of the kind noted above. Such theoretical moves may provide an easy way out of the particular problems noted above, but it should of course be noted that deontologists here risk the same kind of slippery slope problems as their rivals. That is, once one exception is allowed, what about others?

A third problem is perhaps more technical and concerns the internal structure of deontological rules. The deontological prohibition against killing (or murder), for instance, is of course typically taken to forbid me from actively and deliberately killing someone – e.g., from shooting someone on the street just for fun. However it may be noted that it is not normally taken to castigate my passively allowing someone's death; e.g., when I see someone else aiming his or her gun but I refrain from interfering. Nor am I acting wrongly when my behavior inadvertently leads to someone's death; e.g., when I happen to shoot someone while aiming for a tree or something similar (given, of course, that I have not been inappropriately inattentive). This sort of thinking obviously relies on two crucial kinds of distinctions: (1) that between actions and omissions (or active and passive actions) and (2) that between deliberate and nondeliberate behavior (or intended and merely foreseen outcomes). But can these distinctions really be upheld? Many philosophers have criticized similar distinctions for being both theoretically and normatively untenable, and this is sometimes done with reference to (variations of) the following kind of thought experiment.

Say that you are standing next to a railroad track when you suddenly see a runaway trolley heading straight toward five innocent people. The only way for you to stop the trolley would be to throw a switch which you happen to stand next to; an action which would cause the trolley to roll down a side track. Unfortunately, there is one person on that track as well and your throwing the switch would directly kill this person. What should you do? Empirical studies confirm that, when confronted with this kind of case, most

people say that you should throw the switch. But this runs directly against what seems to be a cornerstone of deontological ethics, namely, that actively killing someone should be worse than passively letting someone die – note that you are actively killing the one if you throw the switch, whereas you only would be letting the five die if you did nothing. Deontologists may of course insist that the public intuition to this case is wrong, but as noted above they often wish to appeal to public conceptions of morality in support of their views.

Some deontological camps have tried to revise their position in light of this kind of problem. According to an official Catholic dogma known as the Doctrine of Double Effect, for instance, actions with both good and bad effects (like the one above) may be morally permissible as long as (1) the good clearly outweighs the bad and (2) the good effects are not brought about *directly through* the bad effects (this is a rough simplification of the Doctrine). On this view, it may indeed be permissible to throw the switch in the case above, one may note, since it, firstly, leads to one instead of five dying which clearly is good, and, secondly, the bad effect (the death of the one) is only an unfortunate side effect of the good (that five lives are saved). However, it would not be permissible on this view to, say, directly push a heavy guy in front of the trolley to make it stop and *in this way* save the five. Even though this action has the same outcome, namely, the bad effect is no longer an unfortunate side effect but actually a necessary component in what brings about the good effect. Now, is this Doctrine theoretically plausible? Once again one may note the obvious risk of watering down the heart of deontological thinking by adding these exception clauses. According to critics, furthermore, the kind of distinctions that deontologists will have to conjure up in order to explain our reactions to further variations in these cases (indeed many further variations have been discussed!) simply seem too arbitrary or ad hoc to be plausible.

A fourth and final problem for deontological ethics concerns the ultimate justification of any given deontological code. Even if one accepts

that deontological ethical thinking can be attractive as such, there is still the question of exactly why one should accept this or that more specific set of deontological rules. For instance, why should killing and stealing be on the list of prohibitions and not, say, frowning or picking one's nose? A possible answer open to deontologists, as our discussion above indicates, is that this all boils down to judgments we intuitively – or perhaps *naturally* – make: Most people simply intuitively judge that certain actions are morally prohibited, or “feel” that others are permissible. Another possible answer, open especially to religious deontologists, is that the deontological code ultimately comes from divine commands, unveiled in scripture or some other way. This is sometimes called the Divine Command Theory; that is, that moral justification ultimately must come from God or, more specifically, that certain actions are morally prohibited simply because God says so. The Divine Command Theory was immensely popular among theologians and philosophers during Medieval times.

Many modern critics, however, have been largely unimpressed by both of the answers outlined above. And so have some deontological philosophers. The bulk of Kant's moral philosophy, for instance, is basically an attempt of providing deontological ethics with a more robust fundamental justification. And Kant is generally taken to suggest two more sophisticated ideas of what could justify a given deontological code: First of all, Kant argues, most examples of deontological duties can be justified by an appeal to the universality of morality again. Since morality must consist in rules that apply to everyone in the same way, he contends, it is immoral to perform actions which one cannot at the same time will that everyone performed. But this directly implies, for instance, that it is wrong to lie. It is, namely, impossible to lie while at the same time willing that everyone lied; because in a world where everyone lied no one would expect anyone to tell the truth – and so it would be impossible to lie. And the same goes for most of the other items on the deontological list, Kant argues.

A second suggestion from Kant is that many deontological duties can be justified from

appealing to the core value of dignity (or respect). If morality requires that we treat everyone the same in some important respect, then we cannot treat others merely as means for our own ends, but we must treat them as ends in themselves. From this follows directly that we cannot lie, kill or steal, for instance, because we would then be using others merely as means for our own ends. In both of these suggestions, Kant may be said to invoke a kind of reasoning similar to the “Golden Rule” appealed to by many religions – that is, roughly the saying that “you must only treat others in a way in which you would like to be treated yourself.”

While Kant’s suggestions in the present context probably are the most sophisticated to date, it may be noted that they are both problematic. For instance, the “contradiction in the will” test may work great in the case of lying, but many suggest that it does not work in many other cases. Furthermore, many alternative interpretations exist for both the appeal to respect and the Golden Rule as such. Proponents of utilitarianism, for instance, have argued that the Golden Rule – if properly understood – actually favors their ethical perspective. Finally, there is a notable discord between Kant’s two suggestions, and some even suggest that they imply different sets of deontological rules. Perhaps Kant actually could be said to have paved the way for both of the deontological camps common on the issue of abortion (noted above): those who argue that abortion is strictly forbidden, namely, generally appeal to Kant’s first idea about the universality of rules, and those in favor of the absolute right of women to choose generally appeal to Kant’s second idea about respecting people as ends in themselves.

Exactly how deontological ethics should be justified, and what more specific moral rules it entails, are likely to be issues for much further debate.

Cross-References

- [Christian Ethics](#)
- [Ethics](#)

- [Ethics/Moral theology, Roman-Catholic, Europe](#)
- [Utilitarianism](#)
- [Virtue Ethics](#)

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Dependent Arising

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Related Terms

[Paticca samuppāda](#) (Pāli); [Pratītya samutpāda](#) (Sanskrit)

Description

The doctrine of dependent arising presents the Buddhist perspective on the nature of causality, whose understanding is considered equivalent to an understanding of the teaching of the Buddha, the Dharma (Trenckner and Chalmers 1888–1896, I 190). The centrality of this doctrine is a recurrent theme in various passages.

Thus, dawning insight into dependent arising is on record as part of a pre-awakening investigation of the nature of reality undertaken by the

Buddha (Feer 1884–1898, II 10). Complete insight into the same principle – from the perspective of dependent arising as well as dependent cessation – would have come to its completion with his attainment of full awakening. The texts then report that the Buddha reviewed this doctrine right after his successful gaining of awakening (Steinthal 1885, 1ff), further underlining its importance.

A stanza that succinctly presents the Buddha's teaching in terms of dependent arising and cessation – the mere hearing of which, according to the traditional account, led the two chief disciples of the Buddha to attaining the first level of awakening (Oldenberg 1879–1882, I 40) – has ever since been a popular theme of inscriptions.

The particular soteriological orientation of the Buddhist teachings finds its reflection in the fact that dependent arising is concerned with the factors that lead to the arising of *dukkha*, a term whose meaning ranges from barely noticeable dissatisfaction to outright suffering as inherent features of human existence (► [Dukkha](#)). Descriptions of the dependent arising of *dukkha* often take the form of a 12-link presentation. These 12 links are:

1. Ignorance
2. Volitional reactions
3. Consciousness
4. Name and form
5. Six senses
6. Contact
7. Feeling
8. Craving
9. Clinging
10. Becoming
11. Birth
12. Old age and death

The cessation of *dukkha* comes about through the cessation of the previous links in the series of dependent arising. Thus, with the cessation of ignorance, a reversal of dependent arising by way of dependent cessation takes place.

These two aspects of the Buddhist conception of conditionality – dependent arising and dependent cessation – are an integral part of another key doctrine of Buddhism, namely, the four noble truths (► [Truths, Four Noble](#)). The second of

these four noble truths is concerned precisely with the arising of *dukkha*, while the third noble truth takes up the cessation of *dukkha* or Nirvāṇa.

Traditional exegesis understands the 12-link exposition of dependent arising as extending over three consecutive lifetimes (Taylor 1905–1907, I 52). Here, ignorance (1) and volitional reactions (2) pertain to the past. The series of links beginning with consciousness (3) up to becoming (10) represent the present, while birth (11) as well as old age and death (12) are assigned to a future rebirth.

Ignorance, as the beginning point of this series, is described as being itself without a discernable beginning, since no point in the past can be discerned before which living beings were free from ignorance (Morris and Hardy 1885–1900, V 113).

Volitional reactions, the second link in the series, can be generated by way of body, speech, or mind. Such volitional reactions are held to lead in turn to a type of rebirth whose nature corresponds to their wholesome or unwholesome nature (Trenckner and Chalmers 1888–1896, I 389).

The third link of consciousness is what descends into the mother's womb (Carpenter and Rhys Davids 1890–1911, II 63). However, it is not the same consciousness that is reborn (Trenckner and Chalmers 1888–1896, I 256). Instead, according to early Buddhist thought rebirth takes place by way of the flux of consciousness, a changing process devoid of an abiding permanent entity (► [Consciousness](#)).

The remaining links then depict aspects of present life experience leading up to the arising of craving (8) as a reaction to the experience of feeling (7). This in turn arouses clinging (9) and then leads on to becoming (10), all of which are responsible for rebirth (11) and thereby inevitably for having to face once again old age and death (12).

Besides the three-life interpretation of dependent arising, the early Abhidharma tradition presents an alternative mode of interpretation, according to which the 12 links can be applied to a single mind moment (Rhys Davids 1904, 144). In this context, the link of birth (11) refers just to the arising of mental states. In other words,

according to this mode of presentation, the operation of all 12 links could take place in the present, within a single moment.

According to modern scholarship, the formulation of dependent arising by way of 12 links appears to involve a criticism of a Vedic creation myth (Jurewicz 2000). Instead of leading up to the creation of the world, the point made by the Buddhist reinterpretation of this myth would then be to reveal the conditioned genesis of *dukkha*.

The chief principle underlying this aspect of early Buddhist doctrine is the notion of specific conditionality. This principle finds its succinct expression in the dictum “when this is, that comes to be; with the arising of this, that arises.” Conversely, “when this is not, that does not come to be; with the cessation of this, that ceases” (e.g., Trenckner and Chalmers 1888–1896, I 262). In other words, specific conditions are responsible for whatever happens. Removing these specific conditions is therefore the way to prevent the same from happening again.

This principle of specific conditionality operates in relation to each of the 12 links, independent of whether the entire set is understood to refer to the present moment or to extend over three lifetimes. Illustrations of the same principle in the early discourses at times take the form of shorter listings, which may involve only five, nine, or ten links. Such variant listings confirm that the 12-link presentation is best considered a particularly prominent exemplification of the basic principle of specific conditionality.

In Buddhist thought, this basic principle extends over all aspects of existence. Nirvāṇa, however, is held to stand apart as being unconditioned and therewith the release from all that is conditioned.

Cross-References

- Causality in Physics
- Determinism and Indeterminism
- Free Will
- Reality in Buddhism
- Relations in Buddhism

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Depression

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Description

According to the World Health Organization (WHO) depression is a “common mental disorder characterized by depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy and poor concentration” (www.who.int). Such symptoms can become chronic or recurrent and result in an individual no longer being able to take care of his or her everyday responsibilities.

Depression can lead to suicide and results in the loss of approximately 850,000 lives every year (www.who.int). In primary care depression can be reliably diagnosed. “Antidepressant medications and structured forms of psychotherapy are effective for 60–80% of those affected and can be delivered in primary care” (www.who.int, Nice 2009). Fewer than 25% of those suffering from depression receive such treatments. There are many barriers which hinder the effectiveness of care, including a lack of resources, a lack of trained professionals and the social stigma attached to depression (www.who.int).

Intermediate phenotypes may be the link between genotype and phenotype by increasing the precision of psychiatric phenotypes and providing further insight into the underlying biology (Scharinger et al. 2011). A recent literature review of neuroimaging intermediate phenotypes of MDD and their relation to genetic risk variants shows evidence of the influence of serotonergic genes on neural intermediate phenotypes (Scharinger et al. 2011).

Comorbidity

Shared biological vulnerabilities may exist in the comorbidity of type 1 diabetes and MDD (Korczak et al. 2011). A growing body of research suggests that the prevalence of MDD in children and adolescents with type 1 diabetes mellitus is much higher than that in youth without type 1 diabetes and is linked to heightened illness severity, which suggests evidence of plausible common mechanisms (Korczak et al. 2011).

Treatment

Repetitive transcranial magnetic stimulation (rTMS) is a new treatment within psychiatry (see chapter ► [Transcranial Magnetic Stimulation](#)). The majority of trials carried out have evaluated the efficacy of high-frequency rTMS applied to the left dorsolateral prefrontal cortex (Fitzgerald and Daskalakis 2011). This “standard” form of rTMS appears to have antidepressant efficacy and its effects have now been

demonstrated in several clinical trials and a number of meta-analyses (Fitzgerald and Daskalakis 2011).

Self-Identification

Science

Psychiatry is the discipline and the clinical and scientific issues of depression involve subdisciplines of psychiatry such as psychotherapy, psychopathology, psychopharmacology and subdisciplines of research such as genetic, epidemiologic, neuroendocrine, electrophysiologic, neuroimaging and morphologic methods. The increase of knowledge about depression is reflected by national and international scientific organizations such as the European Depression Association.

The following fields of research are the main areas of interest:

Epidemiological Aspects

The prevalence and clinical phenomenology of depression in specific populations, different cultures, in couples and families and the influence of age, gender and psychosocial factors have been investigated (Gotlib and Hammen 2009). Other topics are its economic cost, the onset and course of depression and longitudinal investigations using interview-based and self-reported measures as outcomes of depression (Freeland and Carney 2009). Furthermore, there is increasing knowledge regarding the relationship between depression and medical illness, medical illness as a predictor of depression, as a cause of depression and depression as a predictor of the onset of medical illness and as a risk factor for morbidity and mortality (Freeland and Carney 2009).

Neurobiological Aspects

MDD is a heterogeneous clinical entity and is associated with a wide range of trait- and state-dependent neurobiological instances (Thase 2009). Research on the neurobiology of depression began in the late 1950s. The research methods focus on transmitter and endocrine

systems, peptides, sleep and circadian rhythms, electrophysiology, anatomical imaging (see chapter ► [Neuroimaging](#)) and pathologic and animal studies to examine the underlying neural basis of mood and emotion. Increasingly, powerful molecular genetic methodologies are being applied in order to find genetic sequence variations that increase one's risk of developing depression (Levinson 2009).

Psychological Aspects

There are links between depression and prenatal stress, inadequate parenting, abuse and neglect, early trauma, loss of a parent, social environment and life stress (Goodman and Brand 2009). The nature of cognitive processes in depression is vital for our understanding of the beginning and the maintenance of MDD (Joormann 2009).

Treatment of Depression

In randomized blinded placebo-controlled multicenter clinical trials, the efficacy of prevention and treatment of depression with pharmacotherapy, cognitive behavioral, family and interpersonal therapy, psychosocial intervention and combined approaches were investigated (Gotlib and Hammen 2009).

Characteristics

The German system of psychiatric services is separated into psychiatry and psychosomatic subdisciplines (Diefenbacher 2005). A lack of empirical evidence means it is not possible to assess the advantages and/or shortcomings of these two subdisciplines (Diefenbacher 2005). There is an overlap between the focus of interest and methods used in psychiatry and affective neuroscience in relation to the neurological discipline (Diefenbacher 2005). Recent developments in psychiatry have gained a better insight into the biological basis of psychiatric disorders (Northoff 2008). The concept of neuronal integration may bridge the gap between localization and holism of functions and brain regions (Northoff 2008). The dimensions of the

mind-brain relationship remain an area of interest for psychiatry irrespective of the progress in research on the biological basis of mental disorders (Slosarczyk 2005).

Relevance to Science and Religion

“The role of cognitive processes in the religious experience should be a focus of neuroscience” (Fingelkurts and Fingelkurts 2009). The key question on this topic is “Is our brain hardwired to believe in and produce God, or is our brain hardwired to perceive and experience God?” (Fingelkurts and Fingelkurts 2009). Aspects of religious beliefs may overlap with neurotic and psychotic symptoms, sometimes making it difficult to determine whether they are a resource or a liability (Koenig 2009).

The recent findings of a prospective neuroimaging study ($N = 268$) measuring hippocampal volume change indicates that hippocampal atrophy in late life may be influenced by certain types of religious factors (Owen 2011). “Significantly greater hippocampal atrophy was observed for participants reporting a life-changing religious experience” (Owen 2011). Hippocampal volume has been linked to clinical conditions, such as depression (Owen 2011).

Recent studies have shown that religion can serve as a psychological and social resource for coping with stress (Koenig 2009). Religiosity and other factors such as the availability of supportive others, access to health care systems, short-term plans for the future, a strong therapeutic alliance, problem-solving skills, are recognized protective factors of depression and can protect people from suicide (Chentsova-Dutton and Tsai 2009). Religion stabilizes the social network whereas the lack of stable and supportive social relationships is associated with a heightened level of depressive symptoms and increased prevalence of major depression across cultural groups (Chentsova-Dutton and Tsai 2009).

Many studies have shammed a negative relationship, that is, the more religious, the lower the depression. Greater religiosity may contribute

to development of resilience to depression in high-risk individuals (Kasen 2011). Increased religious attendance was associated with significantly reduced frequencies for mood disorder (by 43%) in all offspring (Kasen 2011). The relationships between religiosity and mental health were stronger in males and older adolescents than for females and younger adolescents (Wong 2006).

Religion can be split into extrinsic aspects relating to religious rituals and intrinsic aspects showing high levels of spirituality (Nelson 2002). During a trial of 162 patients in palliative-care facilities with a life expectancy <6 months, despite a strong negative association between spirituality and depressive symptoms, no such relationship was found between religiosity and depressive symptoms (Nelson 2002).

However, there was a lower tendency of elderly people with religious affiliations to seek treatment for mental health problems seen in the National Mental Survey of Elderly Singaporeans in 2004. Compared to those with no religious affiliation, elderly people of all religious beliefs showed higher prevalence of mental health problems, yet reported less frequent treatment to health care professionals (Ng 2011).

Sources of Authority

Emil Kraepelin, the German psychiatrist, pioneered the classification of psychiatric disorder early in this century (Hirschfeld and Goodwin 1988). He researched both longitudinal history and the pattern of current symptoms. He proposed that manic-depressive illness “constituted a genetic spectrum of disorders” (Hirschfeld and Goodwin 1988). The American Adolph Meyer saw psychiatric disorders as “primarily the outcome of interactions between the individual and the environment” (Hirschfeld and Goodwin 1988). In 1957, Karl Leonhardt, another German psychiatrist, proposed that manic-depressive illness be separated into bipolar and monopolar disorders. (Ian H. Gotlib and Constance L. Hammen 2009) edited the “Handbook of

Depression,” and this handbook shows the broad and diversified nature and development of the science surrounding depression.

Ethical Principles

The care management of a depressive individual with suicidal ideas could lead to an ethical dilemma. The therapist has to decide between safety and freedom of the suicidal patient.

Good clinical practice (GCP) is an international ethical and scientific set of standards for designing, conducting, recording and reporting trials that involve the participation of human subjects. Compliance with this standard provides public assurance that the rights, safety and well-being of trial subjects are protected, in line with the principles that originate in the Declaration of Helsinki (Good Clinical Practice 2002). The conditions under which placebo-controlled trials in depressives are ethical have to be defined (Laughren 2001).

Key Values

The research of depression requires conceptual and operational definitions. It has to consider third-variable confounding factors, physical comorbidities and interacting comorbidities. Cultural factors, race, gender and age are just some of the factors that influence the course of the illness. Research has been carried out on the onset, response, remission, recovery and treatment effects (Ingram and Siegle 2009). An understanding of causal issues and the risk of recurrence and relapse is needed.

Conceptualization

World

From a clinical perspective, unprecedented migration being a core dimension of contemporary globalization, poses new challenges to global health on a macro and micro scale.

In a *world* of increasing human mobility, there are many new outcomes on health influenced by transnational interactions between care providers and care recipients (Koehn 2006).

Human Being

A living *human being's* life experiences are “a dynamic interaction between the environment around, the environment within and the different forms of consciousness” (Fingelkurts and Fingelkurts 2009). The human is seen as “a psycho-somatic entity consisting of multiple levels and dimensions of human existence (physical, biological, psychological and spiritual reality), allowing consciousness/mind/spirit and brain/body/matter to be seen as different sides of the same phenomenon” (Fingelkurts and Fingelkurts 2009).

Life

Life changes occur as part of passing from one stage to another during the course of maturation and development and in particular the behavior and role-function adaptations that an individual is required to make in response to age-related changes over which he or she has little, if any, control (WHO Library Cataloguing in Publication Data 1994).

Reality

“The perception of living human *reality* is regulated by the environment around, the environment within and the consciousness that helps him make sense of both” (Fingelkurts and Fingelkurts 2009).

Knowledge

“To *know* yourself, your purpose of life and talents and taking these into full use and becoming coherent with life inside and reality outside is what human life is essentially about” (Ventegodt et al. 2005).

Truth

Evidence-based medicine supports validated strategies. Science tries to force “the *truth* way” of treatment. Science is strategically planned and uses a method described as principle-based concept analysis (Penrod and Hupcey 2005).

Perception

Neuronal oscillations of different frequencies are hypothesized to be basic for *perception* (Pöppel 2009). Perceptual scientists have recently enjoyed success in constructing mathematical theories for specific perceptual capacities (Bennett 1991).

Time

The subjective experience of *time* is a fundamental constituent of human consciousness and can be disturbed under conditions of mental disorders (Vogeley and Kupke 2007).

Consciousness

Consciousness consists of the following: A default consciousness, which is “a primary default state differentiating the living from the dead and the non-living” (Singh and Singh 2011). Consciousness also consists of a state of aware consciousness which includes the different stages from awake to sleep, including drowsy, dreamy, non-dreamy, etc., as well as altered states such as delirious, comatose, illusionary, hallucinating, etc. (Singh and Singh 2011). Consciousness is also a state of operational consciousness wherein all observable/unobservable brain operations like cognition, perception, emotion, conation, etc., result (Singh and Singh 2011). Consciousness is, finally, also a state of exalted consciousness wherein the brain establishes a link with the “inner self,” the divine, God, soul, etc. (Singh and Singh 2011).

Rationality

Human decisions cannot be explained solely by *rational* imperatives but are strongly influenced by emotion (Coricelli et al. 2007). Convergent evidence demonstrates the varying contributions of various regions of the prefrontal cortex to cognitive control (Ridderinkhof et al. 2004). Theoretical and behavioral studies provide an empirical basis to the impact of the emotion of regret in guiding choice behavior (Coricelli et al. 2007).

Mystery

The corresponding activities of the neural network occur only in harmony with physical laws;

however, this fact does not necessarily imply that there can be a comprehensive scientific theory of consciousness, despite all the progress in neurobiology, neuropsychology and neurocomputation (Gierer 2008). The brain-mind relationship may never be fully “decodable” and may remain a *mystery* (Gierer 2008). Objective analysis by the methods of natural science cannot, in principle, fully encompass subjective, mental experience (Gierer 2008).

Relevant Themes

A critical issue in Psychiatry and Depression regarding “Science and Religion” is the notion of culture and the different religious affiliations. Although depressive disorders occur across all demographic groups, cultures and ages, their manifestations, meanings, treatments and possible causes may differ significantly from one population to another (Chentsova-Dutton and Tsai 2009). “Culture (e.g., religions, values, norms) shapes behaviour, thoughts and emotions of individuals and is in turn shaped by them” (Chentsova-Dutton and Tsai 2009). The impact of depression on emotional response varies depending on the dominant cultural model of healthy emotional functioning (Chentsova-Dutton and Tsai 2009).

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Depressive Episode

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A disease state manifesting the features of depression which may be specified as mild, moderate, or severe, depending on the intensity and number of symptoms. The severe form may further be subdivided according to the presence or absence of mood-congruent or mood-incongruent psychotic symptoms.

Recurrent Depressive Disorder

A disorder characterized by repeated depressive episodes without any history of independent episodes of mania but not excluding brief episodes of hypomania immediately after a depressive episode.

Dervish

- [Mysticism in Islam](#)
-

Desire

- [Love \(Affective, Sexual\)](#)
-

Desires

- [Passion and Emotion, Theories of](#)
-

Destiny

- [Eschatology](#)
-

Determinism

- [Causality in Physics](#)
-

Determinism and Indeterminism

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Related Terms

[Compatibilism and incompatibilism](#); [Indeterminism](#); [Physical determinism and indeterminism](#); [Theological determinism and indeterminism](#)

Description

Determinism and indeterminism are large-scale doctrines about the nature of reality. Roughly

speaking, determinism is the doctrine that all past, present, and future events – including all acts of the will and all occurrences in nature – are determined and cannot but take place in the way they take place. Indeterminism is the negation of determinism; to deny determinism is to affirm indeterminism.

Versions of determinism and indeterminism have been around for millennia. One of the oldest known forms of determinism is theological determinism. In more recent centuries, it is physical determinism that has attracted the most philosophical attention. In what follows we will survey some main forms of theological and physical determinism and indeterminism, along with their underlying motivations, some of their main difficulties, and some of their mutual interrelations.

Theological Determinism

Theological determinism consists in the belief, roughly put, that there is one unique way in which the world (including human history) will unfold, and that this one unique way has, prior to its unfolding, been “fixed” by a deity or Ultimate Reality of some sort. There is not one but various “theological determinisms,” however. Theological determinisms differ from each other by virtue of the nature of the relevant deity; the deity can be believed to be the God of classical theism, Zeus, Fate, the stars (construed as divine beings), and so on. Theological determinisms also differ from each other by virtue of the way in which the relevant deity is believed to have fixed the one unique unfolding of the world; it could be by divine decree, causation, permission, concurrence, or foreknowledge (or combinations of these), and so on. A third way in which theological determinisms differ from each other pertains to the role that human beings and/or other agents are believed to play in the unfolding of the one unique story of the world – Do they play an active role in this story, contributing something to it by their volitions and actions? Or are they, say, mere puppets, subject to an illusion of free volition and action but lacking the real thing?

A major representative of theological determinism in Western thought is Augustine of

Hippo (354–430). In a famous passage in *De civitate Dei* (i.e., I.V.9–10) Augustine upholds two seemingly contradictory doctrines: first, that God has fixed a unique order of events (*omnium ordo causarum*) according to which the world will unfold ([c. 413–427] 1963, 174); and second, that human beings notwithstanding this fixed order of events have free will (*voluntatis arbitrio*) ([c. 413–427] 1963, 176).

The main sources of motivation for both doctrines are largely theological. The motivation for the first doctrine is provided for by the doctrine of divine foreknowledge. Since Augustine, qua orthodox Christian, believes that God knows everything and hence also all future events, it follows that he is committed to the belief that there is one unique way in which the world will unfold, namely, the way foreseen by God. The main motivation for the second doctrine is provided for by considerations pertaining to moral responsibility and the appropriateness of punishments and rewards. Since Augustine, qua orthodox Christian, believes that moral responsibility exists and that punishments and rewards are appropriate, and given that moral responsibility, on the part of human beings, presupposes that human beings act not under compulsion but out of free will, it follows that Augustine is committed to the belief that human beings have free will.

Augustine is aware that there at least seems to be a tension between the above two doctrines, and so he adduces various considerations that show, or purport to show, that the two doctrines do not conflict with each other. A first such consideration is that human volition is dependent on God in that human beings cannot will anything if God's will does not first permit that they will be the thing in question. A second consideration is that in connection with a human being's act of willing to do something, God is the one who grants the power which translates the volition into the action in question. A third consideration is that human volitions are part of the order of events which constitutes the one unique unfolding of the world.

Although the above considerations yield an understanding according to which free will and determinism are compatible, it should be borne in

mind that it is a specific kind of free will and a specific kind of determinism that are here spoken of. The conception of free will at play in Augustine's reasoning is a conception according to which a person acts out of free will if he or she does what he or she wills to do, and the conception of determinism at play is one according to which everything that happens cannot but happen since God in his foreknowledge has already seen it happen.

A second major representative of theological determinism in Western thought is the Protestant Reformer Martin Luther (1483–1546). In his much-read and controversial book *De Servo Arbitrio* (1525), Luther upholds, among other things, the following two doctrines: first, that “all things happen according to God's immutable, eternal, and infallible will” (*omnia incommutabili et aeterna infallibilique voluntate et praevidet et propouit et facit*) ([1525] 1908, 615); and second, that this entails that human beings lack “free will” (*liberum arbitrium*) ([1525] 1908, 615).

The motivation for both of these doctrines is theological. The first doctrine is supported by considerations deriving from divine foreknowledge. Luther argues that since God foreknows all things that happen and since all things that are foreknown are foreknown according to God's immutable, eternal, and infallible will, it follows that all things happen according to God's immutable, eternal, and infallible will. The second doctrine is taken to be a corollary of the first doctrine (although Luther also seeks to support it by independent biblical proof-texts): since all things happen according to God's immutable, eternal, and infallible will, there can be no such thing as human free will.

Luther claims that his above position is in agreement with the position of Augustine ([1525] 1908, 640). At first sight this might only seem to be partly true: Luther's first doctrine, that all things happen according to God's will, seems to agree with Augustine's doctrine that there is a fixed order of events that God has foreseen and caused to be; but Luther's second doctrine, that divine foreknowledge entails that human beings

lack free will, seems to be the very opposite of Augustine's claim that divine foreknowledge is consistent with the claim that human beings have free will.

The apparent conflict between Augustine's affirmation and Luther's denial of human free will is only apparent, however. As Luther makes clear, in denying the existence of human free will he is using the expression "free will" in the sense of "a power of freely turning in any direction, yielding to none and subject to none" (*possit in utrunque se vertere, neque ea vis ulli caedat vel subiecta*) ([1525] 1908, 637). And he also makes it very clear that he is not denying that human beings act not under compulsion but willingly and spontaneously (*sponte et libenti voluntate*) ([1525] 1908, 634). So Luther's denial of human free will is a denial of man's ability to will and to act without being subject to an overriding divine will; and this denial is in full agreement with Augustine's position. Moreover, Augustine's affirmation of human free will is an affirmation of the spontaneous willing and non-coerced nature of human action, and this affirmation is in full agreement with Luther's position. Thus, although Augustine and Luther employ different terms and phrases, their respective positions are nonetheless in fundamental agreement. They both subscribe to a form of theological determinism according to which God's attributes or actions ensure that all things cannot but unfold in one unique way, and that human volition and action cannot alter this one unique way, although this does not mean that human volition and action is non-spontaneous or coerced.

Theological determinism has been objected to on various grounds. A common objection is that the position is theologically defective in that it renders genuine love of God impossible. Genuine love, it is said, is always free and never subject to necessity, theological, or otherwise. If so, then genuine love of God cannot exist in a world in which all events are already determined. So in order for it to be possible to genuinely love God, theological determinism must be false.

Another objection to theological determinism has it that the position renders many religious

practices unintelligible. Take prayer, for example. What point is there in praying to God to intervene in some worldly event if it is already determined what will take place? It was partly in response to such questions that the classical philosopher Gottfried Wilhelm Leibniz (1646–1716) – himself a Lutheran – wrote his *Theodicy* (1710), in which he retorted that if an event is determined beforehand then the cause of the event (e.g., which can be divine intervention in answer to prayer) must also be determined, in which case there is all the point in the world to keep praying (e.g., Leibniz [1710] 1952, 57).

Theological Indeterminism

A theological indeterminist can be described as someone who believes that there exists a deity but who denies that this belief entails one unique story of the unfolding of the world. There are two basic ways of harmonizing the relevant belief with the relevant denial.

A first attempt to harmonize the belief in a deity with the denial of a fixed order of events consists simply in denying that God has foreknowledge of all future events, which, as we have seen, functions as a main rationale for theological determinism. This strategy was adopted by some ancient philosophers, including Marcus Tullius Cicero (106–43 B.C.), and has recently been revived in contemporary Anglo-American philosophy of religion by the so-called Open theists such as William Hasker (1989). A core tenet of Open theism is the belief that the future is not fixed, which is taken to be allowed for partly by denying that God has foreknowledge of all future events and partly by affirming that human beings have libertarian free will (i.e., a will that is able to select between equally possible courses of action unrestrictedly).

A second attempt to harmonize the belief in a deity with a fixed order of events consists in arguing that divine foreknowledge simply does *not* entail that there is one unique story of the unfolding of the world. This strategy has been fleshed out in various different ways. One such way, endorsed for example by Alvin Plantinga (1986), consists in introducing a distinction

between “hard facts” which hold necessarily, and “soft facts” about the past, which hold only contingently, and then arguing that God’s foreknowledge is of the category of a soft fact, and hence is a contingent matter. This has been held to allow for indeterminacy in the world.

The main motivation or theological indeterminism derives in large part from a belief in the existence of libertarian free will. That is, it is believed that human beings have the ability to select between a variety of equally possible courses of action, without being subject to any overriding divine or non-divine will. Given this belief, an admission of some sort of indeterminacy in the world and in God’s dealings with the world seems warranted.

Critics of theological indeterminism have often sought to undermine the position by arguing either that God does have foreknowledge of all future events, or that the various attempts to harmonize divine foreknowledge with indeterminacy in the world are untenable. The first strategy is pursued mainly against theological indeterminists like Hasker who deny divine foreknowledge, and the second strategy is pursued mainly against theological indeterminists, like Plantinga, who concede divine foreknowledge but deny the inference of theological determinism.

Physical Determinism

In the seventeenth and eighteenth centuries, a new form of determinism gained momentum and subsequently replaced theological determinism as the main form of determinism in philosophical discussions, namely, *physical determinism*. Indeed, physical determinism has so come to dominate philosophical discussion that many contemporary philosophers use the term “determinism” as more or less equivalent to what we are here calling physical determinism, often regarding theological determinism as “a mere historical puzzle” or “intellectual amusement” (Dennett 1984, 171).

That physical determinism gained momentum in the seventeenth and eighteenth centuries was connected in part with the emergence of Newtonian physics. Newtonian physics, and in

particular its claim, that all physical, material phenomena move mechanically by virtue of laws of nature, encouraged deterministic ways of thinking. For if one grants that human beings are material, physical phenomena the obvious conclusion is that also human behavior is entirely determined by laws of nature.

Drawing on the idea of laws of nature, the following influential definition of (physical) determinism has been offered: “*Determinism*... is the thesis that there is at any instant exactly one physically possible future” or again: “given the past and the laws of nature, there is only one possible future” (van Inwagen 1983, 3, 65). The number of philosophers subscribing to determinism, understood roughly along lines of this definition, seems to be vast, and includes, among others, the Enlightenment philosopher David Hume (1711–1776), logical positivists of the mid-twentieth century such as Moritz Schlick (1882–1936), and a large company of contemporary analytic philosophers, among which perhaps Daniel Dennett is the most prominent.

The main motivation for physical determinism seems to be that it is the natural outcome of a naturalistic world-view. On a naturalistic world-view, human beings are understood as entirely natural, physical, and biological phenomena, and like all natural, physical, and biological phenomena their motion or behavior is to be understood as the outcome of the operation of the laws of nature. This natural outcome, it seems, can only be avoided by positing some immaterial extra component in human beings – a “soul,” for example – or by denying that the motion or behavior of material, physical, and biological phenomena can be fully explained via reference to operations of the laws of nature, both of which strategies seem to fit ill with a naturalistic world-view.

There are at least four major types of objections to physical determinism in the contemporary philosophical literature, deriving from considerations pertaining to free will, morality, what is up to human beings, and quantum mechanics respectively. In what follows we will survey each of these three major types of objections.

A first objection to physical determinism derives from considerations pertaining to free will, and goes roughly as follows: If physical determinism were true, then human free will could not exist, for human free will requires that a person is able to select one of several possible courses of action, which would not be possible if physical determinism were true. But we know from human experience that human beings have free will, and so physical determinism must be false.

A second objection to physical determinism derives from considerations pertaining to morality, and goes roughly as follows: If physical determinism were true, then there could be no such thing as genuine human morality and responsibility, for genuine human morality and responsibility requires that human beings could have done otherwise than they in fact did. But there *is* such a thing as genuine human morality and responsibility, and so physical determinism must be wrong.

A third and in recent times much-discussed objection to physical determinism is the so-called Consequence-argument of Peter van Inwagen, which draws on considerations pertaining to what can be said to be “up to” human beings and what cannot. The argument goes roughly as follows: Physical determinism entails that human actions are the consequences of the laws of nature and events in the remote past. But it is not up to us what the laws of nature are and what events went on in the remote past. Hence, the consequences of the laws of nature and events in the remote past cannot – in contrary to what physical determinism implies – be up to us (see van Inwagen 1983, 16).

A fourth objection to physical determinism draws on modern scientific theory, and, in particular, a central postulate of quantum mechanics which allows for indeterministic properties on the part of submicroscopic, subatomic particles. If this postulate of quantum mechanics is correct, it may be wrong to say that the behavior of all material phenomena is determined by laws of nature, for there will then be at least one kind of material phenomena that may not thus be determined.

Physical Indeterminism

Like theological indeterminism, physical indeterminism is a negative position, and can be defined as the negation of physical determinism. Accordingly, if physical determinism is defined, as in the foregoing, as the thesis that given the past and the laws of nature there is only one possible future, physical indeterminism can be defined as the denial of this thesis. Physical indeterminism is, thus, consistent with the claim that given the past and the laws of nature there are several possible futures. One of the most prominent contemporary representatives of physical determinism is the aforementioned van Inwagen.

There are at least three main sources of motivation for contemporary physical indeterminism. A first source of motivation is provided for by human free will. It is maintained that human beings have free will and that free will entails that human beings have the ability to choose between two equally possible courses of action, or alternatively put, an ability to have done otherwise than one in fact did. But if one is to have the ability to choose between two equally possible courses of action or to have done otherwise than one in fact did, then physical determinism must be false and hence physical determinism be true. So given that free will exists, physical indeterminism must be true.

A second source of motivation for physical indeterminism is provided for by human morality and could be regarded as an adaptation of the first source of motivation. It is maintained that morally significant human acts require that human beings could have acted otherwise than they in fact acted (a principle often called “the Principle of Alternate Possibilities”). But if it is to be possible that one was able to have acted otherwise than one in fact acted, then physical determinism must be false and hence physical indeterminism be true. Accordingly, given that human morality exists, it follows that physical indeterminism must be true.

A third source of motivation for physical indeterminism derives from quantum mechanics. Since, as has been said earlier, a central postulate of quantum mechanics allows for indeterminacy

in the world, it is judged that physical determinism is probably mistaken and hence physical indeterminism probably true.

The above sources of motivation for physical indeterminism have not gone unchallenged, however, and especially the first and second sources of motivation have been subjected to much criticism. In what follows we will survey two major objections against each of these two sources of motivation.

A first objection against the first above source of motivation consists in the claim that free will does *not* entail an ability to choose between two equally possible courses of action. According to Hume's famous definition, for example, free will consists simply in a certain "liberty of spontaneity," which is defined as "that which is opposed to violence" (Hume [1739–40] 2009, 262). That is to say, a person acts out of free will if he or she acts not under compulsion but willingly. Given this alternative conception of free will, it is simply false to say that free will entails an ability to choose between equally possible courses of action.

A second objection to the first above source of motivation consists in a so-called conditional analysis of the phrase that one "could have done otherwise" than one in fact did. At first sight it might seem that phrase of this sort require an "ability" on the part of free agents to select between two possible courses of action. Against this, G.E. Moore (1873–1958) famously argued, in his book *Ethics* (1912), that the relevant sort of phrases seem rather to be analyzable in terms of conditionals, such that, say, the phrase "Peter could have refrained from eating lunch" is analyzable in terms of the conditional "if Peter had willed to refrain from eating lunch, he would have refrained from eating lunch." Given this style of analysis, it seems false to say that free will requires an ability to have selected an alternative course of action from the course one actually selected.

Turning to the second above source of motivation for physical indeterminism, we may note the following three major objections: A first objection takes issue with the idea that moral responsibility requires an ability to have acted

otherwise than one actually acted. In a famous paper from 1969, Harry Frankfurt adduces various intuitively appealing thought-experiments which aim at undermining this principle (nowadays known as "Frankfurt-counterexamples"). Imagine, for example, that a certain man called Black is able to manipulate the brain of a certain man called Jones in such a way as to be able to prevent Jones from carrying out any action that he, Black, does not want Jones to carry out. Suppose further that Jones performs a series of actions that we would ordinarily consider are morally significant – whether good or bad makes no difference – without Black preventing this. Would we say that Jones is morally responsible for these actions? It seems we would. But then note: Black could have prevented Jones from carrying out any other series of actions than the series of actions he actually carried out, and so Jones cannot be said to have been able to have acted otherwise than he in fact acted (see Frankfurt 1969). Many philosophers have judged these sorts of counterexamples thoroughly persuasive, and have accordingly rejected the Principle of Alternate Possibilities as mistaken.

A second major objection to the second above-mentioned source of motivation denies that the question of whether one could have acted otherwise than one in fact acted is even *relevant* to the question of the morality of an action. This is the position of Dennett in his much-discussed book *Elbow Room* (1984). The answer to the question whether one could have acted otherwise than one did, says Dennett, "could not conceivably make any noticeable difference to the way the world went" (1984, 138). The basic idea here is that sufficient conditions for the moral status of an action are located in the action itself, irrespective of whether the action was one of several possible actions that the subject could have performed. If Dennett's reasoning on this point is correct, then the Principle of Alternate Possibilities will be mistaken and the presently considered second source of motivation for physical indeterminism will be undermined.

A third major objection to the second above-mentioned source of motivation for physical indeterminism takes issue with the very idea

that human beings are genuinely responsible for their actions. In his book *Freedom and Belief* (1986), Galen Strawson has developed a powerful argument for the claim that human beings are not genuinely responsible for their choices and actions. The argument goes roughly as follows: The choices one makes and the actions one performs are largely a function of one's character; in order to be fully or genuinely responsible for one's choices and actions one must accordingly be fully or genuinely responsible for one's character; but in order to be fully or genuinely responsible for one's character one must have chosen to be the way one is; however, no one has ever chosen to be the way one is; accordingly, no one is genuinely responsible for his or her choices and actions (see Strawson 1986, 28–29). If Strawson's present argument is cogent, then the presently considered source of motivation for physical indeterminism will be subverted.

Interrelations Between Theological and Physical Determinism

Among the various similarities between theological and physical determinism, the following two are particularly interesting.

First, both theological and physical determinism are in agreement that the events of the world cannot but unfold in exactly the way in which they unfold. There is simply no other genuine possibility: either a certain event has been foreseen or it has not been foreseen, or will result from the operation of the laws of nature on matter or will not thus result, and so it is either necessary that it takes place or it is impossible that it takes place. In other words, the unfolding of the world is already fixed.

Second, both theological and physical determinism are typically associated with a non-libertarian, compatibilist understanding of human volition. Thus, it is not surprising to find that major representatives of theological and physical determinism, such as Augustine and Hume, in spite of all their differences, nevertheless, agree in taking human free will to consist in a subject's not acting under coercion but rather doing what he or she wills to do.

Among the more noticeable differences between theological and physical determinism, the following two are worth pointing out.

First, theological determinism can be seen to allow for a greater variety of possible causes of action than physical determinism. Physical determinism sees actions as caused exclusively by the operation of laws of nature on material phenomena; theological determinism allows for such causes, but allows equally for agent causation (both human and divine), and for further kinds of causation as well (if such there be).

Second, theological determinism takes the one unique and fixed way in which the world unfolds to be ensured by a deity, and hence to allow for an element of teleology or goal-directedness. Physical determinism, on the other hand, takes the laws of nature and the existence of matter to be sufficient determinants for the one unique unfolding of the world, and hence allows for no teleology or goal-directedness in this unfolding.

Cross-References

- [Divine Action](#)
- [Free Will](#)
- [Metaphysics](#)
- [Quantum Theory](#)

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Deterministic and Nondeterministic Turing Machine

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A Turing machine is a theoretical machine that manipulates symbols on a strip of tape according to a table of rules. Despite its simplicity, a Turing machine can be adapted to simulate the logic of any computer algorithm and is particularly useful in explaining the functions of a CPU inside a computer. In computational complexity discipline, a deterministic Turing machine is a theoretical machine that is used in thought experiments to examine the abilities and limitations of algorithms. In a deterministic Turing machine, the set of rules impose at most one action to be performed for any given situation. In a nondeterministic Turing machine, it may have a set of rules that prescribes more than one action for a given situation.

Deus Ex Machina

► [God of the Gaps](#)

Development

► [Biology of Religion](#)

Developmental Psychology

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Description

Developmental psychology involves the description, explanation, and optimization of intraindividual change and of interindividual differences in such change (Baltes et al. 1977). The study of development involves seeking to describe, explain, and optimize the course (trajectories) of such changes and, as well, of interindividual differences in intraindividual change across the life span. In other words, there are three goals of the science of developmental psychology: (1) describe the nature of development for individuals and groups, (2) explain the nature of development for individuals and groups, and because of the interest in using developmental science to improve the human condition, (3) optimize, as much as possible, the trajectories of development. Here, then, the key questions for developmentalists are what characteristics of people and what attributes of the environment need to be engaged in what manners and during what portions of the life span to increase the probability that individuals will thrive across the life span (Lerner 2002)?

As suggested by the focus of questions about optimization on both the individual and his or her environmental setting, today, the cutting edge of developmental psychological theory sees development as involving mutually influential relations between the individual and his or her context. That is, the fundamental, or basic, process of development is a *relation* between individual and context. As such, development is

neither an individual “unfolding,” for example, due to genetic influences, and it is not a consequence of an environmental molding of an essentially passive organism. Accordingly, the focus within the contemporary study of human development is on concepts and models associated with relational developmental systems theories.

Such theories focus on the *mutually influential relations* among variables from the multiple levels of organization (ranging from the biological through the sociocultural and historical) that comprise the ecology of human development. These relations may be termed dynamic interactions or developmental regulations, which intends the mutual influence between one variable within the developmental system and another variable or variables within the developmental system, and they are typically represented as individual $\longleftrightarrow$ context relations. The inclusion of history within these theories provides a temporal component to the system and gives the system a basis for change. Indeed, historical embeddedness and temporality are among the defining features of contemporary relational developmental systems theories of human development. Other concepts are relationism, which is the idea that the fundamental character of life involves relations among entities, that to be is to be in relation, and that there are no entities split off or isolated in their structure or function from relations with the other components of the ecology of life; the integration of levels of organization, i.e., the components of the ecology of development, ranging from micro tiers (e.g., levels within a person, such as his/her genes, brain, or cognitive or emotional characteristics) through macro tiers (e.g., society, culture, and historical era); relative $\blacktriangleright$ [plasticity](#) (the potential for systematic change in structure or function across life), $\blacktriangleright$ [diversity](#), and $\blacktriangleright$ [self-organization](#) (Overton 2006).

Self-organization arises because dynamic interactions within a developmental system involve a dialectic between system-changing and system-constraining relations. Such a balance between changes that make the system different and changes that maintain the structure

and function of the system reduces the potentially infinite complexity of the system and, as such, enables the identification of continuous instances of structure and function. In short, change across the life span occurs within a dynamic developmental system that creates both constancy and variation.

As marked by differences across the six editions of the most important reference work in the field, the *Handbook of Child Psychology* (1946, 1954, 1970, 1983, 1998, and 2006), the current emphasis within this subdiscipline on relational developmental systems theories, reflects a remarkable change in the predominant theoretical foci used to study human development (Damon and Lerner 2006). There has been a change from reductionist accounts that stressed the development arose from either nature (e.g., genes) or nurture (e.g., environmental stimuli), or from simplistic combinations of variables associated with nature or nurture, to the above-noted focus on mutually influential, individual $\longleftrightarrow$ context relations emphasized within contemporary relational developmental systems theories.

These changes in theoretical models within the field have resulted in another major change, one involving the professional identity of scientists working in this field. A decade ago, most scholars studying human development labeled the field as either developmental psychology or, if they were not themselves psychologists, as a field wherein one had to recognize that psychological science was the predominant lens through which the span of human life was studied. Today, however, the field has become much more deeply and broadly multidisciplinary (and, in some subareas, actually interdisciplinary or, in other words, disciplinarily integrative, for example, developmental cognitive neuroscience). As a consequence, more and more scholars of human development refer to their field as developmental science (Bornstein and Lamb 2010). Developmental science seeks to describe, explain, and optimize changes across the life span in within-person change and differences between people in within-person change.

The change of name for the field studying the human life span reflects in large part a key

intellectual change that we have noted is reflected across the various editions of the *Handbook of Child Psychology*: the certain “demise” of split conceptions of the nature-nurture issue and of reductionistic approaches to either nature formulations (sociobiology or behavior genetics) or to nurture formulations (e.g., approaches that attempt to account for development through reference to stimulus-response relations or through an analysis of the function of stimuli); the ascendancy of focus on relational developmental systems models, conceptions that seek to fuse systemically the levels of organization involved in the ecology of human development (from biology and physiology through culture and history; and the emphasis on relations among levels and not on the “main effects” of any level itself, as constituting the fundamental units of analysis of developmental analysis).

Indeed, as illustrated by the range of chapters in the 2006, sixth edition of the *Handbook of Child Psychology* that are an instance of or, at the least, are framed by developmental systems ideas about the relational processes linking the multiple, integrated levels of organization within the ecology of human development, there exists a diverse theoretical family of such models that are used to conceptualize both “traditional” areas of interest within the study of human development, for example, biological development; perceptual and motor development; personality, affective, and social development; culture and development; cognitive development; and “emergent” areas of intellectual interest, for example, the development of diverse children, positive human development, and – of particular relevance to this encyclopedia – spiritual and religious development (Damon and Lerner 2006).

These theoretical emphases on individual $\leftrightarrow$ context relations within developmental science fortunately have been coupled with enormous, recent advances in quantitative statistical approaches, arguably especially in regard to the longitudinal methods required to appraise the changing relations within the developmental system between the individual and the context. Moreover, there has been an increased appreciation of the importance of qualitative methods,

both as valuable tools for the analysis of the life course and as a means to triangulating quantitative appraisals of human development; as such, there has been a growth in the use of traditional qualitative methods, along with the invention of new qualitative techniques (Baltes et al. 1977; Lerner 2002).

Finally, it should be noted that this exciting and innovative period in developmental theory and methodology has been framed by a renewed appreciation of the importance of the application of theory-predicated research to promote positive development across the life span. Increasingly, then, across the last two decades, developmental scientists have been involved in conducting research that informs, testing ideas associated with, or evaluating policies or community-based programs aimed at enhancing the lives of diverse individuals, families, and communities.

Self-identification

Science

Yes. Developmental science rests on a commitment to the scientific method and, hence, to empiricism. Indeed, the identity of the field, reflected by preference for labeling the field as developmental science, involves an explicit commitment of the field, and of the scholars working within it, to science.

The subdiscipline is a field of science that, as noted, rests on empiricism. Accordingly, the epistemology of developmental science is framed by empiricism and the other core components of the scientific method – systematic and purposeful observations, replication, communication, correction, and the accumulation of knowledge. The ontology of developmental science is also predicated on empiricism, that is, to be is to be capable of observation. Entities that cannot be made empirical or in some way made available to observation cannot be useful within this ontology. Because current beliefs within developmental science about explanation, and hence about causality, emphasize the centrality of falsification, causal statements for which there are no empirical referents – for which there are no

possible observations that can falsify the statement – are not part of the science (Overton 2006).

Of course, concepts such as spirit, grace, or holiness can be operationalized, thus, made empirical, and thereby become available to be the focus of scientific study. Therefore, facets of religiosity or spirituality may quite appropriately be topics of inquiry within developmental science. However, when such constructs are part of one's faith – that is, a commitment to a belief that does not require empirical verification and is not subject to empirical falsification – they are not part of science. These terms of faith are part of a nonscientific (but epistemologically equivalent in our view) way of knowing.

In short, many scientists, including developmental scientists, are religious. They may therefore use ideas such as spirit and faith as empirical concepts available for scientific study *or* as concepts linked to their religion. When the latter use of these concepts is employed, these ideas are part of a different system of knowing and being and not components of a scientific approach to knowing and being.

Characteristics

Whereas all development involves change, not all changes involve development. Development involves systematic, organized, and successive changes across the life span in the relations within and among levels of organization within the ecology of human development. No other subdiscipline of psychology, or of social and behavioral science more generally, has this focus on developmental change.

Relevance to Science and Religion

Are there any attributes of human development that are distinct from and, perhaps, evolutionarily discontinuous with the attributes of structure and function found in other species? Arguably, religiosity and spirituality are attributes of humans that have no isomorphic parallel in other species. Moreover, religion – both as

a psychological (cognitive and emotional) facet of human functioning and as an institutional force organizing and shaping human behavior – and spirituality, whether linked to religion or faith or directed to senses of awe or transcendence in regard to involvement in the natural social or physical ecological world, are ubiquitous facets of human behavior and development. In a science aimed at describing, explaining, and optimizing human development, especially when that science is framed by a relational developmental systems approach that focuses on individual $\longleftrightarrow$ context relations, religion and spirituality become essential substantive foci of scholarship.

As noted earlier, this substantive focus was included within the 2006 sixth edition of the major reference work in the field of development science, that is, the *Handbook of Child Psychology*. In addition, religion and spirituality were also a focus within the most recent, 2009, third edition of the also influential *Handbook of Adolescent Psychology*. Similarly in the first edition of the *Handbook of Life-Span Development*, there is also a chapter on the role of religious and spiritual development across the course of human life (Scarlett and Warren 2010).

Sources of Authority

In science, which rests on the communication to the scholarly community of one's empirical work and, therefore, on peer review and correction, and potentially final inclusion of one's work in the accumulated archival record of the field, peer-reviewed publications are the main sources of authority. Developmental science shares this commitment to the authority of peer-reviewed publications.

In addition, when one has attained the stature of being a major contributor to the empirical status of a field, one may be asked by scholarly societies and/or publishers to organize major reference works, contributions that reflect the integrative state of the art of the field and that reflect the maturity and scope of a field. Within developmental science, handbooks – most notably the *Handbook of Child Psychology* and the *Handbook of Adolescent Psychology* – are

exemplars of such reference works, which include also annual reviews or, occasionally, reports from such organizations as the National Academy of Sciences or the National Science Foundation that pertain to human development (Damon and Lerner 2006; Lerner and Steinberg 2009; Eccles and Gootman 2002).

Ethical Principles

The major scholarly organizations with which developmental scientists affiliate – for instance the Society for Research in Child Development, the Society for Research in Adolescence, the Society for the Study of Human Development, the International Society for the Study of Behavioral Development, the Gerontological Society of America, the International Society on Infant Studies, the National Council on Family Relations, the American Psychological Association, and the Association for Psychological Science – all have their own and/or subscribe to each others' detailed ethical guidelines for the treatment of animal and human participants in research and, as well, for the application of developmental science scholarship to professional practice, including clinical programs and consultation to communities or private or public organizations (Fisher 2009). In addition, developmental scientists have to meet the standards of protection of human "subjects" (participants) in their research, as specified by university or research organization Institutional Review Boards (IRBs).

Indeed, grant applications to the United States federal government require that the proposals include a discussion of how the welfare and/or rights of animal or human participants will be protected. Before grants are awarded, the principal investigator involved in grant proposals must show the federal funder that IRB approval for the research has been given. In addition, most American universities require that active researchers gain certification that they are knowledgeable about past and current issues, guidelines, and rules regarding the ethical treatment of human participants in their research.

Key Values

Developmental science adheres to two sets of values. First, the field values science, the scientific method, and the ethical conduct of science (Baltes et al. 1977; Lerner 2002; Fisher 2009). Second, the field values humans as "ends in themselves," that is, as individuals whose lives have intrinsic value and who deserve to have the work of developmental scientists aimed ultimately at optimizing their chances for a positive, healthy life. Certainly, this value on the person as a person is reflected in the optimization objectives of developmental science and, as well, is linked to the value of conducting science in an ethical manner.

Together, then, the two sets of values in developmental science coalesce to create emphases on respect for individual rights, dignity, and freedom on beneficence (on doing no harm and in promoting the good) and on social justice. Developmental science, in directing its theoretical and empirical work to describe and explain the mutually influential links between individuals and their contexts and, then, in testing one's explanations of these individual $\longleftrightarrow$ context relations by trying to alter their course and promote positive development, has an "ultimate" concern with social justice. If changes in the relations between people and their contexts can improve the chances for individuals to lead better lives and if such work can therefore be extended to the diversity of instantiations of individual $\longleftrightarrow$ context relations, a vital portion of the work of developmental science is to apply scholarship to policies and programs to distribute opportunities for healthy positive development justly across the diversity of human development.

Conceptualization

Nature/World

Nature and the world are conceptualized as the breadth of the multiple levels of organization within the ecology of human development. The world is organized into multiple levels of

organization ranging from the inner-biological levels of organization within a person (e.g., genetic, cellular, and organ levels) through groups, communities, societies, cultures, and the physical ecology, all of which are in turn embedded in history, in temporal change (Lerner 2002; Overton 2006).

Human Being

The human is regarded as a distinct – and valued – species within the ecology of human development. A holistic and therefore emergent view of the human exists within developmental science. That is, because the “parts” of the individual (characteristics, such as genes, neurons, personality or cognitive style attributes, behaviors, attitudes, social relationships, etc.) create in their systemic fusion attributes of structure and function that do not exist in the parts in isolation, each person must be understood as an individual and in a holistic and integrative manner. Of course, each person, while possessing such ideographic characteristics, also has characteristics in common with some groups (e.g., other people in his or her family, faith institution, community, or profession) and, as well, some characteristics that are shared by all humans (e.g., the various physical systems such as digestion, respiration, circulation, or reproduction, or the potential for systematic change across life, that is, of “plasticity,” across the life span). Therefore, there is truth in the dictum that each person is (in some respects) like all other people, like only some other people, and like no other person (Lerner 2002; Overton 2006).

Reality

Within development science, reality is defined empirically. Reality is the multilevel developmental ecology of human development.

Knowledge

As explained above, developmental science adheres to an empirical epistemology. As such, knowledge is the set of ideas (theories or concepts), principles, and facts accumulated through the application of the scientific method.

Truth

As also noted earlier, developmental science subscribes to an empirical ontology. Following George Berkeley, for instance, developmental scientists would agree that “to be” is to be perceived, that is, to be capable of empirical identification. What is true then is what we can derive as valid from our empirical observations.

Perception

Perception is a function of the individual (including the scientist). Sensation is reaction to stimulation. In turn, perception is “sensing with meaning,” that is, making cognitive and/or emotional associations to one's sensations. As such, perception involves, first, experiencing stimulation through the avenues of the senses and, second, making an association to what one senses (e.g., the object I see before me is a person I recognize and like, or the smell I sense when I walk into the bakery is pleasant, or the voice I hear is my spouse).

Time

Time is the broadest and most inclusive level of organization within the developmental system (Overton 2006). Time (historical change) moderates the structure and function of all other levels of organization within the developmental system. Simply, things change. Individuals mature and grow older. Families evolve from a two-person structure to a structure with children in a household, to an “empty nest” when children grow up and leave home and start their own families. Social institutions and society change, as a function of natural events, for example, hurricanes, earthquakes, and of human-induced events, for example, wars, economic crises, or political upheavals. Accordingly, time has a different meaning at different levels of organization within the developmental system. For instance, as just illustrated, we may speak of individual time, generational time, and historical time.

Consciousness

This term is used within various facets of developmental science to refer to a facet of the

cognitive functioning of individuals. Consciousness refers to material in the current awareness of the person, that is, what the person is thinking, feeling, sensing, or perceiving at a given point of assessment.

Rationality/Reason

These terms are also used within various facets of developmental science to refer to facets of the cognitive functioning of individuals. For instance, rationality may be used to refer to functioning that reflects the person's adherence to logic, established facts, social conventions for appropriate conduct, or even accepted beliefs. Reason may at times be used synonymously with rationality or, alternatively, as a cognitive attribute involved in problem solving.

Mystery

Mystery is not a term typically used within developmental science. When it is employed, it may be a rhetorical device to dramatize the as yet unknown bases of a particular phenomenon or to point out that there remain many unanswered questions about the explanation of an observed facet of human development.

Relevant Themes

As an area of science that views religion and spirituality as essential foci of scholarship – given their status as potentially two species-defining characteristics of human functioning – developmental scientists would seek to elucidate the role of these characteristics within the relational developmental system. As a consequence, research seeking to study religiosity and/or spirituality would be framed within the following complex, multipart question: What physiological and psychological characteristics of individuals (ranging from the inner-biological, through the cognitive and affective, to the behavioral), in relation to what features of the multilevel context of development (ranging from the social relationship level through the family, community, cultural, natural, and

designed physical ecological to the historical), among individuals of what age, sex, race, religious affiliation, ethnic, national, etc. characteristics, impact what facets of religiosity and/or spirituality and, in turn, result in what impacts of religiosity and spirituality on the subsequent development of the individual and on the structure and/or function of his or her context?

Cross-References

- ▶ Epistemology
- ▶ Evolution
- ▶ Functionalism
- ▶ Holism
- ▶ Philosophy of Science
- ▶ Plasticity
- ▶ Reductionism
- ▶ Worldview

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Deviance and Social Control, Sociology of

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Related Terms

[Deviant behavior](#); [Deviants](#); [Elite deviance](#); [Labeling](#); [Moral panic](#); [Social deviance](#); [Social interactionism](#); [Social stigma](#)

Description

The sociology of deviance and social control is a subdiscipline of sociology that is also informed by concepts and theories from social psychology and social constructionism (Adler and Adler 2011). Social constructionism is a transdisciplinary approach to the study of social phenomenon that sees the social world, including social deviance, as an emergent outcome of routine practices of social interaction. The sociology of deviance and social control, which primarily emerged in the 1960s, examines the ways that human social interaction identifies some of society's members' behavior as: (1) different, (2) significant, and (3) negative, in its effect on other members (Henry 2009). It identifies people who experience others' behavior as offensive, the ways that they act to ban the behavior, and the forms of social control that they bring to bear on the perceived offensive behaviors, and on those committing such behavior. These control groups include "moral entrepreneurs" who reflect or generate

public support via the mass media to create rules or laws that ban or criminalize behaviors they find offensive (Becker 1963/1966; Cohen 1972/1980; Goode and Ben-Yehuda 1994), and also includes the formal and informal control mechanisms, such as ostracism and shaming; the process of labeling those designated as "outsiders"; and the construction of stigmatized categories of deviants (Goffman 1963/1986; Schur 1980). The sociology of deviance also examines the behaviors, both individual and collective, of those designated deviant, relative to others seen as "normal," whether this deviance is acquired (e.g., physical disability) or achieved (e.g., substance abuse). It examines deviant social organization and subcultures, their interactions with nondeviants, their private and sometimes secret lives, and the effects of the labeling and stigmatizing process, as well as the ways they can recover from the moral condemnation and exclusion embodied in the stigmatizing process (Henry 2009; Schur 1980).

Recent Developments

Recent developments in studies of deviance include: (1) debate over whether the field of social deviance is still relevant (Hendershott 2002; Henry 2009); (2) a more sophisticated understanding of moral panics and the stigmatization process (Goode and Ben-Yehuda 1994); (3) the positive ways shaming of behavior, rather than shaming people, can be used to effectively reintegrate those who have deviated, back into society (Henry 2009); (4) a shift from studying deviance committed by society's powerless, captured in the phrase "nuts, sluts and perverts," to studying deviance by society's powerful elites and corporations; and, (5) the emergence of a field of studies in positive deviance (PD) emanating from nutrition and health studies, and later, business and organizational change. This seeks uncommon solutions to recurrent economic, social, and community problems from within the range of behavior and practices that are successful and operative on the margins of

conventional practices (Henry 2009). A clear implication of the positive deviance model is that rather than exercise social control, its advocates seek to include this form of deviant behavior into the mainstream.

Theoretical Context

The sociology of deviance and social control has been predominantly set within the interpretationalist or hermeneutic tradition in sociology. While there are positivistic studies within the field, its major research, and the studies published in its major journal, *Deviant Behavior*, use qualitative methods, including ethnography, interview, and case study, to gather data on their subjects. Insofar as those methods are systematically organized, and meet the standards for qualitative research, then the field can be described as a social science in the same way that cultural anthropology is a social science. The field does not self-identify as a religion, although positivist critics might hold, especially in the case of radical social constructionists and some labeling theorists, that their ontological belief that social reality is a coproduction achieved through social interaction with no intrinsic reality beyond humans acting toward the named entities as though they were real, places it closer to religion where that involves a self-referential value system, than science. That it also adopts a cultural relativist stance in relation to difference and subcultures rather than a committed value position, also moves it closer to those religions that tolerate diversity, rather than those that adopt an absolutist stance (but see Hendershott 2002).

The sociology of deviance and social control is distinct within sociology in dealing with the inverse of the main discipline's concern, which is the problem of social order: the institutions and social processes that constitute a collective society or community. The sociology of deviance and social control addresses how mainstream or powerful groups within society deal with those whose behavior exists on its margins, the functional or dysfunctional role these behaviors, individuals

and groups play, and their perceived threat to social order, and what to do about both deviants and deviance.

It is also unusual to have a subdiscipline largely dominated by one theoretical framework, social interactionism/social constructionism (Adler and Adler 2011; Henry 2009), although some sociologists of deviance have introduced multiple disciplinary perspectives in an attempt to broaden theoretical explanation within the field (Pfohl 1994) which brings it closer to a criminological approach.

Relationship to Science and Religion

The sociology of deviance and social control intersects with science and religion through its studies of the process of moral identity and social control. Indeed, historically each of the three criteria, established for determining what counts as deviance, have been justified on moral grounds, in terms of the extent that a behavior constitutes "sin" and, in the extreme, that are embodied in law as "crime." These dimensions are: (1) extent and seriousness of the harm caused, (2) degree of consensus about whether the behavior is offensive, and (3) severity of society's responses.

Deviance as sin preceded the view that deviance was no more than negatively judged difference. The moral control of sinfulness is captured in Kai Erikson's classic book *Wayward Puritans* about the Salem witchcraft trials in seventeenth-century Massachusetts. As Pfohl has argued, this demonic perspective reveals that the control of deviance is a battle between good and evil, over "who gets to name the good and control the bad," and "deviance is, and always has been, a moral battle in which the winners are declared saints and the losers, sinners" (Pfohl 1994).

Significance

The major sources of insight for the field are the fact that two of its landmark texts, Kai Erikson's *Wayward Puritans* (Erikson 1966) and Howard

Becker's *Outsiders* (Becker 1963/1966), are among the best selling sociology texts of all time, with between 100,000 and 150,000 copies sold up to 1997. Erving Goffman's *Stigma* has also become required reading for anyone practicing in the field of mental health.

The self-fulfilling prophecy, is the essential idea of labeling theory describing the social process of creating career deviance from minor deviance, or as Edwin Lemert described it, creating secondary deviance from primary deviance. This has become embedded in popular discourse from education to criminology and criminal justice, and is a major reason justifying segregating juvenile offenders from adults in the criminal justice system, as well as for diverting juvenile offenders into alternatives to institutionalization. Indeed, in the broadest approach to the field, those theories that explain the causes of deviance are substantially the same as those that explain the causes of crime, albeit at different points in the lifecourse (Pfohl 1994).

Ethics of Sociologists of Deviance

The American Sociological Society's *Code of Ethics* governs the behavior of sociologists of deviance and social control and this Code also contains its key values. These include five core principles (elaborated in full at <http://www.asanet.org/about/ethics.cfm>): (1) maintain the highest level of professional competence; (2) maximize ethical integrity by acting in ways to avoid jeopardizing personal or others' welfare, and avoid making false, misleading or deceptive statements; (3) adhere to the highest scientific and professional standards and accept responsibility for work and ethical behavior; (4) respect all people's rights, dignity, and diversity, while striving to eliminate bias, intolerance, and any form of discrimination, and acknowledge the rights of others to hold values, attitudes, and opinions that differ from your own; and (5) act with social responsibility in order to contribute to the public good. Specific ethical issues affecting the sociologists of deviance relate to the source of its research material.

Assumptions About Core Concepts

The position taken by sociologists of deviance and social control on core concepts varies depending upon the theoretical position adopted by the sociologist, particularly their ontological position. The interactionist/social constructionist position is predominant in the field and it has a particular interpretation of these core concepts. It divides nature/world into a physical and social order. Following sociological phenomenologist Alfred Schutz, it takes the physical/natural world as a reality that can be directly experienced and conceptualized by scientists in a "first-order" sense. In contrast, the social world is already pre-constituted by other social beings and so the social scientists is only able to make "second-order" constructs based on reinterpreting the first-order constructs of those in that social world.

Human beings are in the world as physical and social entities. Their social being is as a human agent who can act individually and collectively, but the intersection of the individual and social world is such that individual agency is more or less colored by social agency, as in social psychologist George Herbert Mead's intersection of the "I" and the "Me," that reflects the collective social other's view of that individual.

Human agents are energized to act, but are not fully free to act outside of the discursive social frameworks that serve as the medium for their interaction and expression. Life is a series of interactive experiences of the physical world, and of the socially meaningful world of others, mediated by the social and institutional forms that humans have pre-constituted.

Death is a socially meaningful transition point in which individual human agencies cease to contribute to the ongoing reproduction of the existing social order that will continue to be reproduced by those still living.

Reality is the concreteness of the physical world, mediated by the social, and the socially constructed world of meaning that humans continuously create and reproduce, sometimes as closely replicated forms of that which already exists, sometimes as variations and transformation of that emergent reality.

Knowledge is the accumulation of concepts, theories, and research applications about the physical and social worlds at a variety of levels, from formal and organized down to informal and spontaneous; from academically organized, objective knowledge to experiential, subjective knowledge. In its organized form, what counts as knowledge and how it relates to the worlds that produce it, varies by historical era and stage of societal development. In the present era, organized knowledge is divided into disciplinary fields and subdisciplinary specialties, gathered by different methods, depending upon the discipline. In contrast, interdisciplinary “integrative” sociologists of deviance avoid the disciplinary division by applying methods to integrate knowledge across disciplines to produce a unity of holistic knowledge deemed to provide a more comprehensive understanding of the phenomenon.

Truth is seen as an artifact of the process and methods used to gather data and, in the radical social constructionist interpretation, is a variety of truth claims, no more, no less. From this perspective there is no underlying reality than the different interpretations of what is perceived as the constituted reality.

Perception comprises the ways that ongoing constituted reality is seen and acted toward as though it were real, so contributing to its ongoing constitution.

Time is the relationship in space through which social reality is recurrently constituted.

Consciousness is self-awareness and social awareness of our role as human agents in the ongoing production of what appears to be real.

Rationality/reason is a particular form of thinking about the world, born of a historical era associated with the Enlightenment, that is used to discriminate between other ways of thinking that are deemed irrational or unreasoned, in a similar way that disciplines are used to police what counts as acceptable and unacceptable knowledge to the academy.

Mystery is the state in which we suspend our conviction for the subject/topic at hand, that is, we question that we know or can know how or why events, processes, or outcomes happen,

assuming as we do, that such knowledge is possible or meaningful, other than the meaning that we attribute to it.

Finally, an additional critical issue facing sociology of deviance and social control is how the divisions between knowledge from science and religion can be transcended to produce a more holistic understanding of social phenomenon, without excluding knowledge on the basis that it is outside our present realm of disciplinary valued knowledge. The attempt to produce a common ground of knowledge, which does not marginalize some knowledge in favor of other knowledge, is a major challenge because it applies the sociology of deviance and social control to the structure of normal knowledge and the ways we seek to control deviant knowledge. At best, it takes a conscious reflexive stance toward its own field of knowledge production.

Cross-References

- [Constructivism \(Philosophy of Mind\)](#)
- [Criminology](#)
- [Evil, Problem of](#)
- [Meaning, The Concept of](#)
- [Phenomenology](#)

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Deviant Behavior

- [Deviance and Social Control, Sociology of](#)

Deviants

- [Deviance and Social Control, Sociology of](#)

Dhamma/Dharma

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Dhamma (Pāli) or *Dharma* (Sanskrit) in singular and generally denotes the Teaching of the Buddha, the truth or natural law he discovered, used for liberation, and taught.

Dhammā or *dharmā* in plural – according to context – usually point to phenomena, things, experiences, factors of existence, conditions, realities.

The conditioned phenomena (*saṅkhata dhammā*) have three characteristics:

1. Impermanence (*anicca*): They are impermanent and transitory phenomena arising and immediately vanishing totally again.
2. Suffering (*dukkha*): Through their transience, instability and liability to suffering, they all have the nature of *dukkha*, that is, they are unsatisfactory, deficient, or insufficient.
3. Non-self (*anatta*): They are void of an “I” or any permanent entity which could be called I, ego, self, or soul. The third characteristic applies to *Nibbāna*, the unconditioned *dhamma*, too.

Dhammā are ultimate realities (*paramattha dhammā*), the qualities of which are always the same, never change, while the *dhammā* themselves exist only momentarily. These realities, physical or mental, are exactly what one can experience directly with one of the six senses (including the mind). The observed object as well as the observing mind (subject) is transient and egoless. Only void phenomena happen and void processes run.

The *dhammā* are taught in greatest detail in the *Abhidhamma*, and they can be experienced, penetrated, and intuitively known by insight meditation (*vipassanā*), which has the power to transform and liberate the mind.

Dharma/Dhamma Psychology

- [Psychology in Buddhism](#)

Diagnostic Neuroradiology

- [Neuroradiology](#)

Dialectic

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Essential to the Western philosophical tradition, but not absent from Eastern philosophies, the dialectical method was founded by Plato and referred to philosophical implications of dialogue. Critical Theory deploys the term in its modern sense. These are basically the Hegelian view which, as Hegel himself has put it, declares that the purpose of dialectics is “to study things in their own being and movement and thus to demonstrate the finitude of the partial categories of understanding,” and the Marxist view.

For Marx, dialectics is the framework for development and home for the diagnosis of capitalist contradictions. What critical theorists do is to correct and to suggest different paths and philosophical uses of the term. Questioning traditional dialectics is precisely a major issue for them. In general terms, dialectics entail huge attention to contradictions, tensions, and interrelations between different aspects of materiality, nature, society, and the process of thinking itself.

Dialectic Logic

► [Logic in Buddhism](#)

Digital Electronics

► [Electronic Circuits in Computers](#)

Dioptrics

► [Optics in Islam](#)

Direct Perception

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The claim that perceiving is a process of keeping “in touch with” properties of the environment without the mediation of non-perceiving processes, such as memory. Experience of the environment is immediate, rather than being grounded in a mental construction existing apart from the environment. Things are experienced, rather having an experience of things. It

stands in contrast to the dualistic, post-Cartesian view that perception is always mediated (enriched) by stored mental representations either built up through prior experiences or in place innately.

Discernment

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Discernment refers to the quality of being able to comprehend what may be obscure. In the context of religious coping, it is a practice involving meditation, self-reflection, and consultation with others through which individuals seek to determine the Divine intention for the individual in a particular, usually stressful, situation. It involves trying to discern what the correct course of action is, as well as what personal characteristics individuals need to work on in order to apply the correct course of action and to remove barriers in their relationship with the Divine.

Discipline

► [Mathematics and Religion](#)

Discourse Analysis

► [Conversation Analysis](#)

Discursive Psychology

► [Conversation Analysis](#)

Diversity

► Pluralism (Religious)

Divine Action

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Related Terms

Christ event; Conservation; Creation; Divine government; General divine action; Miracle; Providence; Purpose; Special divine action

Description

The notion of divine action (DA) is central to theistic belief, especially to the Christian tradition, which will be the focus of this entry. The God of both Testaments is continually acting in the world to further His salvific purposes. In the primitive Church, the view of an idle God was considered a form of atheism. In contrast, the modern age has strongly attacked the idea of DA. Together with a fundamental theological reticence about the notion of an acting God and its anthropomorphic connotations, two main reasons for such a critical stance are the problem of evil and the claim that DA conflicts with the success of scientific explanations (see Tracy 1994, 1–4). In order to assess the pertinence of these objections we need to recall some important distinctions.

First of all, in spite of being semantically close, DA and providence are not synonyms. The concept of providence exceeds the concept of DA in claiming a certain degree of divine foreknowledge and planning. DA is usually differentiated into general or ordinary divine action (GDA) and special or particular divine action (SDA). GDAs are “actions of God that

pertain to the whole of creation universally and simultaneously,” while SDAs “pertain to a particular time and place in creation as distinct from another” (Saunders 2002, 21). GDA has to do with what Christian tradition calls creation and conservation of the world, provided conservation is not reduced to sustaining creatures in being, but includes habilitating them to exert their natural powers as well. SDA, on the other hand, relates to the traditional concept of divine government of the world, and its particularity can be either a result of subjective interpretation or an objective feature of that action. In the latter instance, the risk of conflict with scientific explanations becomes greatest (see Gwynne 1996, 119–226).

Objective SDA can be conceived both functionally and causally. In the first case, the event which is labeled as SDA differs from other events only by its special role in fulfilling God’s purposes, while in the second case particularity is due to a different causal history which does not result alone from the laws and processes of nature, that is, to the fact that God acts directly within world’s history to create the conditions for the occurrence of that particular event. (Functional and causal objective SDAs are almost equivalent to indirect and direct objective SDA, respectively.) We still have to make one more distinction, namely, between interventionist and noninterventionist objective SDA. Interventionist SDA implies disruption of the laws and processes of nature, that is, the classical concept of miracle. Noninterventionist SDA upholds the integrity of natural laws and processes, either taking place through them or, if they are supposed to be necessary but not sufficient causes of what is happening, complementing them in some way.

Given these distinctions, we are now prepared to briefly review the most important current types of theories of DA. A privileged site for assessing theoretical efforts to conceptualize DA is the six volumes of the project “Scientific Perspectives on Divine Action,” jointly run by the Vatican Observatory and the Center for Theology and the Natural Sciences (Berkeley, USA) from 1990 to 2008 (see Russell et al. 1993–2008).

The mainline participants in it underscore the relevance of SDA for a proper understanding of the Christian God. This is, however, a disputed thesis, as several theological positions exist (e.g., that of M. Wiles and G. Kaufman) that argue for the suitability of subsuming SDA within GDA. According to this, God relates to the world and history as a whole, not to particular situations. This cannot be equated with deism, since it affirms a continuous relation, not restricted to the temporal beginning of the world. Such a proposal must be seen as a response to the challenges that modern reason poses to the concept of DA: to do without SDA is an attempt to respect the alleged self-sufficiency of naturalistic explanations and exempt God from responsibility for evil.

The VO/CTNS project highlights two features of SDA. To do justice both to the Christian religious experience and to the integrity of natural sciences, it must be objective and noninterventionist. Let us look at what is thereby excluded. Subjective SDA is espoused by theological schools influenced by Bultmann's existential and demythologizing thought, but also by non-realist theologians such as D. Cupitt. Interventionist theologians are those who advocate a Humean concept of miracle, affirming that God may occasionally override the laws of nature to obtain particular aims. This position exacerbates the theological problem of suffering, as it presents a somewhat arbitrary God who corrects Himself. One of its foremost proponents is V. White. There are other ways of understanding miracles which are not interventionist; for example, assuming that the laws of science do not offer an exhaustive account of nature and conceiving miracles as law-transcending, instead of law-violating events.

When it comes to a more precise definition of noninterventionist objective SDA, there are two main approaches: one that stresses the role of metaphysics and the other that opts for direct dialogue with the natural sciences. Metaphysics is paramount both for neo-thomistic Catholic theology (e.g., W. Stoeger and D. Edwards) and process theology (e.g., I. Barbour and J. Haught). Neo-thomists build upon a basic distinction between God as the primary cause of all events

and creatural processes and beings as secondary causes through which God achieves His purposes. There is, therefore, cooperation between God and all actions of finite creatures. Process theologians admit SDA in all events as well, but do not underline God's transcendence as distinctly as neo-thomists do. Every actual occasion is influenced by God's "subjective lure," but also by efficient causality from the past and by the innate creativity of the occasion itself. Here we have an instance of direct SDA, while the neo-thomistic view subscribes to indirect SDA. But both positions are compatible with a causal order wholly regulated by natural laws (not all of which are known or even knowable by science); in other words, they do not need gaps in the causal order.

There are three main ways of approaching SDA in dialogue with concrete scientific theories. The first one, advocated by A. Peacocke and partly by Ph. Clayton, takes theories of complexity and emergence as its starting point. Upper levels of nature influence lower levels insofar as they impose boundary conditions on them. God is pantheistically conceived of as the whole which envelops the world, that is, as the world's environment, and exerts constraints on the behavior of its parts. This whole-part causation is also compatible with a deterministic view of reality. The other two strategies employ, on the contrary, particular gaps in the causal order and assume that noninterventionist objective SDA is only possible if reality is truly indeterministic. J. Polkinghorne, regarding chaos theory not only as epistemologically, but also ontologically indeterministic, makes use of some of its mathematical features to propose that God could guide the course of nature through input of information instead of energy. Finally, R.J. Russell, N. Murphy, Th. Tracy, and G. Ellis explore the possibility of locating SDA at the quantum level, concretely at the so-called collapse of the wave function, availing themselves of the stochastic character of the quantum world, which they construe indeterministically in the sense of the Copenhagen interpretation. In a nutshell: Quantum events are always underdetermined, and God resolves such an underdetermination, either in all or only in certain instances.

All these proposals have originated a fascinating debate, starting with the questioning of the notion of divine action itself. W. Wildman and W. Drees, for example, favor the so-called ground-of-being theologies, which try to do without this concept. Anyway, two crucial issues that remain open are of philosophical nature, namely, how to develop a broad enough concept of causation and elucidate the character of natural laws, whether they are descriptive or regulative. Furthermore, to guarantee DA not being located in only one level of reality is a permanent challenge. This requires, among other things, that DA in the providential guide of creation be adequately related to DA in individual human life and the history of salvation. Divine and human actions have, moreover, important structural analogies (for these questions regarding DA and human freedom, see Tracy 1994, 77–145). Another significant theological issue concerns the distinction between GDA and SDA itself. They cannot be separated from each other. We tend to see SDA as coming on top of GDA, but it is perfectly possible to conceive GDA as being always accomplished through SDAs. *Creatio ex nihilo* alone cannot be the template of all DAs; as a matter of fact, God's action in the Christ event must serve as the guiding criterion (see Edwards 2010, 25–33).

Life, death, and resurrection of Jesus are, from a Christian perspective, the most decisive of God's acts for us. That is where we get a glimpse of the real nature of the God who acts, where we learn about His unconditional love and unswerving fidelity to us. The image of a God who respects the integrity of His creation and is neither interventionist nor arbitrary removes many misunderstandings about suffering, the experience of a God who always stays by our side and nourishes the hope that evil will one day definitively be overcome (Bernhardt 1999, 462–466; Edwards 2010, 15–33, 143–150).

In any case, we can never intend to determine the “causal joint” between God and the world, to spell out how God acts; that is something we cannot know. Any theology of DA should recognize this fact and remain humble (Edwards 2010, 63).

Cross-References

- [Creationism](#)
- [Deism](#)
- [Determinism and Indeterminism](#)
- [Evil, Problem of](#)
- [Free Will](#)
- [God of the Gaps](#)
- [Naturalism, Ontological and Methodological](#)
- [Panentheism](#)
- [Process Theology](#)
- [Theism, Classical](#)
- [Theistic Naturalism](#)

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Divine Creativity

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Related Terms

[Creatio continua](#); [Creatio ex nihilo](#); [God as
semper Creator](#)

By all accounts, the starting point for a Christian doctrine of creation is in the Hebrew Scriptures, with the principal focus on the Genesis account. Although these verses are open to multiple interpretations, their articulation produced a twofold conviction: First, the universe had a temporal beginning, and second, in the beginning, God created all that is *ex nihilo*, (out of nothing). Over time, the doctrine of ► *creatio ex nihilo* came to represent both a theological and a metaphysical principle. Theologically, the doctrine of ► *creatio ex nihilo* preserved the unique eternity and sovereignty of God. Metaphysically, it ruled out the possibility that matter was a fundamental, primary, and eternal principle. Nonetheless, the tendency to identify the broader notion of creation solely with the singular divine act of ► *creatio ex nihilo* has, according to theologian William Carroll, resulted in a “fundamental confusion...about what creation is.” Focusing on the metaphysical and theological concepts, rather than on the particular act, the concept of creation “affirms that all that is, in whatever way or ways it is, depends upon God as cause” (Carroll 2010).

Scientist-theologian Arthur Peacocke echoed this understanding of creation as a relation of ontological dependence and cosmic contingency and asserted that “the postulate of God as Creator of all-that-is...is a postulate about a perennial or ‘eternal’...relation between God and the world”(Peacocke 1986, 95). In this relation, God is seen, not only as original creator of the cosmos, but also as its faithful sustainer and preserver. To model this perennial relation, Peacocke utilized a *Trinitarian panentheistic paradigm*. Within this model, God as the ground of cosmic being subsumes, permeates, and yet exceeds the being of the universe, which is dependent and contingent on the creative Being of God.

In contrast to the stasis implied in the notion of God’s sustaining and preserving the cosmos, however, evolutionary cosmology and biology continued to discover evidence of dynamism in the cosmos. Research indicated that cosmic creativity has been ongoing since the origin of the universe and has exercised such creativity in and through the very stuff of the material world.

Because of these scientific understandings, the theological notion of ► *creatio ex nihilo* as traditionally interpreted represented an inadequate conception of the creative relation of God to the cosmos. Although ► *creatio ex nihilo* could preserve the transcendent differentiation of God from the universe and the dependence and contingency of the universe on God, it could not accommodate the scientific understanding of the ongoing creativity of the cosmos in new and emergent forms. Hence, static conceptions of God’s differentiated relation to the cosmos, such as those of origination and preservation, had to be augmented and nuanced by a notion of dynamic interaction between God and world. Buttressed by the findings of the natural and physical sciences, many theologians have acknowledged that *creatio ex nihilo* must be supplemented in order to attribute this continuous creativity to God as Creator.

Theologically, the dynamic creativity between God as Creator and the cosmos as creation has been termed ► *creatio continua*. It arises from the understanding that the stuff of the world has an inbuilt creativity that makes the process of creation ongoing and incessant. Moreover, if God is understood as Creator and if the process of creation has been ongoing throughout cosmic history, into the present and the cosmic future, then the ceaseless creative processes revealed by the physical and biological sciences must be interpreted as the creative activity of God’s very Self exercised “in, with, and under the very processes of the natural world from the ‘hot, big, bang’ to humanity” (Peacocke 1986, 95–6). God is neither conceived as a separate or wholly transcendent creator dwelling in serene detachment from the cosmos, nor as a “God-of-the-gaps” who creates in sporadic or interventionist ways. God is Continuous Creator, directly involved in the continuing processes of the cosmos in creative relation.

In the Trinitarian panentheistic paradigm, the universe is conceived as an open system in receptive relation with the very Being of God, which both surrounds and permeates the cosmos. Creativity in such a paradigm can be conceived either through top-down or whole-to-part causality

or through bottom-up or part-to-whole causality. As applied to the God-world relationship, both have been appropriated as means by which one could conceive of God's interaction with the world without violating the laws and regularities operative in the cosmos, that is, in a way that would not be deemed interventionist.

In the panentheistic model of whole-part or top-down causality, God is the "circumambient Reality in which the world persists and exists" (Peacocke 1993, 158). The world-as-a-whole is thus conceived as within God, who is present to the world both in its totality and to its component parts. In this model, God is seen as always and everywhere freely and autonomously interacting with the world through an input of information. God communicates Godself and God's purposes to the world-as-a-whole through an all-embracing and all-pervasive presence that is essentially self-communicating. This self-communication trickles through the levels of its parts to those capable of receiving this communication.

Observations of self-organization in open systems continuously undergoing change and growth in a state of disequilibrium give evidence that the "whole" external environment in which a system exists has a relation of effect on its component parts. Philosopher Donald Campbell (1974) applied the interpretation of downward causation to the process of natural selection in the formation of jaw structures of worker termites and ants. In his study of how higher cultural values downwardly influence immediate humanitarian traits, psychologist Roger Sperry (1983) demonstrated that whole-part influence also applied to the realm of the behavioral and social sciences.

Conversely, in the panentheistic model of bottom-up or part-to-whole causality, "the stuff and processes of the world as we know it are...an expression of God in his modality as Creator" (Peacocke 1989, 35). Arising from the understanding that the stuff of the world has an inbuilt creativity, part-to-whole causality suggests that if God is understood as Creator and if the process of creation has been ongoing throughout cosmic history, then the ceaseless creative processes revealed by the physical and biological sciences

must be interpreted as the creative activity of God's very Self. As continuous and immanent Creator in relation to the cosmos, exercising divine creativity "in, with, and under the very processes of the natural world from the 'hot, big, bang' to humanity" (Peacocke 1986, 95–6), the creative dynamism of the cosmos is *itself* God's creative action; the creative processes of the universe are manifestations of the Divine as continuous Creator. This perspective understands God as *semper Creator*, "creating now and continuously in and through the inherent, inbuilt creativity of the natural order – a creativity that is itself God in the process of creating" (Peacocke 1986, 95).

Biochemists such as Ilya Prigogine and Gregoire Nicolis have demonstrated the dynamics of part-to-whole causality. They identified fluctuations within certain living systems and organisms which produce changes in the structure of the organism or system. In their studies, they found a class of systems with what they called "dissipative structures." These structures enable organisms or systems to maintain themselves in a state of order, although far from equilibrium. They found that when fluctuations in a system are amplified to a particular frequency, the entire system undergoes structural change. It becomes a newly ordered state with the capacity to take in energy and matter from the outside to maintain its novel form. They reasoned that a similar process of order-through-fluctuation made the conditions for the initial emergence of living organisms, as well as for their ongoing development, highly probable (Prigogine and Nicolis 1971).

In this perspective of divine creativity, God as Creator accords cosmic processes the same value and reverence that God accords to human choices, with God's activity as Creator as ongoing in, with, and under the entire cosmic process. These cosmic processes include the operation of law, the indeterminacy of chance, the unpredictability of events at the quantum level, the continuity of life forms, and the emergence of novelty, just to name a few. This convergence of cosmic dynamics, what John Polkinghorne calls the elements of "free process"

(Polkinghorne 1989, 77), which he sees as akin to human free will, constitute “the means by which the universe explores its potentialities, human-kind exercises its will, and God interacts with...creation” (Polkinghorne 1989, 78). Because of the divine choice to create the cosmos in this way – in autonomy and freedom, through chance within law, and indeterminate in principle – the continuing creation of the cosmos and its creatures results in a coincidence of opposites. Free process and free will not only occasion the emergence of new life forms, but also the inevitably costly process of diminishment and death. They produce not only the kaleidoscopic fecundity that delights both creatures and Creator, but also the calamitous events of pain and suffering. They create not only serendipitous moments of joy and well-being, but also events that cause the destruction and extinction of cosmic and human life. Moreover, evolutionary theory contends that it was, in fact, the free process of self-creativity through chance and law in the cosmos that resulted in the emergence of free persons, humans who “are not the mere ‘plaything of the gods,’ or of God,” but who are sharers in the “costly process of bringing forth the new” (Peacocke 2001, 37).

Cross-References

- [Creator – Co-creator](#)
- [Divine Action](#)
- [Evolutionary Theology](#)
- [God of the Gaps](#)
- [Ontology](#)
- [Panentheism](#)
- [Quantum Theory](#)
- [Relational Ontology](#)
- [Transcendence and Immanence](#)

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Divine Government

- [Divine Action](#)

Divine Motivation Theory

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Related Terms

[DMT](#)

Description

Divine Motivation Theory (DMT) is a form of theologically based moral theory proposed by Linda Zagzebski. The theory defines all moral properties of persons, acts, and outcomes of acts in terms of God’s motives. God’s motives are states such as love and compassion, states that

are motivating, and that are emotions or similar to emotions. She proposes that these states constitute the metaphysical and conceptual basis for moral value. Given traditional assumptions about the nature of God, the theory combines moral realism with divine noncognitivism.

According to DMT, persons and their qualities are good in so far as they are like God or imitate God in the relevant respect. Human motives are good in so far as they are like the divine motives as those motives would be expressed in finite and embodied beings. Human virtues are those traits that imitate God's virtues as they would be expressed by human beings in human circumstances. Outcomes get their moral value by their relation to good and bad motivations. For example, a state of affairs is a merciful one or a compassionate one or a just one because the divine motives that are constituents of mercy, compassion, and justice respectively aim at bringing them about. Acts get their moral value from the acts that would, would not, or might be done by a being who imitates God in the relevant circumstances. God's own goodness and the rightness of God's own acts follow immediately from the theory since God himself is the supreme standard of all moral value.

This theory is a special case of a general form of virtue theory that Zagzebski calls "motivation-based virtue theory." If we assume that what makes an ethical theory a virtue theory is that it gives virtue explanatory centrality, such a theory must explain how an understanding of the nature of virtue illuminates other important concepts of moral evaluation, such as the concepts of a right act, an obligatory act, a good consequence, a good motive, and human well-being. In virtue theories inspired by Aristotle, the concept of a virtue is more basic than concepts of act evaluation, but not more basic than the concept of *eudaimonia*, or well-being. In theories of this type, a virtue is either a quality that reliably leads to *eudaimonia*, or it is a quality that is partially constitutive of a life of *eudaimonia*. In contrast, Zagzebski's motivation-based virtue theory makes the foundation of the theory exemplars of goodness – persons whose exemplification of goodness is identified without dependence upon a judgment of the person's well-being or

any prior evaluative judgment. In particular, she proposes that these persons are identified through the emotion of admiration. When we investigate virtuous exemplars, we see that their psychologically most basic good-making feature is a good motivational structure: Emotions that fit their intentional objects and which can motivate the agent to act in certain ways for certain ends. A virtue is a good motive disposition with reliable success in reaching the end of the virtuous motive. Moral properties of acts, intentions, and consequences are defined in terms of good motives.

Divine Motivation Theory gives a theistic foundation to motivation-based virtue theory since it adds to the structure just described the claim that God is the supreme exemplar. The theory permits the identification of human exemplars in the same way they would be identified without the theological foundation, but it maintains that human exemplars are exemplary because of their relation to a supremely good God. The theory also has a plausible Christian version since traditional Christian doctrine holds that Jesus Christ is both God and the most perfect human exemplar. There can be versions of the theory for other religions as well since many religions recognize exemplars, for example, the Buddhist arahant, the Jewish tzaddik, the Confucian sage, and of course, there can be secular versions.

The way DMT defines moral rightness and wrongness is structurally parallel to a form of Divine Command theory, with the important difference that DMT identifies the property of rightness with divine motivations like love and compassion rather than with the divine will or divine commands. Zagzebski argues that this means that famous objections to Divine Command Theory (DCT) do not arise for DMT. One problem for DCT is that if morality is grounded in God's commands, and if God can command anything, then it looks as if God could command brutalizing the innocent, in which case brutalizing the innocent would have been morally right, a highly implausible consequence. In contrast, it is impossible that brutalizing the innocent is right on DMT as long as being loving is one of God's

essential motives. The right thing for humans to do is to act on motives that imitate the divine motives. Brutalizing the innocent cannot imitate the divine motives as long as (i) it is impossible for such an act to be an expression of a motive that is like the motives of God, and (ii) it is impossible for God to have different motives. Assumption (ii) follows from the assumption that God's motives are part of his nature.

DMT does not face the famous Euthyphro problem either. The problem for DCT is that God's commands are either based on a reason, in which case the reason is the ground of moral rightness, not God's commands, or else God's commands are arbitrary. This problem does not arise in DMT. Although a command needs a reason, a motive *is* a reason. The theory says that the right thing to do is to acquire motives like God's motives. These motives provide the agent with both a reason for an act and the impetus to perform the act. DCT is appealing because commands are directed toward specific acts, whereas motives are much more general. On the other hand, versions of DCT that interpret God as giving very specific commands to agents are not very plausible.

Divine Motivation Theory has another theoretical advantage over DCT. DCT is most naturally interpreted as an ethics of law, a divine deontological theory, wherein the content of the law is promulgated by divine commands. But God's own goodness and the rightness of God's own acts are not connected to divine commands since God does not give commands to himself. In contrast, DMT makes the features of the divine nature in virtue of which God is morally good in the foundation for the moral goodness of those same features in creatures. Both divine and human goodness are explained in terms of good motives, and the goodness of human motives is derived from the goodness of the divine motives. DMT, therefore, provides a unitary theory of evaluative properties, divine as well as human.

Divine Motivation Theory has theological advantages. One is that it has the capability of resolving putative problems of inconsistency among the divine attributes. For instance, there is a set of puzzles arising from the idea that God is

perfectly good, where perfect goodness entails that God cannot be evil or do anything morally wrong. One problem is that the inability to do wrong seems to imply that God is not significantly free, so perfect moral goodness appears to be incompatible with divine freedom. For the same reason, perfect goodness appears to be incompatible with omnipotence. These puzzles are resolved if the goodness of all of God's attributes derives from God's motives. Perfectly good power is the kind of power God is motivated to have; perfect freedom is the kind of freedom God is motivated to have; and so on. Perfection of all kinds derives from the motives of a perfectly good God, not by reference to an independent standard.

DMT also leads to a reformulation of the logical problem of evil. What happens in the world is *ipso facto* something that is compatible with the divine motives, and cannot be deemed evil, all things considered. The real problem, however, is that many things occur in our world that seem to be incompatible with the motives of a loving God, leaving aside the metaphysical issue of the ground of value. That means that the problem of evil is not actually about the concepts of good and evil and the apparent inconsistency between a good God and the existence of evil. It is about the apparent conflict between the motives of the deity that make him worthy of worship (love, concern, etc.) and the motives apparently exhibited in a suffering world.

Divine Motivation Theory makes God the ultimate standard of goodness as exemplar rather than as lawgiver or judge. Since it gives a central place to virtue, it could be called a divine virtue theory, and since it maintains that the basic component of a virtue is an emotion or an emotion-like state, it focuses attention on the qualities of God that lead to a personal relationship with the divine.

Cross-References

- [Divine Action](#)
- [Emotion](#)
- [Ethics](#)
- [Imago Dei](#)

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DMT

- [Divine Motivation Theory](#)

Dogmatic Theology

- [Constructive Theology](#)

Drama

- [Theater](#)

Dualism

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Related Terms

[Mind-body](#); [Mind-body problem](#); [Mind-body relationship](#)

Dualism is a philosophical term with a long history. It is often associated with such major philosophers as Plato and, in the seventeenth century, Descartes. It is still a live philosophical position and subject to much dispute. Although some would see it as “antiscientific,” others would claim that our belief in dualism is itself deeply rooted in human nature. Basically, it holds

that there are two different ontological categories, or levels of existence. In this, it is opposed to monistic theories which assert that there is only one kind of entity. As such, although it is not an intrinsically religious position, it is one required by any religion which looks to a transcendental, or supernatural, reality, alongside the world of ordinary sense experience.

“► [Materialism](#)” would be an obvious example of a monistic theory, opposed to dualism, because it holds that only “matter” exists. Modern scientific difficulties in defining matter have led to the greater popularity of such terms as “► [physicalism](#)” and “► [naturalism](#),” both of which tend to tie what can exist to what can be within the grasp of science. Whether that means present-day science, future science, or even hypothetical science remains a difficulty. All, however, would agree that reality must be defined in scientific terms and that the idea of any reality which is in principle inaccessible to science must be discounted.

Defining reality, however, in terms of the capabilities of actual or possible science is to make the idea of reality very anthropocentric. A typical dualist view does not start with what we can know, but with the kinds of things that exist. Naturalists want to rule out anything “supernatural,” but the dichotomy between God, as Creator, and the created, physical world, would be a form of dualism. God’s reality would not be thought to be physical, or limited by the spatiotemporal framework in which science operates.

Other forms of dualism, however, have also been influential. They also normally distinguish between physical and some other form of reality. The best known is that between mind and body, or the self and the brain. It is alleged that our reality as persons is not constituted by our physical makeup. I am not my body. My body ages, but I, it may be thought, am the same person throughout all physical change, growth, and decay. A particular instance of this view would be the belief that death is not the end, that “I” can survive the dissolution of my body. Another instance is the experience of my own mental events and the strong feeling that they are not

the same as any bodily accompaniments, even of a neurophysiological kind. Pain is not just the firing of neurons, it will be maintained. It is a specific kind of sensation, and its felt quality can never be reduced to bodily events or forms of behavior. Not all unpleasant sensations are pains, and not all pains are unpleasant. (Trigg 1970) It may seem to follow that pain is defined by the way it subjectively feels. It may be associated with bodily and brain events of various kinds, but they must be understood as the cause of pain and not be identified with it. This means, however, that the true nature of pain eludes the grasp of science. Similar arguments are mounted in favor of other “qualia,” such as the way red looks. It is a mental event which cannot be defined in terms of anything else.

All this is to raise the venerable problem of consciousness, with which scientists make little headway. Attempts to explain it in scientific terms have not just proved difficult. There are allegations that they have to be self-refuting. Science is always a human practice, engaged in by scientists who use conscious processes of reasoning. The idea of science explaining consciousness inevitably implies that it is able to explain itself. If science can explain the working of consciousness, it can also explain why scientists see one thing as true and another false. Yet it can be argued that science cannot itself distinguish between good and bad reasons for belief. It can only explain why those beliefs were caused in the first place.

Dualism certainly challenges the naturalistic, and even deterministic, assumptions which can easily become part of the working methodology of science. It is itself a metaphysical thesis about the nature of reality and may well be seen by many to restrict the scope of science, perhaps in an illegitimate way. Dan Dennett, a leading contemporary philosopher and prominent atheist, accepts (Dennett 1991) that if “dualism” is the best we can do, then we cannot understand “human consciousness.” He had just remarked (Dennett 1991) that “given the way dualism wallows in mystery, accepting dualism is giving up.” In other words, dualism is incompatible with

a scientific stance. Yet that is itself to assume the metaphysical view that only what is within the reach of science can exist.

The word “mystery” is easily invoked in connection with dualism. Whenever the reality of two entities is specified, there is going to be a problem as to how they interact. This is a notorious problem for dualism, dating back to the work of Descartes, although insisting that the connection is understood in physical terms already begs the question against dualism. It is to assume that the only possible causal connections are those understood by science. One reply is that we all, each day, have personal experience of the way mental events control, or influence, our bodily processes and behavior. One attraction of the doctrine is that it allows interaction between mind and body. In other words, there is causation both ways, both upward, from the body to the mind, as when we suffer injury and suffer pain, and downward, when our conscious desires and decisions affect what we do. The very idea of “psychosomatic” illness points to ways in which our conscious states can even affect our health.

Modern cognitive science complicates the issue by drawing attention to the fact that we do naturally, as humans, tend to think in dualist terms, at least about the relation of the mind and body. As the anthropologist Emma Cohen points out (Cohen 2007), recent research in the area suggests we are “natural Cartesians.” In other words, not only do we think our minds – our thoughts, feelings, and sensations – are different from bodily processes. We find it easy to think of the separation of the mind and the body, as Descartes did. She shows how even the idea of minds migrating between bodies is easy for us to grasp. Most significantly, the strong belief in human societies of all kinds that a person survives the dissolution of the body seems natural for humans.

Philosophers such as Dennett tend to deride such “► folk psychology.” They may accept the reality, and ubiquity, of our common sense beliefs, but consider that they must be supplanted by the findings of science. Yet seeing human beings in a neo-Darwinian context, continuous with other animals, does not itself resolve the

issue of mind-body dualism, as it is an open question how far animals may have mental experiences which are caused by physical events, but are not necessarily identical with them. They may see colors for example.

Dualism is a central issue in questions concerning the relation of science and religion. The nature of the human personality is of major importance for any religious understanding, as is the question of the nature of reality. Dualism maintains that the human self is more than its body, and not necessarily to be identified with it. It is the locus of our identity and often identified with the “soul.” Those who wish to follow some modern science in refusing to accept “mysteries,” such as the nature of consciousness, are adopting an antidualist metaphysics. Yet in ruling out any division between body and mind, more than this is being claimed. If the only reality can be physical, however defined, this brings us on a collision course with another form of dualism, that between God and world. The same antimetaphysical arguments which dispense with human consciousness as a separate entity must also hold against a belief in a God who is separate from the spatiotemporal world (Taliaferro 1994).

In other words, some form of dualism is essential to traditional theism and also underpins many other forms of religious views, invoking spirits, and nonmaterial influences. In some ways, the idea of an immaterial “self” is a mirror image of God. Indeed, as it is claimed by monotheists that humans were made in God’s image, that is perhaps not surprising. Whether dualism is hostile to a scientific outlook, or even underpins the possibility of scientific rationality, remains a vexed question (For more on the brain and the mind see Trigg 2002).

Cross-References

- [Consciousness, the Problem of](#)
- [Determinism and Indeterminism](#)
- [Naturalism, Ontological and Methodological](#)
- [Nonreductive Physicalism](#)
- [Soul](#)

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Duḥkha (Sanskrit)

- [Dukkha](#)

Dukkha

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Related Terms

[Duḥkha \(Sanskrit\)](#); [Suffering](#); [Unsatisfactoriness](#)

Description

The predicament of *dukkha* and the way to freedom from it are the chief motivation of the Buddhist soteriological enterprise. According to a dictum found in the early Buddhist discourses, what the Buddha teaches is simply the nature of *dukkha* and its cessation (Trenckner and Chalmers 1888–1896, I 140). While the existence of *dukkha* as a motivation for adopting a spiritual life appears to have been a common concept in ancient Indian thought, the Buddhist approach to this problem stands out for conceptualizing the human predicament of *dukkha* in terminology reminiscent of medical analysis, namely, by way of the four noble truths

(► [Truths, Four Noble](#)). From the perspective of the dialogue between science and religions, this is significant, since in this way Buddhism presents its perhaps most central teaching deliberately couched in medical terms.

The term *dukkha* is often translated as “suffering.” This translation does not adequately capture the range of meaning of the term and even runs the risk of giving a misleading impression. Hence, the meaning of the term needs further examination.

According to a statement made in the early Buddhist texts, *dukkha* covers whatever is felt (Feer [1884–1898](#), II 53). If on following the standard translation one were to render *dukkha* in such a context as “suffering,” this would result in the proposal that all felt experience is simply suffering. Such a conclusion would directly conflict with a standard analysis of felt experience in early Buddhist discourse, according to which feelings can be pleasant, painful, and neutral. These three types of feelings are mutually exclusive in the sense that at the time one has one type of feeling, one does not experience the other (Carpenter and Rhys Davids [1890–1911](#), II 66). According to another discourse, the above dictum regarding *dukkha* covering all that is felt has the impermanence of feelings in mind (Feer [1884–1898](#), IV 216). The changing nature of feelings, however, need not be experienced as “suffering.” While a change of pleasant feeling to its opposite could indeed result in suffering, a change of painful feelings to its opposite would rather be experienced as a relief (Trenckner and Chalmers [1888–1896](#), I 303).

This goes to show that all feelings are not necessarily “suffering”, nor is the changing nature of feeling invariably something that results in “suffering.” Yet, no type of feeling can provide lasting satisfaction, precisely because the nature of feelings is to be impermanent. Hence, a better way of translating *dukkha* would be as “unsatisfactory,” although perhaps the best solution is just to keep the original form of the term, thereby allowing for a sense that ranges from outright pain and

suffering to the unsatisfactoriness of pleasure, dependent on the context.

The problem with the translation “suffering” is not only that it does not capture the full compass of meaning of the term *dukkha*. This rendering also tends to give the misleading impression that the Buddhist teachings are predominantly concerned with the negative sides of existence and that Buddhism is an instance of pessimistic thought in ancient India.

This does not appear to be the case, however, since the importance of joy and happiness is repeatedly emphasized in the teachings of early Buddhism. A collection of Buddhist poetry has a whole chapter dedicated to the theme of happiness (von Hinüber and Norman [1994](#), Stanza 197–208), and joy is reckoned one of the so-called factors of awakening, thus being a necessary requisite for progress toward liberation.

This much can also be seen in the case of the four noble truths, the central mode of exposition on the significance of *dukkha*. The first noble truth defines *dukkha* and the second noble truth traces its arising to craving; thus, these two presentations are concerned with negative aspects. But then the third noble truth takes up the positive value of the cessation of *dukkha*, and the fourth noble truth delineates the equally positive notion of the practical path that leads to freedom from *dukkha*. This thus gives an overall rather balanced impression, instead of reflecting an excessive concern with the depressing sides of existence.

The nature of *dukkha*, according to the first noble truth, covers physical events such as disease and death, as well as the mental displeasure that can arise from being unable to satisfy one’s desires. Thus, the range of meaning of *dukkha* extends from barely noticeable dissatisfaction to outright suffering as inherent features of human existence. Another presentation distinguishes between three chief aspects of *dukkha*: related to the experience of outright pain, related to the state of being subject to conditions, and related to the fact that things invariably change

(Carpenter and Rhys Davids 1890–1911, III 216). The actual manifestation of *dukkha* could then be overwhelming or just trifling; moreover, *dukkha* might disappear quickly or last for a long time (Morris and Hardy 1885–1900, III 416).

According to the first noble truth, manifestations of *dukkha* can be summed up under the heading of the five aggregates affected by clinging. These five aggregates are considered in early Buddhism as the chief constituents of an individual, comprising bodily form, feeling, perception, volitional reactions, and consciousness. Thus, *dukkha* can in the final count be traced back to clinging to various aspects of oneself.

In other words, the actual experience of *dukkha* requires personal involvement in what is taking place by way of clinging, attachment, and craving. Such clinging, attachment, and craving are in the end simply a manifestation of ignorance. This is reflected in another central Buddhist doctrine related to the topic of *dukkha*, namely, dependent arising. According to this doctrine, the arising of *dukkha* hearkens back through a series of conditional links to the presence of ignorance. In turn, with the cessation of ignorance, craving and clinging cease, and therewith the cessation of *dukkha* is accomplished (► [Dependent Arising](#)). A fully awakened one, who has eradicated ignorance, has gone beyond being affected by *dukkha*, as even the experience of physical pain will not cause him or her any mental distress.

Dukkha is one of the three characteristics of existence recognized in Buddhist thought, together with impermanence and the absence of a self. According to a standard teaching, because all conditioned things are impermanent, they cannot yield lasting satisfaction – they are *dukkha*. Since they are *dukkha*, however, it is not reasonable to identify them as a self (► [Anattā](#)). Thus, from the perspective of the development of liberating insight in Buddhism, *dukkha* forms the transition point from an appreciation of impermanence to insight into the absence of a self. With insight fully developed,

then, the cessation of *dukkha* through the attainment of liberation is attained and future rebirth is therewith transcended.

Cross-References

- [Happiness](#)
- [Mental Health](#)
- [Pain \(Suffering\)](#)
- [Reality in Buddhism](#)

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Dukkha: Suffering

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Dukkha (Pāli) or *duhkha* (Sanskrit), a key term and truth in Buddhism, is usually translated as suffering. According to the context, *dukkha* is either direct suffering, being liable to suffering, a bodily painful feeling, or unsatisfactoriness, deficiency, insufficiency.

The Buddha declared suffering in the first Noble Truth: “Birth is suffering, old age,

disease, death is suffering, to be united with unbeloved ones is suffering, to be dissociated from beloved ones is suffering, not to get what one wants is suffering, in short, the five aggregates of clinging are suffering.” (Dhammacakkappavattana-Sutta, Saṃyutta-Nikāya, S 56, 11) These types of suffering are evident, which all beings have to face; they are unavoidable. But the Buddha penetrated suffering and found its cause, which he taught in the second Noble Truth: Craving (*taṇhā*). The third Noble Truth declared the cessation of suffering by the complete end and liberation of craving. Finally, the fourth Noble Truth gives the practical way how to remove craving and be freed from suffering through following The Noble Eightfold Path.

Dukkha in the context of feeling (*vedanā*) denotes the bodily unpleasant or painful feeling. Altogether the Buddha taught five kinds of feelings, which should not be mixed up with emotions which are already reactions to the primary feelings or sensations. If only three feelings are mentioned, *dukkha* represents unpleasant bodily as well as mental feelings, that is, pain and unhappiness.

Dukkha is one of the three universal characteristics of existence. Here, and in the context of insight-meditation (*vipassanā*), *dukkha* is the unsatisfactory, imperfect, deficient, and insufficient quality of all formations or conditioned phenomena (*saṅkhāra*), and of all worldly experiences too. The intuitive insight into this characteristic leads to detachment, disenchantment, and turns the mind to the quest for *Nibbāna*, which alone does not have the quality of *dukkha*, but to the contrary, is highest bliss and true happiness. All phenomena have the intrinsic nature of *dukkha* according to the three types of *dukkha*:

1. *Dukkha-dukkha*: Some phenomena evidently are painful and suffering directly in themselves (such as headache, worry, anxiety, etc.).
2. *Vipārināma-dukkha*: All phenomena have the nature of “*anicca*” impermanence, so they

cannot satisfy permanently. Even happy feelings and desired emotions will change, dissolve, and cease. One cannot control them or make them permanent.

3. *Saṅkhāra-dukkha*: All phenomena are conditioned by some other phenomena, which themselves are impermanent and conditioned. A network of conditions has to work harmoniously together in order to produce one phenomenon as result. One has no power or cannot control the resulting phenomenon which arises and vanishes according to its own natural laws.

Penetrating to this truth of *dukkha* in insight meditation (*vipassanā*) for whatever conditioned object one’s mind grasps, as well as for the subject, one’s own mind, leads to disenchantment and finally to neither like nor dislike but equanimity (*upekkhā*) toward these conditioned objects, which is called *saṅkhār’upekkhā-nāṇa*, the knowledge of equanimity toward conditioned phenomena. This is the highest worldly insight a *vipassanā* meditator can achieve. After this, one is ready for the experience of *Nibbāna*, the unconditioned, which has none of the above-mentioned attributes of *dukkha*.

The contemplation of suffering (*dukkhānupassanā*) is one of the three main methods in insight meditation. It discards desire through craving. *Nibbāna* first appears through the desireless aspect and the practice leads to desireless emancipation (*appaṇihitā-vimokkha*) with concentration as gateway to liberation.

Dying

► Death

Dynamic Systems

► Ecological Psychology

Dynamical System

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A means of describing how one state develops into another state over the course of time. In engineering and mathematics, a dynamical system is a *deterministic* process in which a

function's value changes over time according to a rule that is defined in terms of the function's current value. Simple nonlinear dynamical systems and even piecewise linear systems can exhibit a completely unpredictable behavior, which might seem to be random. This unpredictable behavior has been called *chaos*.

Cross-References

► [Complex Systems](#)

East Orthodox Theology

► Orthodox Theology

Eastern Orthodox Christianity and the Sciences

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Related Terms

Orthodox Christians

The Eastern Orthodox strand of Christian theology is strongly traditionalist, with the writings of the Fathers of the early centuries of the church – especially those of the Greek-speaking east – remaining the touchstone for theological authenticity. A major feature of this patristic background is an understanding of the created order that stresses the strong linkage between the concepts of creation and incarnation. In its patristic expression, this theological vision was inevitably expressed in terms of the scientific understanding of the late antique world, and this has proved problematical for some Orthodox Christians of the present day, for whom the secular thought of the last few centuries has sometimes seemed to be at odds with patristic

perspectives. However, the Fathers themselves – especially the Cappadocians – developed a sophisticated natural theology using the scientific insights of their time, and in principle a neo-patristic approach incorporating the sciences of our own time is seen as possible by many. Moreover, many of the best Orthodox theologians of the past century have, like Christos Yannaras (2004), explored issues of epistemology in a way that reflects the work of St. Gregory Palamas in the fourteenth century, and their insights arguably provide the basis for such a neo-patristic synthesis. If there is still a strong suspicion of modern science among some of those who see themselves as the Fathers' spiritual heirs, this suspicion is by no means universal.

Why, then, does this suspicion linger? Here part of the answer may lie in sociological factors. Many Orthodox lived until very recently in situations in which they were inevitably influenced by the need to react against the Marxist-Leninist version of atheism, with its supposed "scientific" basis, so that even after the downfall of that ideology in their countries some of them still tend, almost instinctively, to see science and atheism as having an intrinsic connection. In addition, at least some influential Orthodox in the West have developed a similar attitude for reasons that are susceptible to comparable analysis. Especially if reacting against the recent "liberalization" of many of the mainstream Western forms of Christianity, they too may tend to associate science with the ideologies of those they perceive to be the enemies or diluters of faith.

This suspicion of science among at least some Orthodox Christians should not, however, be equated with the attitude of “fundamentalist” Christians of the West. While the two groups are sometimes comparable in sociological terms, their theological views are often very different. For example, even though modern historical-critical study of scripture has had relatively little influence in Orthodox circles, scriptural exegesis in these circles is far from fundamentalist in the Western sense, in that it is strongly influenced by the way in which patristic authors often read the Old Testament scriptures using an allegorical rather than a literal mode of interpretation, and with a creative use of the science and philosophy of their time. This means, for example, that the creation accounts in Genesis are not usually seen by Orthodox Christians as expressing literal, “scientific” truths about the way in which the cosmos came into being. (Indeed, patristic writers such as St. Gregory of Nyssa quite explicitly set aside the literal meaning of these texts.) As a result of this patristic basis to their thought, it is not science and philosophy as such that are looked at with suspicion by some Orthodox Christians, but only what are perceived (rightly or wrongly) to be perverted forms of these disciplines. Neo-Darwinian insights in biology are, for example, still sometimes held to be incompatible with Orthodox faith, though advocates of these insights do seem to be becoming more numerous among upholders of that faith.

Given this complex background, it is hardly surprising that there is, as yet, no consensus about how to formulate a contemporary Orthodox response to the sciences in general and to neo-Darwinism in particular. Moreover, intellectual ferment in this area – characteristic of Western Christianity for several generations – has (with the notable exception of a number of theological appraisals of psychology) been effectively absent from Orthodox circles until relatively recently, and this again makes the wide spectrum of existing views within those circles more readily understandable.

At one end of the spectrum is the essentially antiscientific attitude of writers such as Seraphim Rose (2000) and Philip Sherrard (1992).

The former of these effectively defends a kind of fundamentalism in relation to the patristic literature. The latter – with major concerns about ecology and about the need for the revival of a “sacred cosmology” – fails to perceive any validity in the distinctions commonly made between technology and pure science and between science and scientism. For their supporters, anything in current Orthodox thinking which reflects the positive view of modern science that is characteristic of the mainstream of the Western dialogue between science and theology represents an unacceptable dilution of Orthodoxy.

At the other end of the spectrum lie writers such as Basarab Nicolescu and Christopher Knight. These, while insisting that Orthodox perspectives have an important role to play in the science-theology dialogue of the future, do not reject the Western dialogue of the last two or three generations, with its positive attitude to science and its view that scientific insights provide genuine insights into major theological themes. Nicolescu – who in his Romanian homeland has led the first major effort to develop a structured and widespread science-theology dialogue in a traditionally Orthodox country – has focused on essentially philosophical issues, taking bold and controversial strides to formulate a “transdisciplinary” approach that affects not only the science-theology dialogue but every area of human thought (Nicolescu 2002). Knight, in a rather different way, has focused on theological issues, arguing that one of the main resources that Orthodoxy can bring to the current dialogue is a “teleological-christological” understanding of created things, of a kind that he sees as a valid extrapolation from the thought of St. Maximus the Confessor. In an updated form that acknowledges current scientific insights, he argues, the traditional Orthodox understanding of the link between creation and incarnation can provide a new framework within which the legitimate questions enunciated by participants in the Western dialogue can be answered more satisfactorily than they have been when examined in a purely Western context (Knight 2007).

Between these extremes of the Orthodox spectrum lie writers who, while not rejecting science,

effectively deny the validity of the kind of dialogue between it and theology that has taken place among Western Christians over the last few generations. Among the exponents of this kind of position, few have direct experience of science or a deep understanding of it. A notable exception, however, is the cosmologist, Alexei Nesteruk, who perhaps presents the most scientifically informed argument of this intermediate kind. While affirming science as being a legitimate expression of the human spirit, he tends to bypass the questions that characterize the Western dialogue – about truth in science and theology, and about the consonance or dissonance between them – by interpreting both in terms of the philosophical approach known as phenomenology. Major themes in Orthodox theological thought can, he claims, be incorporated in this approach (Nesteruk 2008).

Given this wide spectrum of views, and the sociological framework within which they at present interact, the future of Orthodox theology in its response to the sciences of our time is hard to predict. Will sociological factors continue to affect the discussion that has now begun in earnest, so that what, in the short term, comes to be seen as the mainstream Orthodox position may reflect the effects of these factors rather than of a full appreciation of the resources that the Orthodox tradition has to offer? Or will the epistemological issues on which many contemporary Orthodox theologians have focused allow the development of a more subtle and creative response, which will have an impact not only in the Orthodox world but beyond? Activity in this area in the early twenty-first century – with several new initiatives based, like Nicolescu's, on a real understanding of the content of contemporary science – represents a hopeful sign that this latter outcome is the more probable one, at least in the longer term.

Cross-References

- [Creationism](#)
- [Christianity](#)

- [Orthodox Theology](#)
- [Physics and Orthodoxy \(Physics and Eastern Christian Theology\)](#)
- [Scientism](#)

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Eastern Orthodoxy

- [Orthodox Theology](#)

Ecclesiology

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Related Terms

[Anthropology](#); [Bible](#); [Church](#); [Hermeneutics](#); [History](#); [Physics](#); [Political science](#); [Psychology](#); [Sociology](#)

Description

► **Ecclesiology**, from Greek *ekklesia* (church) and *logos* (discourse), is the analytical and constructive study of the (self-) understanding of the Christian Church in its varieties of forms and practices.

The term ecclesiology has a double reference. It is the more or less coherent understanding of what is church held by a church, a movement, or a person. This understanding can be explicit or implicit. Ecclesiology is also an academic discipline studying these ecclesiologies.

As an academic discipline, ecclesiology originates in dogmatics and the need for a more specialized field of studies depending on a more focused development of the understanding of the church in theology at large during the nineteenth century. During the last part of the twentieth century, ecclesiology integrated theories from history, sociology, anthropology, and other disciplines in humanities and social sciences due to growing insights that the church could not be understood only by interpreting documents and theories but also needed to be understood from the perspective of science. This in turn led to an emerging integration of ecclesiology also in nontheological academic fields like political science, sociology, and history.

In universities and academic institutions, ecclesiology, partly depending on recent developments partly on history, is either an independent discipline or a subdiscipline, often related to dogmatics, social sciences, ecumenics, law, or history. As an academic discipline, ecclesiology differs worldwide in form and content among the institutions which include the discipline.

The church as an object of studies is a unique phenomenon in the world of religions and organizations, claiming to be itself divine revelation and by analogy the presence of Christ, the human-divine founder of the church. Historically, the church has decided about the biblical canon (at the end of the third century) and all dogmas (about the Holy Trinity, ► **Christology**); so basically, all information about the Christian faith is based on the church.

From the times of the early church, however, the church has been characterized by controversies and a constant striving to maintain or reestablish unity.

Self-identification

Science

Depending on language, the connotation of science differs also in relation to the self-understanding of ecclesiology.

Ecclesiology appeared as a part of the teaching in dogmatics during the late Middle Ages and remained so until it became a part of the university system during the twentieth century. It then became a part of systematic theology/dogmatics at the university where it partly served the traditional purpose of the constructive confessional theology of the churches and partly by means of church history emancipated itself from the teaching authority of the churches. As an academic discipline, ecclesiology during the twentieth century has combined the dogmatic and historical perspective with empirical studies and theories used in sociology, anthropology, political science, etc.

The use of ► **history** in ecclesiology is manifold. It originates in the insight that the church dogmatically is an historical phenomenon. Therefore, the dogmas on the church must be read in the historical context to be understood (Yves M.-J. Congar (1904–1995)). But history also presents constructs for ecclesiological analyses. If one, for example, researches the circumstances of the cheap production and distribution of Bibles during the last part of the nineteenth century and contextualizes it in the framework of the emergence of political liberalism and individualism, this is one of the most important ecclesiological changes in modernity.

► **Sociology** and ► **anthropology** offer ecclesiology tools for investigating what is church as a fellowship or assembly (*koinonia*, *ekklesia*). But ecclesiology integrates theories from social sciences with theories taking into account the theological presuppositions or postulates necessary to understand the claims of the church to be

a unique part of a given divine revelation, that is, the theological aspects. Ecclesiology is thus compared with sociology and anthropology, not an empirical science even if it takes into account and integrates them into ecclesiological studies because empirical data are a too narrow scope. Sociology goes together with theological interpretations like Christology and soteriology in ecclesiology. What sometimes is called empirical ecclesiology is used to create data for systematic theological analyses. The church is a political and historical reality that claims to be a divine revelation. It is at the same time ► [incarnational](#) and ► [eschatological](#). One of the problems when correlating ecclesiology to sociology, except for the German sociology of the church (Kirchensoziologie), is that its research object is religion at large which for ecclesiology is too vague and therefore sometimes irrelevant.

Constructively, social sciences and political science have played a decisive role in, for example, Latin American liberation ecclesiology, based on exploratory ecclesiological research. The same could be said about feminist ecclesiology and especially in relation to studies on power in the church. Not uncommon is the use of social sciences when developing middle-range theories for understanding church in a certain context.

The church is an organization, sometimes easily identified as a bureaucratic institution and in any society related the dominant administrative procedures and theories of administration for its administration of finances, buildings, personnel, etc. It is the same church which administer finances and sacraments. When the church today in its life integrates management theories, ideas of professionalism for its ministers, and introduces the concept of service in a manifold meaning, this, of course, affects the self-understanding of the church and is then an object for ecclesiological studies. If earlier in the history of the church it could be and still can be studied as a teaching institution with a magisterium and those who are taught by that teaching office, today it can be studied by means of categories like provider and consumer.

Cooperation between ecclesiology and ► [political science](#) and the use of ecclesiology and political science in each discipline is grounded in the fact that they are not possible to separate, for example, when studying Western constitutional thought, the idea of nation or kingdom, at least up to the nineteenth century. It was possible to distinguish between the political and the ecclesial worlds but not to separate them. Political science also is of importance for ecclesiology, for example, when studying the ecclesiology of a political party. There are studies in how communist parties in Eastern and Central Europe both made analyses of an ecclesiological character and presented coherent understandings of what is church that is ideologically motivated ecclesiologies.

Ecclesiology has to take into account the various anthropologies presented in the theological self-presentations made by the ecclesial traditions themselves. There is no fundamental and common view of the human being in the academic discipline itself.

The church is as a community a system of communication in word and deeds, which according to its own self-presentation expresses the unity between God and the believers and between the believers. To ecclesiology, this means that it must engage in ► [communication science](#) to understand what it implies and to have the possibility to theologically interpret the phenomenon (German “kommunikationstheoretische Ekklesiologie”).

Religion

The church is not a religion unless it by abstraction is converted into Christianity in the modern meaning of the word, an idea invented during the eighteenth century and developed by the phenomenologists of religions during the eighteenth and early nineteenth century. Thus, the study of the church cannot be understood as a religion and so not even the dogmas on the church. In some academic institutions, however, ecclesiological studies are founded on theories that are intimately related to specific confessional standpoints.

Characteristics

The distinctiveness of ecclesiology among the academic disciplines is a debated issue.

Ecclesiology is the theoretical interpretation of the self-understanding and self-realization of the church and how this has been understood and developed by churches, movements, and persons in theory and practice, in history, and in contemporaneity.

During the last century, ecclesiology less and less was confined to a perception of dogmatics as an isolated and of other disciplines than philosophy unaffected reflection on what is the true church. This is still to a certain extent true, but the church is nowadays commonly not understood as a generalized abstraction that is detached or possible to detach from its worship, institutions, or actual life.

Ecclesiology is not restricted to materials produced in the ecclesiastical domains. Also, for example, a state or a political party, as well as a novelist can produce ideas or systems of ideas about what church is or might be according to their opinion. Consequently, also, these can be subject to ecclesiological analyses.

Ecclesiology is organized differently at various academic institutions. In some, it is a discipline called ecclesiology or by a similar name; in others, it is either a subdiscipline in another discipline or combined with another discipline in the same department. Examples of combination are dogmatics, church history, ecumenics, canon law, and practical theology. Sometimes, individual scholars make research in ecclesiology in other disciplines, for example, sociology and political science.

The task of ecclesiology is to keep together the understanding of the church from various perspectives (dogmatic, social, cultural, and so on). The church as an object for studies is a complex and sometimes inconsistent phenomenon, and ecclesiology must necessarily make distinctions but cannot separate the various elements in ecclesiology as it is an object of the study. Such a separation would lead to a fragmentation of the object (church). In ecclesiology, different

aspects and elements are integrated or put in relation to each other in such a way that the church, whatever that means, retains its integrity.

In recent years, ecclesiology has bridged the traditional divide between empirical and theological analyses because of a renewed interest in the cultural and social expressions of the church but also new possibilities to add new knowledge to traditional dogmatic or systematic theological problems by means of theories presented by disciplines directed toward empirical studies.

Relevance to Science and Religion

Ecclesiology has until present times not explicitly on a broad basis engaged in the scholarly area called “science and religion.” Its increasing engagement in other disciplines and the incorporation of ecclesiology in, for example, social sciences will, however, demand such an engagement. Also, the fact that ecclesiology constructively has used, for example, models in physics as well as insights from biology in its hermeneutical assets will contribute to this.

From the 1960s, the idea of model used in social and natural science, particularly in physics, has influenced ecclesiology (Avery Dulles 1918–2008). It is interesting to observe that ecclesiology when being most theological in character, pursuing various sorts of analogical imaginations, is related to natural sciences. In ecclesiology, thus, the relation to natural sciences, is established in the framework of systematizing biblical images of “church,” not in the context of science, for example, political science or sociology. In physics, it is observed by ecclesiologists, the use of model has a clear similarity with the understanding of analogy not least from the perspective of neoscholastic theology. Models in ecclesiology are used in two ways: as explanatory models, which functions as means for synthesizing, and exploratory as means to achieve new perspectives and new knowledge.

During the 1930s and 1940s, there was a debate among especially Roman Catholic

theologians whether the analogy of the church as the Body of Christ was excessively influenced by concepts used in biology. Anyhow, explanatory models in biology has been used to understand what, since the nineteenth century, was called the organological perspective on the church presented by more or less botanical images in the New Testament (vine tree, body, etc.) that describes change without dissolving the identity.

In constructive ecclesiology, the idea of corporate person, corporate personality, or extended personality has been developed with help of development psychology both as a hermeneutical tool and an analytical instrument. This is understood as a phenomenon common to the ecclesiology of Israel and the church. One could say that psychology has offered hermeneutical tools for ecclesiology. It is of importance here to remind us about the relation between the individual person and the corporate, communal entity that is the church. In classical ecclesiology, an individual gets his or her identity by belonging to the fellowship called church.

Sources of Authority

Fundamentally, ecclesiology is an analytical and a critical and constructive reflection on a postulated divine revelation, as this is expressed in the Christian Church and interpreted in manifold ways through ideas and practices. This is the basis for the academic and scientific work of various schools in the field of research.

In ecclesiology, the productivity of the theories to which the individual scholar adhere is presenting the authoritative frame of the discipline.

Ethical Principles

The ethical principles in the field of ecclesiology are depending on the requirements held by the individual discipline that is included in the actual research made, for example, sociology or research in archives.

Key Values

The key values in ecclesiology are developments of (new) theories and presentation of new knowledge about the church, acquired by the larger academia, the churches, and the society.

Conceptualization

Nature/World

The object of ecclesiology is not relational, for example, church and world but the study of the church per se. However, studies of nature and world are included in, for example, sacramental theology, integral in some ecclesiology. Recently, ecclesiology has also been engaged in studies in ecology.

Human Being

An ecclesiological question is raised when there is a discussion about the identity of an ecclesial tradition, and it is about the relation between an individual person and the corporate person, that is, the church. If aspects of identity is brought in from psychology and applied on an organization and in this case an ecclesologically founded corporate person, the question about the real image and the subjective image of the subject occurs, the problem with an external as well internal regenerated identity as well. This is in ecclesiology possible to approach by means of tools presented in social sciences, including anthropology and psychology; the interaction between the person and social structures are studied and the person cannot be detached from collective processes of experience.

Anthropology at large has influences on the ecclesiology held by the churches. One example is the difference between Baptist and Lutheran view on the child which finds expressions in different views on baptism and thereby the organization of the church. This is thus a field of ecclesiological studies.

Life and Death

Theologically, the church claims on the basis of the Bible to be an eschatological phenomenon,

that is, transcending the borders of heaven and earth. In Christian anthropology, the idea of the beginning of the individual person's life has shifted according to the understandings in biology during history and that is applicable also to death. In ecclesiological structures, birth, dying and death have been interpreted by means of various rites and practices, for example, baptism and funeral ceremonies. For academic ecclesiology this implies a multidisciplinary approach, considering dominating patterns of understanding presented by history of ideas and social and natural sciences.

Reality

In ecclesiology, the ideas of reality differ depending on epistemological assumptions held by the individual scholar.

Knowledge

Knowledge produced in ecclesiology is possible to evaluate in the academic fields of theology and in accordance with the theories and methods applied in specific research done.

Truth

The churches' ecclesiologies generally present absolute and universal truth claims. Ecclesiology as an academic discipline does not make such claims. Thus, truth in ecclesiology depends on the researcher's philosophical position and the theories used.

Time

Theologically, the church builds on the idea of incarnation, that God has become a human person in Christ and that the church is the living Body of Christ. Therefore, history is an essential element in many ecclesiological investigations studying continuity and change of the church.

Rationality/Reason

Rationality in the field of ecclesiology as an academic discipline seems from the perspective of constructive ecclesiology to be system immanent in the meaning that it depends on the philosophical preconditions for a certain theory or cluster of theories. One thing seems, however, to be in

common, namely, that as the object itself transcends in its totality empirical verification, so ecclesiology as a field of research is not confined to empirical data and that those data must be interpreted in such a way that the theories and methods are intelligible in the larger academia.

Mystery

The church is from the Biblical presentations of it and onward offered by categories of mystery. This affects ecclesiology in two ways: It has in the research to consider the claims of the church to be a mystery also when it is studying its organizational or political character, and it motivates studies of the idea of mystery itself and how it is used.

Cross-References

- ▶ [Biblical Studies](#)
- ▶ [Catholic Sociology](#)
- ▶ [Christian Cosmology](#)
- ▶ [Christianity](#)
- ▶ [Global Christianity](#)
- ▶ [Historical Theology](#)
- ▶ [Incarnation](#)
- ▶ [Liberation, Theology of](#)
- ▶ [Political Theology, Theological Politics](#)
- ▶ [Practical Theology](#)
- ▶ [Religion, Sociology of](#)
- ▶ [Systematic Theology](#)

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Ecological Optics

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Analysis of the ways in which radiant light interacts with surfaces of the environment, and, in turn, the manner in which the resulting reflected light is structured by those surfaces. The array of reflected light serves as potential information for perceiving, and as such creates the possibility for direct perception of environmental layout. Formulated by James Gibson in his ecological approach to perception-action.

Ecological Psychology

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Related Terms

[Communities](#); [Context](#); [Cultural evolution](#); [Dynamic systems](#); [Evolution](#); [Human development](#); [Perception](#); [Place](#); [Policy](#)

Description

► [Ecological psychology](#) is a term that has been applied by three different psychologists to their distinct, independent theoretical approaches and associated research programs: the perceptual psychologist *James J. Gibson (1903–1979)*, the child/social psychologist *Roger G. Barker (1903–1990)*, and the child psychologist, *Urie Bronfenbrenner (1917–2005)*. Roughly contemporaries, all three developed their individual approaches over the second half of the twentieth century. Because of their different research interests and approaches, there was little overlap, or

even cross citing, among them. Still, the three share some common historical antecedents. The thematic thread linking all of them, however, is a careful and systematic consideration of the environmental context for psychological processes. All concur that the environmental context for the development of perception, thought, and action has not been given adequate attention in ways most suitable for psychological considerations.

Overall, an ecological approach in psychology takes as its basic phenomena the ongoing, reciprocal processes of a dynamic environment-organism system. Psychological processes are viewed as operations of organisms in transaction with their *econiche*. *Econiche* refers to that portion of the environment that is functionally significant for a particular species. The *econiche* is specified relative to the living habits of an animal or a group of animals. Moreover, environment-organism systems are seen as being embedded in a nested hierarchy of natural systems. Consequently, in addition to its emphasis on reciprocal environment-organism relations operating within a psychological level of analysis, an ecological approach calls attention to between-level influences, especially those stemming from the higher-order systems (e.g., sociocultural processes) within which psychological processes are embedded.

Let us briefly consider an overview of each of these distinct “ecological psychologies”:

James Gibson’s Ecological Psychology

James Gibson’s ecological psychology takes as its starting point the dynamic environment-animal relationship, and its primary concern is the act of perceiving (Gibson 1979). A unique characteristic of the ecological approach is its intention to provide the theoretical grounds for a philosophy of *direct realism* – the position that individuals perceive the environment directly (i.e., without the mediation of nonperceiving processes) (Heft 2001; Reed 1988, 1996). The claim of ► [direct perception](#) (sometimes called pejoratively, naive realism) stands in contrast to the

view dominating much of post-Cartesian thought that perceiving the environment is always mediated by stored mental representations (*indirect realism*). An epistemological consequence of this latter position is the assumption that what the individual perceives is a mental construction of the environment, rather than the environment itself. The threat of Humean skepticism, and even solipsism, ever looms over this position.

In contrast to the standard position that perception is the result of a linear sequence of causal events – from imposition of physical stimulation on stationary receptors to subsequent stimulus “processing” along a neural stream to the brain – Gibson proposed that the senses be “considered as perceptual systems” of an *active, exploring perceiver* (Gibson 1966). Actions by the individual play a critical role in revealing structure (information) specific to environmental features and events. To illustrate, it is far easier to identify an object through active touch (i.e., manipulation by means of the tactile perceptual system) rather than by passively holding the object. In both cases, sensory receptors are stimulated, and yet successful identification of the object is far more likely in the former case. Likewise, perceiving objects through vision is facilitated by actions of the visual perceptual system (e.g., movements of the head and body), in comparison to a fixed, stationary view. Why is it that actions contribute to detection of stimulus information? Activities of perceptual systems help to reveal what is invariant (i.e., the relations that do not change in the context of change) in the stimulus array. Such invariant structures specify stable and persisting features of the environment. (An account of how such structure is available in reflected light is offered through Gibson’s development of ► [ecological optics](#) (Reed 1988; Gibson 1966; Reed and Jones 1982). The detection or “pickup” of structure specific to objects and events by means of perceptual systems makes possible the *direct (unmediated) perception* of environmental layout.

An especially significant concept formulated in Gibson’s later writings is ► [affordances](#) (Gibson 1979). Gibson proposed that *what* is perceived through the pickup of information is

the affordances of the environment. The term “affordance” refers to meaningful properties of the environment taken with reference to an individual. For example, a surface affords “sitting on” if it is approximately at knee height and if it appears to be able to support one’s weight. Consequently, what affords “sitting on” has particular properties taken with reference to an individual. As such, affordances are neither solely properties of the environment nor properties of the perceiver, but they are relational properties within an environment-perceiver system. Critically, then, the concept of affordance transcends the standard Cartesian objective-subjective dichotomy and is characteristic of a relational ontology. This concept has drawn much attention in recent years because it raises the possibility that *meaning* originates in dynamic perceiver-environment *relationships*, rather than being solely a subjective quality in isolated minds. This way of thinking opens up the prospect that meaning is a property of the environment-individual systems and that, ultimately, it can be located in a public, shared domain of experience (Reed 1996).

Much of Gibson’s ecological psychology is anchored in the experimental research tradition. Ongoing empirical research has deepened our understanding of the nature of affordances and of the information supporting locomotion. Moreover, it has been fertile ground for research in movement science as well as perceptual and motor development, the latter domain of inquiry initiated by Eleanor J. Gibson (1910–2002) (Gibson and Pick 2000). Gibsonian ecological psychology is currently a thriving area of research and inquiry. The International Society for Ecological Psychology (www.trincoll.edu/depts/ecopsyc/isepp/journal.html) meets regularly and publishes a journal (“Ecological Psychology”) as well as a book series.

Roger G. Barker’s Ecological Psychology

Roger G. Barker’s ecological psychology (later called by him “eco-behavioral science”) started with his realization that even though psychologists knew a great deal about how children

behave within laboratory conditions, they knew little more than laypersons about children's behavior patterns and experience in daily life. In response to this shortcoming, Barker followed the path set by naturalists in the biological sciences and established a field research station, in this case, in a small town, that provided "easy access to phenomena of the science, unaltered by the selection and preparation that occur in laboratories." In due course, Barker and his colleagues developed empirical methods for observing and recording the activities of children in everyday circumstances (Barker 1968).

Their extensive observations revealed an order or pattern in individuals' actions that could not be adequately accounted for solely by considering the environment as it operates at the level of the individual child. Instead, Barker found it necessary to identify higher-order structures that emerge from the actions of two or more individuals in concert with environmental objects and other features ("milieu"). He called these dynamic structures ► **behavior settings** (Heft 2001; Schoggen 1989). Joint, coordinated actions by individuals generate the dynamic structure of the behavior setting, and reciprocally, those actions are constrained by that structure in the course of generating it. To take a simple example, a chess game between two individuals is a dynamic structure constituted by their joint action in some milieu. Their participation in, and hence creation of, the game simultaneously constrains their actions. Barker began to see communities as being comprised of behavior settings that their inhabitants participate in to varying degrees of involvement. Observations such as this led him to conclude that the best predictor of individuals' actions is knowing "where they are" (i.e., in which behavior setting are they currently participating) rather than knowing their "intrapsychic" traits (e.g., personality).

One important insight that grows out of behavior setting research is the psychological implications of "*levels of staffing*." "Optimal staffing" occurs when the requisite number of individuals needed to fill the essential roles of a setting is present. In conditions of "understaffed" settings (less than the requisite number present),

individuals must be intensively engaged in the setting, often taking on more than one role, in order to preserve the setting's operational integrity. Understaffed settings, then, often challenge its participants, and if the degree of understaffing is not too extreme, they are challenged in psychologically beneficial ways. Conversely, overstaffing results in some individuals in the setting being superfluous to its operations, and hence marginalized. This analysis of the psychological impact of "staffing" applies directly to organizational and institutional settings, such as schools and workplaces.

With the closing of the field station, and the passing or retirement of the first generation of eco-behavioral psychologists, work along these lines has been steadily declining. The demise of this research program is also partially attributable to the very demanding, long-term nature of the research, which is at odds with the institutional practices within the discipline of psychology. Unfortunately, with the passage of time, this significant work is being remembered by a dwindling number of psychologists.

Urie Bronfenbrenner's Ecological Approach to Human Development

Urie Bronfenbrenner's ecological approach to human development (later called the bioecological approach) primarily focuses on the social contexts for interpersonal processes that have an impact on the developing child. Bronfenbrenner pointed out that after decades of child development research, psychologists know very little about the environmental influences operating at many levels of society that affect child development. As a consequence, he lamented, child developmental psychologists have little to offer to those working in the realm of public policy that bears on child welfare. Bronfenbrenner's emphasis on the policy implications of human development research distinguishes his work from that of the others considered here.

The most distinctive feature of his approach is a model of the developing child as being

embedded in a series of nested systems of influence, conceptualized as a set of concentric spheres of dynamic, mutually interacting processes (Bronfenbrenner 1978). The most immediate reality from the perspective of the developing child is the *microsystem*. This system is the primary developmental context, consisting of the child, the available environmental resources, and typically another person (e.g., a parent). It is necessary to recognize that the parent is but one of a number of relations with which an individual child operates at a microsystem level. Other microsystems include the relationship of the child with a sibling, a relative, a peer, or a teacher. Because of the coexistence of multiple microsystems, the relationships between microsystems require close consideration. For example, the character of interpersonal processes in a microsystem that includes a sibling may have an influence on dynamics of the child–parent microsystem and so on. Bronfenbrenner refers to these relations between microsystems as *mesosystems*. Unlike microsystems where children are participants, ► *exosystems* are interpersonal and institutional conditions that can affect the child indirectly even though he/she is not a participant in them. For example, the parent’s experience in the workplace can affect the character of the parent–child microsystem even though the child is not a part of the former. Other instances of exosystems that may indirectly affect child development are the decisions by school boards on educational/curricular matters, by neighborhood planning boards concerning play space, and by legislators on children’s rights. Bronfenbrenner also identifies what he calls *macrosystem* processes, by which he means the culture’s value system(s), political ideology, etc. These macrosystem factors have a pervasive influence on all of the systems nested within it. Later additions to his model are the *chronosystem* that refers to the temporal patterning of life events at each of these levels, as well as the biological resources that play a role in developmental processes.

Bronfenbrenner’s ecological psychology conceptually cuts across numerous traditional disciplinary boundaries, including sociology,

economics, political science, and anthropology. This interdisciplinary breadth is both its strength and its challenge when it comes to formulating a comprehensive, contextually sensitive framework for the analysis of human development as well as for intervention. Bronfenbrenner did not develop a sharply defined research program and often drew on existing research and data resources. Still the overall impact of his approach continues to be influential among researchers broadly interested in the contexts for human development.

Self-Identification

Science

Ecological psychology, in all of three of its variations, identifies itself as a science. Ultimately, the validity of its claims and concepts rests on empirical evidence. Most of the work in the Gibsonian tradition is based on experimental research, the Barker “school” followed along more naturalistic and descriptive rather than experimental lines, and the evidentiary base of Bronfenbrenner’s approach draws on a combination of “natural experiments” (comparison of existing conditions for development) and demographic data sources. A significant challenge all three face is to develop research techniques and ways of analysis that capture the dynamic, environment-organism phenomena at the center of their respective programs.

Moreover, each of them in their own way is interdisciplinary, at least within the sciences, connecting with empirical and theoretical work in other domains of scientific inquiry. Recent developments in Gibsonian ecological psychology have been exploring linkages with the physics of complex systems, particularly concerning motor performance and coordination, and with dynamic systems research in motor and cognitive development. Barker recognized that with the discovery of behavior settings as extra-individual environmental structures, his focus shifted from exclusively that of the individual to collective, ecological structures. He understood that he was operating at the boundaries of traditional

psychology and the social sciences, and for that reason, he began to call his research approach “eco-behavioral” science. Bronfenbrenner’s program, as we have seen, cuts across the traditional boundaries of the biological, psychological, and social sciences.

Characteristics

In spite of differences among these separate programs, each in its own way attempts to elucidate the properties of the environment that are significant from a psychological perspective. Barker’s and Bronfenbrenner’s ecological psychologies draw attention to environmental properties that, respectively, either have gone largely unnoticed before (i.e., behaviors settings) or that rarely figure into psychological analysis of child development (i.e., mesosystems, etc.). Gibson’s ecological psychology is more far-reaching than the others, however, in its call for a radical transformation in how environment-organism relations are conceptualized.

Following in the footsteps of the American pragmatist tradition, Gibson’s ecological psychology explicitly rejects dualistic approaches to psychological phenomena (see above). The environment and organism are relational concepts, each implying the other. Environment-organism is a dynamic system, neither facet of the system is possible without the other. To illustrate by way of a biological process, respiration is not an organism property that operates in itself, but rather it is a function of an environment-organism system (in the absence of oxygen, there is no respiration). Reciprocally, oxygen as one of numerous chemical constituents of the biosphere is biologically significant because of its function in organisms’ respiration and metabolism. Psychological processes and the environment are to be conceptualized in a likewise manner.

At the level of psychological functioning, what animals perceive and act on are the environment’s affordances (see above), and reciprocally, animals regularly modify the environment to fashion affordances that support life activities (e.g., spider webs, beaver dams,

human shelters) – processes that have been called in recent years niche construction. From this perspective of environment-organism systems, then, features of the environment are meaningful and value-laden taken with reference to an animal. As a result, meaning is not solely a property that resides in the mind considered in isolation, but rather it is *grounded* within an environment-perception/action system. Approaching meaning from the starting point of perception/action establishes the basis for viewing knowledge as being fundamentally *embodied*. The last decade has witnessed a surge of research on embodied knowing within cognitive science stemming from this insight.

Relevance to Science and Religion

None of the variants of ecological psychology have direct relevance to “science and religion” as a scholarly area. That said, Gibson’s ecological psychology, with its starting point being the environment-organism systems and its identification of meaning as a relational property of that system, would view both science and religion as frameworks for human activity operating within such systems. Barker’s ecological psychology considers religious institutions (e.g., houses of worship) as behavior settings that emerge from collective action and thought (belief) and, reciprocally, create contexts/constraints that make religious practices possible. Bronfenbrenner would most likely view the stances toward living offered by science and by religion as macrosystem influences on human development.

Sources of Authority

The authority for ecological psychology, like any scientific endeavor, rests on empirical, pragmatic criteria: ideas that prove to be useful for ongoing processes of inquiry and understanding are to be valued. At the same time, these ideas remain open to scrutiny, to revision, and even to rejection when other empirically grounded, substantive ideas are formulated that challenge them.

As far as historical sources, James Gibson's ecological approach to perception rests in part on the *radical empiricist philosophy of William James* which claims that immediate conscious experience includes objects *and* their relations (Heft 2001). Traditional empiricist views have it that "relations" are not immediately perceived – a position that Hume demonstrated has devastating consequences for an empiricist epistemology. Gibson's mentor was Edwin B. Holt, one of James's students and the earliest proponent of molar (nonreductive) behaviorism. Gibson was also deeply influenced by the phenomenology of Gestalt psychology, especially by Kurt Koffka, and by the dynamic field theory developed by Kurt Lewin, which took as central the claim ($B = f(P, E)$) – behavior is a function of joint person and environment influences. Likewise, the works of both Roger Barker and Urie Bronfenbrenner were inspired by the work of Kurt Lewin, who was their mentor.

Ethical Principles

As a science, ecological psychology in its variations adheres to the ethical practices of the sciences involving human research. Participants' anonymity is protected, and whenever possible, participants' informed consent is obtained. Observational research can often make it difficult to meet the latter criterion; however, in Barker's ecological psychology research, the individuals who were being observed were aware of the researchers' presence and were informed about the aims of the investigation. Moreover, as in all the sciences, ethical practices in scholarship, such as properly attributing work and faithful, accurate reporting of evidence, are strictly maintained.

Key Values

Ecological psychology is principally an area of empirical inquiry. It seeks to gain understanding and insight into the human condition by drawing on empirical information and on the formulation

of evidence-based concepts and theory. To the extent that this empirical information can be utilized to improve the quality of human life, as well as the quality of the biosphere, it is especially valued. While any science goes beyond its data to develop models and theories, which in turn facilitate the prediction of future possibilities, those predictions must be grounded in existing evidence. Ultimately, predictions must be rejected and theoretical commitments critically evaluated in the absence of confirmatory data.

Conceptualization

(The following comments are intended to reflect the perspective of Gibson's ecological psychology only. No doubt there would be much agreement among all three psychologists on the following, but still some subtle differences may exist on certain matters. I will not explore these possible differences here.)

Nature/World

Nature refers to all that is from the standpoint of the sciences. Within that all-encompassing domain, ecological psychology distinguishes between the environment and the world. The environment is that which exists in relation to living organisms (Gibson 1979). The world is all there is independent of considerations of living organisms. The physical sciences have developed quite sophisticated descriptions and models of the world defined as such.

Environment and organisms exist relative to each other and, indeed, are facets of a common, dynamic system. The environment refers to those aspects of the natural world that are significant because of their value for specific organisms. Reciprocally, in many instances, some properties of the environment result from organisms operating in the natural world (e.g., from the production of oxygen by plants to the building of burrows and nests, human dwellings, and settlements).

From the standpoint of science, then, there are no multiple worlds (e.g., the physical world, the natural world, the social world) – but one, the

natural, some parts of which are especially significant for some types of scientific inquiry and some types for others, such as environments for biological and psychological functions.

Human Being

Human beings are members of the species *Homo sapiens sapiens*, and current evidence indicates that the species evolved roughly 200,000 to 150,000 years ago. The biological similarities between them and other primate species are considerable, but the relatively small biological differences that do exist have resulted in enormous psychological and behavioral differences over time. Human beings are highly social with possibilities for cooperative processes unmatched by other primate species. The comparative ease with which humans can offer and receive instruction and can develop symbolic systems of thought, requiring a long period of dependence on others, has allowed for extended collaborative, planning processes and, critically, has made possible the accumulation of know-how across generations. Thus, although many primates show evidence of protocultural processes in terms of cooperative action and instruction (e.g., in tool use), humans alone have developed the possibilities for processes (e.g., systematic pedagogy, making symbolic records) that allow for the preservation of collective gains of successive generations. Further, symbolic processes make possible different frameworks of thought (e.g., religion, mythology) that provide a basis for collective action as well as for individuals' efforts toward finding meaning in their existence. Possibilities for *culture* and *cultural evolution* rest on these combined foundations.

Life and Death

The origin of life is a topic outside of the purview of ecological psychology. That all living systems eventually die is a fact of biological processes.

Reality

What constitutes reality varies depending on one's purposes (life sciences, physical sciences, social sciences, religion). This is not a relativism, however, but rather a pluralism because it is

accepted that certain conceptualizations may operate well for some purposes but not others, and vice versa. What is reality for living things is their immediate perceptual reality – their perceived, living circumstances. The reality that is relevant to ecological psychology is the perceived environment taken with reference to active organisms, that is, affordances. Likewise, a mathematical or a cosmological framework is to be valued in the context of their associated conceptual or symbolic systems.

How might one differentiate between “perceptual” reality and “conceptual” reality? Conceptual systems are intellectual abstractions from immediate experience. As such, they can be – and have been – replaced by other conceptual systems. The reality of environment-organism systems is present in ongoing immediate perceptual experience, and facets of it must endure if environment-organism systems are to remain viable. Extinction occurs when the reality of the environment necessary for a species' existence ceases to be.

Knowledge/Truth

Ecological psychology's stance on knowledge and truth follows the pattern established by pragmatist philosophers. *Knowledge* consists of those acquired practices (habits) and ideas that successfully serve as means to the individual's ends. However, individuals always operate within social contexts; therefore in the long run, these individual practices and ideas must be in concert with social norms and collective goals. Moreover, all ends of praxis, both individualistic and collective, are established over the course of development within social contexts.

Truth is knowledge that has successfully stood the test of time, including assessment by individuals within a social group who care to evaluate it. Although some outcomes may satisfy a narrow set of goals for a segment of the social group in the short run, truth is warranted only over the long run and, in principle, from the perspectives of all social group members. Although long held *truths* (traditions) should not be discarded casually or without due consideration, neither should they go

unchallenged or unrevised when they clash with reliable, empirical evidence, and when they no longer serve human interests and what humans take to be the interest of the biosphere.

Perception

Perception is the major concern of Gibson's ecological psychology (Gibson 1966, 1979; Reed and Jones 1982). In this regard, it follows the tradition of Aristotelian and British empiricist thought positing that knowing stems from perceptual experience. However, unlike most empiricist approaches, ecological psychology rejects the position that perception is a linear chain of causal events, from the stimulation of sensory receptors, which produces simple sensations (or sense data), to the mental construction of a percept based on those sensations, supplemented by memory. Instead, sensation and perception are treated as separable processes, and perception (but not sensation) is the means by which perceivers stay in touch with meaningful features of the environment (e.g., affordances – see above). Perceiving involves the detection of relational structure in the environment – structural relations specify their environmental sources – and structure is not carried in sensations (Gibson 1966). Moreover, because structure is most readily detected with respect to what remains constant in a changing pattern of stimulation, actions by the perceiver (i.e., functioning of the perceptual systems) play a critical role in perceiving. In an information-rich environment, memory is not needed to supplement perceiving processes, because perceiving – like all processes of a living organism – is an ongoing and continuously transforming process of a dynamic environment-organism system. Change is always ongoing. Structures that are detected by way of perceiving processes also serve as the foundation for higher level nonperceptual processes (e.g., imagining, remembering). Finally, ecological psychology takes the standard dichotomy of nativist-empiricist sources of knowledge to be a false choice based on dualistic thinking that distinguishes world and mind (see above). Perceiving is function of an environment-organism system, and perceptual information is constituted within this system.

Time

What is experienced is *change* due to environmental events (e.g., day-night cycle, seasonal conditions, growth and decay, inanimate and animate motion) and organismic action (e.g., self-produced locomotion, exploration, production) (Gibson 1979). Time is an intellectual abstraction based on events. Abstract systems of measuring time have been developed by humans to provide a common framework for ordering interpersonal affairs, and these systems are overlaid on the ongoing changes that are found in immediate experience.

Consciousness

Consciousness is a term with a wide range of meanings within psychology. Ecological psychology, to date, has been primarily concerned with consciousness qua awareness accompanying perception and action. For example, to perceive one affordance of the environment as opposed to some other is to be aware of the former. That is, awareness is not superadded to perceiving; rather to perceive is to be aware of some properties of the environment. In addition, perceiving the environment is accompanied by a coperceiving of the self. There is an awareness that it is “I” that is perceiving, as evidenced by the fact that, e.g., some alterable vantage point (rather than some other) has been adopted; that there is a self-referential locus of control for self-movement; and that parts of my body are enduring features of my visual field. This evidence points to an empirical, *embodied* “I” as opposed to an intellectualized “I.”

Rationality/Reason

Ecological psychology is concerned primarily with perception-action processes. For this reason, it has not addressed reasoning processes in living systems. That said, it has vigorously opposed the view that perception and action are a reason-like processes (e.g., that they are mediated/based on inferences, hypotheses, or “programs”). As explained above, ecological psychology provides the groundwork for considering perceiving through action to be a direct and unmediated process of engaging the environment.

Mystery

Science is driven by the experience of wonder when confronting natural phenomena. Within the bounds of science, wonder does not have a transcendent significance. Although the experience of “uncertainty” does not fully capture this experience, it is a part of it. Some of the experience of uncertainty may be resolved with greater understanding, but owing to the complexity of natural processes, and perhaps due to factors intrinsic to natural processes themselves, uncertainty is ever-present. With regard to perceiving, more specifically, as the individual explores the environment, new information comes into view and prospective (inherently uncertain) information appears on the forward edge of the awareness accompanying perception-action (Gibson 1979).

Relevant Themes

The ecological approach to perceiving provides theoretical and empirical grounds for a direct realist epistemology. Perceiving (perception-action) is a process of detecting publically accessible information that is specific to objects and events at various levels of complexity. The array of potential information available to be perceived is essentially limitless, and at any particular moment in time, individuals selectively detect some portion of this array owing to their prior history and current intentions. With opportunities for further individual exploration and perceptual learning, perceiving is an ongoing process of detecting new information, which both broadens and deepens the individual’s awareness of what is there to be perceived (Gibson and Pick 2000). And because perceptual information is publically accessible, the prospect is always open for individuals who may be selectively aware of different informational structures, even conflicting structures, to come to be aware of what the other perceives. Ecological psychology, then, is an epistemology of both direct realism and pluralism, and unlike post-Cartesian views that gesture in the direction of solipsism, by taking percepts to

be products of processes occurring in so many isolated minds, ecological psychology offers an epistemology of hope (Reed 1996).

Cross-References

- [Cognitive Psychology](#)
- [Developmental Psychology](#)
- [Dualism](#)
- [Meaning, the Concept of](#)
- [Perception](#)
- [Philosophy of Mind](#)
- [Theoretical Psychology](#)

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Ecological Theology

- [Environmental Theology](#)

Ecology in Islam

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Related Terms

[Environment](#); [Qur'an](#)

Islam is a religion that was born in the desert, and as such the first Muslims seem to have had a keen sense of the fragile balance that existed in the harsh ecosystem that made their lives possible. This awareness is abundantly reflected in the Qur'an, which contains many references to water and other vital natural resources and lays down clear guidelines for their conservation and equitable distribution.

The Islamic legal tradition, devised from the eighth to tenth centuries on the basis of the Qur'an and hadiths (reports about the words and deeds of the Prophet Muhammad), spells out in detail the divinely prescribed parameters for the use of natural resources, including water, soil, air, plants, and animals. As in the Qur'an, conservation and fair distribution are emphasized. Moreover, like everything in creation, resources are seen foremost as belonging not to humans but to Allah, for whom humans are to hold nature in trust (*amāna*).

Humans and Nature in the Qur'an

The Qur'an presents natural phenomena as signs (*āyāt*) pointing to the existence of God (16:66, 41:53, 51:20–1, 88:17–20). The value of nature is therefore primarily symbolic. Scientific inquiry which aims to understand the workings of the universe thus constitutes, for Muslims, a sacred quest. Nature is perfectly proportioned and without any flaws (67:3), a reflection of the qualities of its creator. It has a divinely ordained purpose (3:191, 21:16, 38:27) and is neither random nor meaningless. The “environment” is

nothing less than God himself, since, according to the Qur'an, “whithersoever you turn there is the presence of God” (2:115).

Within the hierarchy of creation, the Qur'an accords humans a special status that of God's *khalifa* (2:30, 6:165), which has been generally understood by Muslims to mean “vice-regent,” thus one of stewardship or trust (*amānat*). Recently Idris has criticized this as a later interpretation, however, arguing that the original meaning of *khalifa* was “successor”; according to this view, humans are not the “deputies of God” but simply the “successors to Adam” (Idris 1990).

Nevertheless, the Qur'an states that “all that is in the earth” has been subjected (*sakhkhara*) to humans (22:65) and that “It is He who has created for you all things that are on earth” (2:29). Yet ultimately, it is God “in whose hands is the dominion of all things” (36:83; cf. 2:107, 24:42). And though humans are said to have been created “in the best of forms” (*fī aḥsanī taqwīm*), the Qur'an goes on to caution that “Assuredly the creation of the heavens and the earth is [a matter] greater than the creation of human beings: Yet most people understand not!” (40:57).

Humans are described in the Qur'an as being more like other beings than unlike them. All creation is said to worship God (22:18), even if their praise is not expressed in human language (17:44, 24:41–2). Nonhuman communities are said to be like human communities (6:38), and nonhuman animals are explicitly said to possess speech (27:16). Nonhuman animals are said to have received divine revelation, as when God instructs bees on how to make honeycombs and honey (16:68). The earth was created for the benefit of all living beings (*anām*), not for humans alone (55:10). In fact, the only significant difference between humans and other beings is that humans alone possess consciousness (*taqwa*) and are thus accountable for their actions.

Humans will accordingly be held accountable for any acts of wanton destruction committed against the earth (2:205, 7:85). Wastefulness and overconsumption are also prohibited (7:31), as is hoarding. Water, arguably the most vital natural resource, is to be kept as common property (54:28). Balance (*mīzan*) is to be maintained

in all things, including, presumably, natural systems (13:8, 15:21, 25:2). Failure to do so, consequently, may be argued to be un-Islamic.

In the Hadiths

The Arabs to whom the Qur'an was revealed in the early seventh century CE had a long familiarity with the ecological constraints posed by their native desert environment. Reports about the words and deeds of Muhammad (*hadīths*) indicate that the prophet of Islam possessed both an awareness of these constraints and a sensitivity to the duties of humans toward the rest of creation.

Muhammad received the first of his revelations while meditating in a cave on a mountain outside of Mecca. Thus, as in the case of numerous other seminal religious figures, his insights came within the context of immersion in the natural world. Perhaps the most illuminating of the hadiths in this regard is the one which states, "The earth has been created for me as a mosque [i.e., as a place of worship], and as a means of purification" (*Sahīh Bukhārī*, 1:331). According to another hadith, Muhammad said, "The world is green and beautiful and Allah has appointed you His stewards over it."

A well-known hadith has Muhammad prohibiting his followers from wasting water, even when it is found in abundance and when it is used for a holy purpose such as ritual ablutions (*Musnad ibn Hanbal*, ii, 22). Muhammad also decreed that no more than an ankle depth of water (i.e., sufficient for one season) could be taken for irrigation. Essential resources are to be common, not private property: "Muslims share alike in three things – water, pasture and fire" (*Mishkat al-Masābih*).

Numerous hadiths speak to Muhammad's concern for the interests of nonhuman animals. In regard to the killing of domestic animals for food, he called for swift and conscientious slaughter with a sharp knife (*Sahīh Muslim*, 2/11, "Slaying," 10:739) and not to slaughter an animal within view of its kin. He forbade hunting for sport and frequently reprimanded his followers for abusing or neglecting their

camels and donkeys. He urged his followers to plant trees and cultivate land not only to provide food for humans but for birds and other animals as well (*Sahīh Bukhārī* 3:513). In a hadith which is strikingly similar to a well-known rabbinical saying, Muhammad is reported as saying "When doomsday comes if someone has a palm shoot in his hand he should [still] plant it" (*Sunān al-Baihaqī al-Kubrā*).

In Islamic Law

The legal corpus known as the *sharī'a*, codified by Islamic jurists during the Classical period (eighth to tenth centuries CE), was meant to be all encompassing and thus includes aspects which could be said to deal with environmental protection and management of natural resources. The jurists applied the four principles of Qur'anic injunctions, the example of Muhammad as attested in the hadiths, analogical reasoning, and their own consensus of opinion to the preexisting customary practices of the Arabs and the Persians in particular and to some extent of other Muslim peoples.

The aspect of *sharī'a* law with the most explicit environmental applications may be the institution of the protected zone (*harīm*), which prohibited the development of certain areas, mainly riverbanks, for purposes of protecting watersheds. A related institution is that of the preserve (*hima*), which usually entailed the protection of trees and wildlife. Some traditional *harīms* and *himas* still exist today, notably in Saudi Arabia, but they are much diminished from former times and continue to disappear. The legal texts go into some detail about the distribution of water resources and also devote sections to the "bringing to life" (*ihyā*) of "dead" lands (*mawāt*), including the conditions and rights pertaining to one who engages in such "development."

Islamic law also extends many legal protections to nonhuman animals, including the "right of thirst" (*haqq al-shurb*), which states that they cannot be denied drinking water (Qur'an 91:13). A thirteenth-century work by 'Izz al-din ibn 'Abd al-salam, *Qawā'id al-ahkām fī masālih al-anām*

(*Rules for Judgment in the Cases of Living Beings*), includes what might be called in contemporary terms “an animals’ bill of rights.” Among the provisions are that animals should be properly cared for, not overburdened, kept safe from harm, given clean shelter, and allowed to mate.

Although there is little in the classical legal corpus that could be explicitly categorized as environmental law, there exist within it several basic principles which could, if so interpreted, serve to mitigate some of the main causes of global environmental degradation today. In particular one may cite the principles of minimizing damage, the primacy of collective over individual interests, and the giving of priority to the interests of the poor over those of the rich. While some contemporary Muslims – notably Mawil Izzi Dien and Uthman Llewellyn – have attempted to provide such interpretations, these have not yet found their way into the legal codes of any existing Muslim societies.

In Islamic Philosophy

From around the tenth century CE, Muslim philosophers, familiar with Classical works, appear to have been the ones to coin the Arabic term *tabī‘a* to represent the Latin and Greek equivalents *natura* and *physis*. (The word *tabī‘a* does not appear in the Qur’an.) The derivatives *tab‘* and *mathbū‘* may, on the other hand, have been the source of the Latin pairing *natura naturans* and *natura naturata* (Nasr 1964/1993, p. 9). In Islamic philosophy the distinction between the creator and creation is represented by the terms *haqq* (lit., “divine truth”) and *khalq*. The laws of the universe exist not in and of themselves but rather as expressions of the divine will, understood in Aristotelian terms as the first cause. There are no “secondary” causes; thus, what appear to be the laws of nature are merely the “habits” of created things, which God could alter if he chose. Miracles, accordingly, are seen simply as instances where God chooses to cause things to happen in other than their familiar, habitual manner.

Yet the relationship of the infinite (the creator) to the finite (creation) is neither entirely one of immanence (*tashbīh*) nor one of transcendence (*tanzīh*), since both extremes are incompatible with the ultimate oneness (*tawhīd*) of God. Neither can creation be divine alongside the creator nor can there exist separate realities for each; either case would represent a kind of polytheism (*shirk*) unacceptable in Islam.

The Muslim philosophers largely followed the Greek model of the cosmos, which they understood to be spherical in shape and bounded by the stellar field. The planets, the Sun, and the Moon occupy the middle layers, with the Earth constituting the center. The heavenly world (*al-‘ālam al-ā‘la*), though made up of ether in contrast to the lower world (*al-‘ālam al-asfāl*) which is comprised of the four elements, shares with it the qualities of heat, cold, moistness, and dryness and acts upon it accordingly. The earth’s geography was most often understood in terms of the pre-Islamic Iranian divisions of seven concentric climes (*keshvars*), although the fourfold division of the Greeks and the ninefold version of the Indians were also known.

The Islamic philosophers affirm the position of humans near the top within the hierarchy of created beings, below angels but above other animals, plants, and minerals. Humans are the mediators between the heavenly and earthly realms and a major channel for divine grace. The human body, furthermore, is perceived as a microcosm of the universe, with specific parts of the body being identified with parts of the zodiac and thus subject to their influences.

The so-called Pure Brethren of Basra (*Ikhwān al-Safā*), in their tenth-century treatises collectively known as the *Rasā’il*, write that the study of nature offers proof of God: “Know that the perfect manufacturing of an object indicates the existence of a wise and perfect artisan even when he is veiled and inaccessible to sense perception. He who meditates upon botanical objects will of necessity know that the beings of this reign issue from a perfect artisan” (Nasr 1964/1993). For the Ikhwan, who considered themselves Pythagoreans, numbers were an important means of insight into the ordering of

nature. In one section of their treatise, the Ikhwan present a fictitious court case in which nonhuman animals complain of their treatment by humans. Goodman has drawn attention to the similarity of ecological vision evoked in this tenth-century tract with that of contemporary ecologists (Goodman 1978). The Ikhwan were a marginal group, however, and their views should not be taken to represent the mainstream Islamic thought of their time.

In Sufism

Muslim mystics, known as Sufis, have tended to interpret Qur'anic references to the oneness of God (*tawhīd*) as indicating an underlying unity to all reality. The Andalusian mystic Muḥyi al-din ibn 'Arabi (1165–1240) described creation in terms of “unity of being” (*wahdat al-wujūd*), an idea which won wide popularity among Sufis especially in South Asia where his work remains highly influential. Many mainstream Muslims have found this belief to verge dangerously close to pantheism, however; the seventeenth-century Indian Sufi teacher Shah Waliullah preferred the term “unity of witness” (*wahdat al-shuhūd*) as more clearly maintaining the distinction between creator and creation.

The Sufi notion of the “complete man” (*al-insān al-kāmil*), also elaborated by Ibn 'Arabi, expands the conception of the human being as microcosm of the universe. For Sufis, cultivation of the individual is analogous to cultivation of the cosmos as a whole; thus, one's personal spiritual development can affect the entire world.

To Sufis such as Jalal al-din Rumi (1207–1273), not just animals and plants but the entire universe of creation is alive (Clarke 2003). “Earth and water and fire are His slaves,” he writes in the *Masnavī-yi ma'navī*; “With you and me they are dead, but with God they are alive” (1.838). Nature also speaks, though only the mystics realize this: “The speech of water, the speech of the earth, and the speech of mud are apprehended by the sense of them that have hearts” (1.3279). The conversations of nature are indicative of affective relationships: “You yourself know what

words the sun, in the sign of Aries, speaks to the plants and the date palms/You yourself, too, know what the limpid water is saying to the sweet herbs and the sapling” (6.1068–69). Moreover, the Sufis often employ the symbolism of love (*‘ishq*) to describe the relationship of mutual attraction between the creator and his creation. Yunus Emre, a thirteenth-century Turkish poet, composed the famous line, “We love all creation for the sake of its Creator.”

Many Sufi tales, such as those found in the works of Rumi, Attar, and others, include animal characters, though these are almost always stand-ins for human characteristics associated with particular species. Nonhuman animals are seen as occupying a level below humans, and the “animal soul” of the philosophers is equated by the Sufis with the “lower self” (*nafs*), or one's own baser instincts which along the path of spiritual development one strives to overcome.

Contemporary Islamic Environmental Ethics

While it is important not to romanticize the past – Muslims, like people of all cultures, have not always followed the spirit or the letter of their sacred laws – it would appear from the above that premodern Islamic societies possessed something that might be considered in contemporary terms as having constituted an environmental ethic. And while one may likewise remain skeptical of arguments that Western imperialism alone is to blame for the erosion of traditional norms throughout the Muslim world, it does seem to be the case that traditional Islamic directives enjoining care and restraint in regard to the use of resources have become less apparent in the modern period.

In short, not only are Muslim societies today *not* models of environmental consciousness, in many cases they provide examples of the worst sorts of environmentally destructive lifestyles and development policies. Many of the most severely degraded environments in the world today are those in which Muslims constitute

a majority of the population. While overall per capita consumption and pollution rates are generally less than in Western industrial societies, Muslim countries mostly suffer from acute environmental problems connected with poverty, overpopulation, and outmoded technologies.

Unfortunately, it is also true that Muslim societies today are faced with so many severe problems of all kinds – political, social, and economic – that environmental protection often seems at best a secondary concern. Few Muslims have yet come around to the way of thinking expressed by Stanford biologist Paul Ehrlich, when he stated that “the environmental crisis is the playing field on which all other problems are played out,” or the popular environmentalist image in which the various human struggles going on in the world today are like “fighting over deck chairs on the Titanic.” We are so preoccupied with dealing with the threats approaching us head on that we fail to notice what is happening under our feet.

To be fair, Westerners too have been extremely slow to recognize the severity of the threat posed by global environmental degradation. This is more true than ever today, as the government of the United States of America, the world’s number one polluter, holds ever more firmly to a Pollyanna-esque notion that environmental concerns are overstated and trumped by the unrivaled importance of permanent economic growth. It seems significant that in March 2005, the publication of the so-called Millennium Ecosystem Assessment, in which a 5-year study by 1,360 scientists from 95 countries concluded that human activities have severely compromised two-thirds of the earth’s ecosystems in only the past 50 years, made front-page headlines in Europe and elsewhere in the world but was almost completely ignored by the mainstream media in the USA.

The USA is the world’s richest country, and environmental degradation is typically less worrisome to the rich who can mostly shield themselves from its effects than it is to the poor who suffer from environmental problems most immediately and most severely. In the developing world, the environmental crisis is

often experienced most profoundly by rural women, who are the primary users of natural resources (and whose husbands may be quite disconnected by comparison, away working in urban factories). At the same time, rural women tend to be the most disempowered members of traditional societies, thus the least able to react to the crisis.

Ironically the United States, while remaining the world’s major agent of environmental destruction as well as the leading proponent of unsustainable economic policies and practices, is also the original home of environmentalism in its modern sense. Environmental consciousness, in its contemporary form, emerged in the late nineteenth century among Americans such as Henry David Thoreau, John Muir, and Theodore Roosevelt. Revisionist philosophies which placed humans within and not above natural systems were articulated by Americans such as Aldo Leopold in the 1940s and Edward Abbey in the 1970s. Contemporary environmentalism, as exported to the rest of the world, is thus largely an American product.

This point has not gone unnoticed by environmentalists elsewhere. In a 1989 article in the US-based journal *Environmental Ethics*, Indian sociologist Ramachandra Guha argued that whatever its inherent merits, an environmentalism derived within the particular history and culture of North America cannot simply be applied as a one-size-fits-all model to the rest of the world. The attempt to do so – seen in such examples as the creation of national parks from which human inhabitants are forcibly expelled – too often constitutes a “direct transfer of resources from the poor to the rich” (Guha 1989, p. 75).

It hardly comes as a surprise, then, that environmentalist policies and initiatives in the Muslim world are often seen as merely another example of Western imperialism, an attempt by foreigners, foreign interests, or foreign puppets to meddle in the affairs of Muslim communities for purposes of exploitation and control. It would seem that under such circumstances, environmentalism in Muslim societies would have to develop in an indigenously derived form

seen as locally relevant, if it hopes to take root and flourish. Unfortunately examples of home-grown environmentalism are not yet easy to find in the Muslim world, though they are not nonexistent.

Probably the credit for first beginning to think about the environmental crisis in Islamic terms should go to Seyyed Hossein Nasr, an Iranian-American academic who has been preoccupied with the effects of human activities on natural systems since before Rachel Carson, during his student days in Massachusetts during the 1950s when he would trace Thoreau's footsteps around Walden Pond (Nasr 2003, p. 85). A historian of philosophy and science, Nasr, was struck by how much had changed since Thoreau's time and began to feel that there was a marked difference between Islamic science, in which the pursuit of understanding nature was seen as a sacred undertaking, a way of better knowing the mind of God, and the desacralized scientific approach of the post-Enlightenment West in which nature was seen as mechanical, devoid of life or inherent meaning, and existing only to serve human ends.

Nasr spelled out this distinction in his book *Science and Civilization in Islam* and other works, even preceding by several months Lynn White Jr.'s famous critique of human exceptionalism in Western religions, a 1967 paper titled "The Historical Roots of Our Ecologic Crisis" (White 1967), with a similar argument in a lecture series Nasr gave at the University of Chicago in the summer of 1966 (Nasr 1967). Over the past four decades, Nasr has continued to describe the environmental crisis as one that originates as a crisis of values; his works are cited widely by Muslim environmentalists and as a representative authority by Westerners seeking to include "the Islamic perspective" in discussions on the environment.

The main shortcoming of Nasr's contribution has been that he has always written predominantly for a Western audience of non-Muslims, serving first and foremost as an apologist for Islam. Those Muslims who have read him have almost always read him in English, as his works have been little translated into Arabic or even his own native Persian. His case exemplifies the

paradox that, even among Muslims seeking to derive an environmentalism from within their own tradition, the initial impetus and context is often the West.

The first specifically Islamic treatise on environmental protection, composed by a team of Islamic scholars in Jeddah, Saudi Arabia, in 1983, was commissioned by a Swiss-based environmental organization, the International Union for the Conservation of Nature and Natural Resources (IUCN) (Kader et al. 1983). The resulting tract, which consisted of only 30 pages of text, was very poorly distributed, and its authors have since acknowledged that their efforts to have its findings adopted by policy-makers in Muslim countries have largely failed.

A second effort to articulate Islam-based environmental values came at the instigation of another Western organization, the Worldwide Fund for Nature (WWF). The WWF organized a symposium in Assisi, Italy, in 1986 on environmental values in world religions, to which a Muslim representative was invited and who composed a one-page statement on Islam and the environment (Nasir 1987, p. 47). Later, the WWF expanded their project to commission short edited books of articles on religion and the environment, one book for each major religion. To edit the Islam volume, they approached Fazlun Khalid, a British Muslim of Ceylonese origin who had developed a strong interest in environmental issues through reading the works of Nasr and a number of Western environmentalists.

The WWF volume edited by Khalid and published in 1992 under the title *Islam and Ecology* contained a half dozen brief essays by practicing Muslims which took note of Islamic teachings on the environment and offered explanations for the environmental crisis based on such things as Islamic critiques of the global economy (which, being based on the taking of interest and the unlimited creation of credit, they claimed as fundamentally un-Islamic) (Khalid and O'Brien 1992). Again, this little book was poorly circulated – though it has since been issued in Turkish and Indonesian translations – and was known and used mainly by

Western environmentalists as a statement of “the Islamic position” on environmental protection.

The most sophisticated attempt yet to discuss environmental values through the lens of the world’s religious systems was undertaken in the late 1990s by two professors at Bucknell University, Mary Evelyn Tucker (a specialist in Confucianism) and her husband John Grim (an expert on Native Americans). Tucker and Grim obtained funding from a variety of sources which enabled them to organize a series of ten international conferences on religion and ecology, which were held at Harvard University Divinity School from 1996 to 1998. For the Islam conference, which occurred in May 1998, Grim sought out the organizational assistance of Fazlun Khalid, who drew on his growing international network of Muslims concerned with the environment to come up with a list of participants.

The Harvard conferences, perhaps to be expected of an initial foray into a new field, provided mixed results. At the Islam conference, it was hard not to feel that many of the participants were less interested in saving the environment than they were in taking advantage of an all-expense-paid trip to Harvard. In their presentations many referred to the environment only passingly, some not at all. Though other axes were ground, no hard questions were asked about the treatment of the environment in contemporary Muslim societies, and all problems were blamed on Western interference, Western values, and the erosion of traditional Islamic norms. The dominant theme of the conference was that Islam provides everything necessary for the appropriate management of natural resources and that if Islam were widely and properly practiced, then there would be no environmental crisis to talk about. Issues such as human population control, lifestyles of overconsumption, and animal rights, when briefly raised, were loudly dismissed out of hand by certain vocal participants and not revisited.

Nevertheless, a number of genuinely committed Muslim environmentalists did attend the conference, even if their voices were not prominently heard there. The event at least resulted in both the publication of an edited book, like its predecessor titled *Islam and Ecology* but at 584

pages much more extensive (Foltz et al. 2003), and in the strengthening of a global network of Muslim environmentalists which continues to expand today. Among them can be counted, in addition to Fazlun Khalid, Uthman Abd al-Rahman Llewellyn, an American convert who has spent many years working as an environmental consultant for the government of Saudi Arabia; Turkish theology professor İbrahim Özdemir, author of several books on environmental ethics and now Undersecretary of Education for the Turkish government; Safei El-Din Hamed, professor of landscape architecture at Texas Tech and former consultant to the Egyptian government and the World Bank; and Mohammad Aslam Parvaiz, founder-director of the Islamic Foundation for Science and Environment in Delhi. Özdemir has since arranged for a Turkish translation of the Harvard *Islam and Ecology* volume, while Parvaiz has commissioned an Urdu version for use in the Islamic seminaries of India. Another longtime Islamic environmentalist, Iraqi-born law professor Mawil Izzi Dien, who did not attend the conference but who submitted a paper for the published proceedings, has been attempting to establish a Centre for Islam and Ecology at the University of Wales. Izzi Dien contributed to the 1983 Jeddah tract and is the author of the first book-length treatment of Islam and the environment, titled *The Environmental Dimensions of Islam*, which was published in 2000 (Izzi Dien 2000).

By far the most significant efforts in disseminating an Islamic ethic of the environment on a global scale have been by Fazlun Khalid. Beginning with the establishment of the organization he founded in the early 1990s, the Islamic Foundation for Ecology and Environmental Sciences (IFEES), based in Birmingham, England, this former British civil servant has spent the last decade of his retirement endlessly traveling around the world conducting environmental education seminars in Muslim communities from Saudi Arabia to Indonesia. A project conducted by Khalid among the Muslim fishermen on the East African island of Zanzibar was described by BBC News in early 2005 as a remarkable success.

Such efforts by practicing Muslims, who happen to be environmentalists and therefore seek to

articulate their environmentalism in Islamic terms, may be weighed against initiatives in countries where the environmentalists concerned just happen to be Muslims (Foltz 2005). The international environmental organizations WWF and IUCN, for example, both have offices in a number of Muslim countries. (The IUCN Karachi office is the largest in the developing world.)

As might be expected, organizations that are Western in their origins, outlook, and approach are likely to attempt projects which reflect their Western orientation. Equally predictably, their successes have been mixed, when they have not – as in IUCN Pakistan's attempt to enlist Pathan religious scholars in teaching environmental ethics in religious schools – been acknowledged failures. One significant aspect of the constraints faced by international environmental organizations operating in Muslim countries is that they tend necessarily to be grant driven. That is to say, because they rely heavily on grants to carry out their works, they must devise projects which may reflect more the interests of granting agencies than they do the actual needs of the societies in question.

An exception to this phenomenon can be found in Iran, where NGOs are severely restricted in their ability to solicit or obtain external funding because of a long-standing US-led economic embargo. As a result, environmental organizations in Iran have emerged in a context of independence and localism. Indeed, Iran would seem to offer the most successful example in the world today of a truly home-grown environmentalism (Foltz 2005).

Civil society in Iran benefited greatly from the election of reformist president Mohammad Khatami in 1997. Since then, over 200 new environmental organizations have been officially recognized by the Iranian government. The government of the Islamic Republic itself has promoted an environmentalist rhetoric which is among the most sophisticated and progressive in the world, even explicitly calling for an Islamic approach to environmental ethics, although its rhetoric has not been backed up by action in many cases.

Environmentalism in Iran is seen most tangibly in the proliferation of environmental NGOs, many of which, such as the Green Front of Iran (GFI), have been remarkably effective in raising public awareness and carrying out environmental protection campaigns. And while the government continues to be seen by most Iranians as all talk and no action, Iranian environmentalists at least enjoy the theoretical support of the Islamic state.

While Iran's home-grown environmentalism seems to hold unique promise in the Muslim world today as proof that indigenous, non-Western models can indeed succeed, paradoxically the conditions of enforced independence which gave rise to Iran's unique environmental movement are little appreciated by most Iranians, who are eager to overcome their 25 years of forced isolation and climb aboard the juggernaut of economic globalization. With Iran's entry into the WTO newly on the table for discussion and a president for whom environmentalism seems a lesser priority than challenging the West, the future of Iranian environmentalism may be in question.

In conclusion, a plurality of models currently exists for environmentalism across the Muslim world. Unfortunately, none yet appears up to the task of reducing the momentum of ecologically devastating modernity, which continues its head-long plunge toward global catastrophe. But if there is any hope at all for the world's environmental movements to play a role in slowing the present destructive trends and steering human society toward more just and sustainable alternatives, the planet's 1.2 billion Muslims demonstrably have cultural resources to draw upon which are both compatible with their traditions and hold promise for meeting emerging needs.

Cross-References

- ▶ [Allah](#)
- ▶ [Animal Theology and Ethics](#)
- ▶ [Environmental Theology](#)
- ▶ [Islam: An Overview](#)
- ▶ [Philosophy in Islam](#)
- ▶ [Theology in Islam](#)

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Ecology in Judaism

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Related Terms

[Environmentalism](#); [Jewish religion](#)

Description

Broadly speaking, the term “ecology” connotes a worldview that emphasizes interaction and connectedness: all living and nonliving things are integral parts of the biospherical web; their essence or identity is an expression of connection and context, so that to understand their makeup, it is necessary to consider relations between parts and not just the parts themselves. All life-forms – including *Homo sapiens* – result from the same processes, and given the affinities between humans and nonhumans, the value of nonhumans is not merely instrumental as a resource utility for human beings. It is precisely this misguided instrumental attitude toward the natural world that has led humans to cause serious damage for the earth, a situation which calls for environmental ethics. In a narrower sense, the term “ecology” refers to the science of ecology which has a specific history consisting of individual scientists practicing ecology within definite social and institutional milieus. In popular parlance, “ecology” has become vaguely synonymous with “environmentalism” and denotes an awareness of the current ecological damage to the earth and its inhabitants and the actions necessary to remediate the damage.

Jewish Environmentalism

A Jewish environmental movement emerged in the early 1970s as an apologetic defense against the charge of Lynn White Jr. that the Judeo-Christian tradition, rooted in the Bible, was responsible for the current ecological crisis. In defense of Judaism, Jewish theologians have argued that White and other environmentalists either misread the Hebrew biblical text or lack any knowledge of postbiblical Judaism. An accurate and informed reading of Jewish sources shows that the Jewish religious tradition, and especially the Bible, is replete with ecological wisdom and that its environmental ethics can be used as a basis for sound ecological policies.

While Judaism views the human as the zenith of creation, the Jewish faith does not give license to exploit the earth's resources. Rather, Judaism articulates an ethic of responsibility that enjoins humanity to take care of the world God has created. The biblical narrative of the Garden of Eden, in which the first created earthling was placed "to till and protect it" (Gen. 2:15), serves as a paradigm for the desired relationship between humanity and the natural world: humans must tend to and care for the natural world of which they are part.

Since the 1970s, Jewish environmentalists have mined the Jewish literary tradition for its ecological wisdom, reinterpreting the Jewish heritage in light of environmental concerns and values. In particular, the prophetic commitment to social justice and care for the poor inspired leftist political thinkers, chief among them Arthur Waskow, to preach a Jewish-, religious-, and leftist-oriented environmentalism. Under the broad concept of "eco-kosher," Waskow has integrated a wide-ranging critique of unjust social practices with deep concern for the Earth and its natural resources and compassion for the socially marginal. In 1993, several Jewish environmental organizations coalesced into the Coalition on the Environment and Jewish Life (COEJL). With a membership of about 10,000, this umbrella organization has attempted to educate Jews about environmental matters, inspiring Jews to lead environmentally sound lives, beginning with the greening of synagogues and calling Jews to lend their support to various legislative organizations and to enter into interfaith dialogue on environmental matters. In the past two decades, several Jewish organizations and educational initiatives in North America (e.g., ALEPH, Alliance of Jewish Renewal, Isabella Freedman Center, Hazon, Kanfey Nesharim, Shalom Nature Center, Tel Shemesh, and others) have attempted to cultivate a Jewish ecological outlook and a program for Jewishly environmental activism rooted in Jewish values.

However, the message that Judaism can be part of the solution to the environmental crisis

and that Judaism approaches the environmental crisis in its own distinctive manner has been slow to spread. Jews either assume that Judaism has little to say about environmental matters or presuppose that Judaism and environmentalism are inherently incompatible. The inherent tensions of Jewish ecological discourse are most evident in the State of Israel. A strong theme within early Zionism conceived the return to the Land of Israel as the return of the Jews to nature, but the complex situation in the modern State of Israel illustrates the paradoxes of Zionism. On the one hand, intimate familiarity with the landscape of the land, its flora and fauna, and the concern for the preservation of the physical environment are popular among secular Israelis, but they are not legitimized by appeal to the religious sources of Judaism. For secular Israelis, attention to environmental issues has more to do with western orientation and links to the environmental movements in Europe and North America than with Judaism. On the other hand, Jews who are anchored in the Jewish tradition tend to link their love of the Land of Israel to the creation of a religious-nationalist vision, which has little to do with environmental values and sensibilities. In fact, these religious-nationalist groups have no qualms committing various environmental sins (e.g., uprooting ancient olive groves) in order to advance their nationalist agenda (i.e., the settlement of Greater Israel) at the expense of the nationalist agenda of the Palestinians. The ongoing Israeli-Arab conflict and especially the Israeli-Palestinian conflict have exacerbated the environmental challenges in the Land of Israel, but, conversely, acute environmental problems such as water shortage that affects Arabs, Israelis and Palestinians have actually inspired some promising Israeli-Arab-Palestinian collaboration. In the past decade, Jewish religious environmentalists have established various educational efforts (e.g., Heschel Center for Education and Environmental Leadership and *Teva Ivry* [Hebraic Nature]) to ground environmental activism in the religious sources of Judaism.

Today, a small but growing body of environmental Jewish discourse articulates a distinctive Jewish presence in the environmental conversation about religion and ecology worldwide. In the State of Israel, a robust environmental movement is involved not only in environmental education and advocacy but also in legislation and political action. Yet in both the State of Israel and the Diaspora, the Jewish environmental movement takes the environmental crisis as a fact to which humans must respond; the movement does not engage the ecological crisis as a scientific question. Scientific findings about particular environmental problems such as soil corrosion, extinction of species, loss of biodiversity, deforestation, or pollution of air, water, and soil are used as evidence to chart the appropriate courses of action. The scientific data about the physical environment are coached neither as “old ecology” (i.e., the view that nature exhibits inherent harmony, order, and beauty) nor as “new ecology” (i.e., a view that highlights the “dark side of nature” due to predation, competition, struggle, conflict, and strife). The call for preservation and protection of natural resources or to find political solutions to growing environmental problems is rooted not in the science of ecology but in the Jewish commitment to justice and the Jewish ethics of responsibility, whether these are anchored in the Jewish religious tradition or given a secular interpretation. Ethics takes precedence in Jewish environmentalism today.

Torah Versus Nature in Premodern Judaism

The complexity of Jewish attitudes toward the natural world could be traced to two foundational beliefs of Judaism: first, that God created the world and continues to manage it and care for it, and second, that God revealed His will to Israel, the chosen people, in the form of Torah. The dominant doctrine of creation insists that God is *not* part of nature and that nature is *not* intrinsically holy. Nature only points beyond itself to the Creator God who has entered a special relationship with one species – the human species – and with one

group of humans, Israel, namely, the covenant. As part of His covenant with Israel, God revealed the law that specifies how Israel is to treat the natural world. These commands constitute the Jewish religious environmental ethics that includes the following principles: First, the world belongs to God, its Creator, and humans are but temporary tenants who should treat God’s world with care. Second, humans, who are created in the image of God, must follow divine commands and protect God’s creation from wanton destruction (*Bal Tashchit*). Third, humans should imitate God who rested at the end of the act of creation; humans and their domestic animals must rest on the Sabbath and extend rest to the Earth in the sabbatical year. Fourth, humans must prevent needless suffering of animals (*tza’ar ba’aley hayim*), even though humans are allowed to eat certain animals which should be killed and prepared in a certain way. Finally, how humans care for the weak and vulnerable of their society determines the well-being and fertility of the earth. These principles are applied first and foremost to the Land of Israel, the collateral of God’s covenant with the chosen people; when cruelty and greed exceed what the land can bear, God exiles the people of Israel from the Land of Israel.

Although the ecological wisdom of the Bible could inspire sound environmental policies, the belief that God revealed His will to Israel in sacred texts also set Judaism as a religion of a Book in which nature was understood, experienced, and interpreted through the prism of Scripture. From the priestly reforms that produced the Book of Deuteronomy, through the Pharisaic interpretation of Judaism during the Second Temple, and into the rabbinic Judaism of the Talmudic period, Judaism emerged as a scholastic culture that over time brought about the increased alienation of Jews from the natural world. In rabbinic Judaism, the Torah was regarded as the sacred medium for communication between God and Israel and the exclusive object of love, devotion, and veneration. To worship God, Israel should study the Torah and behave according to its commandments as expounded in the authoritative interpreters of the Torah, the rabbinic sages, and their heirs through the generations.

The exclusive study of the Torah and the acts that follow from it stand in some tension with the worship of nature (Mishnah Avot 3:7).

The rabbinic movement created a comprehensive lifestyle that was text-centered, a life of prescribed commandments of Torah study. For observant Jews in the premodern world, nature was good but not holy; it could be made holy, or sanctified, through the observance of divine commands that pointed to the divine Creator as the source of meaning and value rather than to nature. Nature (or what “is”) does not dictate what ought to be; only divine revelation articulates the moral norm (what “ought” to be). Historical circumstances further contributed to the disconnect between Jewish communal life and the physical environment: the exile of the Jews from the Land of Israel, urbanization of the Hellenistic world during which rabbinic Judaism came into existence, the occupational shift from agriculture to commerce in the Islamic world, and the restriction on Jewish ownership of land in the Christian world. All of these factors brought about growing alienation from and indifference to the immediate natural environment in which Jews lived. While caring little for the environment where they actually lived, Jews continued to yearn to return to the Land of Israel in the messianic age.

In the middle ages, Jewish philosophers theorized about nature. Especially in Muslim lands, rationalist philosophers were very interested in the natural world as an object of study since in the regularity and orderliness of nature one could discover how God manages the world and come closer to the knowledge of God. Jewish rationalist philosophers were not only interested in the laws of nature as explained by the physics of Aristotle, but they also held that the hidden meaning of the Torah means what natural philosophy, that is, Aristotelian science, teaches. In the middle ages, the study of the laws of nature was seen as a religious obligation.

The medieval worldview and its culture ended for Jews only in the eighteenth century with the emergence of the modern nation-state that could not tolerate the semiautonomous communal life of Jews. From the end of the eighteenth century

and throughout the nineteenth century, European Jews began to demand an end to centuries of discrimination, exclusion, and marginalization and demanded civil rights and social inclusion. By the 1870s, Jews in Western and Central Europe indeed received civil rights, but granting civil rights to Jews did not entail social acceptance; the emancipation gave rise to ongoing internal debate about the meaning of Jewish identity, and the emancipation unleashed a backlash in the form of racial anti-Semitism. All these factors played a role in how “nature” was construed in Jewish discourse during the nineteenth century.

“Religion” and “Science” in Modern Judaism: The Debate about Evolution

As Europe made it possible for Jews to integrate into majority society and culture, Jews flocked to the universities, whose doors had previously been closed to them. Many Jews were attracted to the natural sciences, especially the new disciplines of chemistry, microbiology, and medical biology. In some scientific fields, Jews were disproportionately represented and reached outstanding achievements; other fields were shaped entirely or mainly by Jewish scientists. For Jews who wished to become part of European culture, modern science became a substitute for religion, although, ironically enough, it was the lifestyle of traditional Judaism with its insistence on study, meticulous observance of laws and commitment to the pursuit of truth that generated the personality type suitable for the rigors of scientific inquiry. Since academic excellence did not guarantee academic appointments or social acceptance, conversion to Christianity was rather common, being seen as a path toward full integration that many Jews coveted. For those who remained loyal to the ancestral tradition, the meaning of Jewish identity became hotly contested, resulting in diverse ways of being Jewish. Some insisted on the modernization of Judaism from within (Reform); others insisted on the timelessness of Judaism, although they accepted the validity of modern culture and

consented to superficial changes in Jewish practices (positive-historical school and neoorthodoxy), and still others rejected the winds of change and erected an ever higher fence around the Torah to defend Judaism from modernity and modernization (ultra-Orthodoxy).

These developments brought a cleavage between the natural sciences and religion in Judaism, which was simply unknown in the premodern world. Unlike Maimonides and the late medieval Aristotelian Jewish philosophers, nineteenth-century Jewish theologians, especially if they were associated with the movement for religious reform, did not consider the study of nature a religious obligation. As “science” and “religion” grew apart from each other, theologians held that scientific knowledge about nature was to be found in the laboratories of the modern university rather than the sacred texts of the Jewish tradition. The role of the theologian was not to speculate about the natural world, but to defend the rationality of the scriptural tradition which had come under the scrutiny of yet another modern science: the science of history. Historicism in the nineteenth century invalidated many religious claims by questioning the divine origin of scriptural texts, showing them to be but human-produced documents.

In contrast to their Protestant counterparts, Jewish theologians who agitated for Reform Judaism did not turn to the Book of Nature to justify their claims but rather focused on the rationality of the doctrine of revelation. They continued to see the Bible as a revealed text, although they challenged the authority of its rabbinic interpretation. Without loyalty to revealed Scripture, they believed, Jewish religious identity could not be maintained. Thus, Ludwig Steinheim (d. 1866), Solomon Formstecher (d.1889), and Samuel Hirsch (d. 1889) all attempted to prove that revelation is logically plausible and that Judaism is the highest expression of universal, rational, and moral religion. They focused on the meaning of revelation and employed the philosophy of Kant, Hegel, and Schelling to articulate the intellectual content of the Jewish religion. The doctrine of creation, which was the primary context for the Jewish reflection on nature among medieval and early

modern thinkers, became less important to these theologians because they presented Judaism as a spiritual religion that transcends nature. Presumably, only pagan religions identify God with nature, while rational, ethical Judaism based on the teachings of the prophets is the ultimate rejection of paganism including its Christian manifestations.

The core theory of the science of ecology – the theory of evolution – generated diverse Jewish responses. In Europe, especially in Germany, nineteenth-century theologians of the Reform Movement, who endorsed modernization and acculturation, defended Judaism as a rational religion and insisted that in principle, Judaism has nothing to fear from modern science. Although a radical and rationalist form of Reform Judaism had developed in Germany, viewing Judaism as faith in ethical monotheism, it did not necessarily entail openness toward Darwin’s theory of evolution. Abraham Geiger, for example, the leading Reform theologian, rejected outright the transmutation of species, using standard arguments from the 1860s: the moral and rational gap between humans and animals, the harmony evident in organic nature, and the apparent incapacity of natural forces to produce new species. However, the historical gist of the theory of evolution was adopted by several Jews (e.g., Zecharias Frankel), who sought modernization of Judaism and who argued that the Jewish religion developed over time.

In Victorian England, the coherence of Judaism and science (including the theory of evolution) was the standard view of Anglo-Jewry. The presumed alliance between Judaism and science was expressed in the pages of the *Jewish Chronicle* and fits well with the assimilationist tendency of the rising middle-class English Jewry. In contrast, the less assimilated and generally poorer members of the community, who tended to read the *Jewish Record*, were more aware of the challenge that the science of evolution posed to Judaism. The communal leaders insisted on harmony between Judaism and science, as a survival strategy against anti-Semitism, on the one hand, and assimilation, on the other hand, but a radical, rationalist Reform Judaism did not take root in

England. There was only one rigorous scientific defense of the theory of evolution by the eminent Jewish naturalist, Raphael Meldola, who considered the theory of evolution to be in full accord with the highest standard of scientific method and who saw no incompatibility between being an evolutionist and a materialist and being a Jew, albeit an assimilated one. He was the exception rather than the rule.

In America, the debate about Darwin's theory of evolution was much more rigorous, but it emerged only after the publication of the *Descent of Man* in 1871. Rabbi Kaufmann Kohler (d. 1926) endorsed the theory of evolution which he viewed as a scientific proof for the Reform understanding of Judaism, that is, as a progressive religion that evolved in morality and conceptions of God from biblical times to the present. Kohler ignored the theory of natural selection and defined Darwinism as "the natural law of progressive development of life under favorable conditions." The major critic of evolution among Reform Judaism, Rabbi Isaac Mayer Wise (d. 1900), understood natural selection to be a natural law in which survival of the strongest prevails. For him, nature was indeed a "battle ground" which robbed the moral law as taught by Judaism of its legitimacy. Wise developed his own theory about the history of life which acknowledged that the Jewish religion like nature is bound by a law of evolution, meaning that it progresses from lower to higher forms. However, he did not adopt the theory of progressive revelation and opposed the notion of gradual continuous transmutation of species.

At stake in the debates about evolution were not the varying theories of evolution, but the implications of the concept of progress for the Jewish religion. A few Reform rabbis followed Wise in rejecting evolution on the ground that it is improbable, but several traditionalist Jews began to consider arguments against evolution on the basis of specific references in Genesis. The traditionalists understood that the evolutionary theory denied the belief that God created the world according to his free will and insisted that the materialism and atheism associated with evolution also undermine human accountability before

God which results in nihilistic and immoral behaviors. The traditionalists gave rise to Conservative Judaism which offered a way for numerous Jewish migrants from Eastern Europe to Americanize while remaining loyal to their traditional Jewish lifestyle.

In the twentieth century, the theory of evolution has generated much less debate among Jews than among Christians. Leading evolutionary biologists and ecologists – Stephen Gould (d. 2002), Richard Lewontin (b. 1929), Lynn Margulis (b. 1938), and Lawrence Slobodkin (d. 2009) – are born Jews, but their scientific research is not informed by the sources of the Jewish tradition, since they tend to see science and religion as two "nonoverlapping magisteria." Conversely, there are Jewish scientists (especially physicists) who are religiously committed and scientifically educated – Nathan Aviezer, Gerald Schroeder, and Judah Landa – who have attempted to show that the doctrine of evolution does not violate the literal meaning of the biblical creation narrative. For them, there is no conflict between the Torah and science, only between rabbinic interpretation of Torah and science. When the Bible is properly interpreted, these seeming problems "dissolve into nothingness." Today, the ultra-Orthodox world has become less and less interested in contemporary science and more willing to interpret the biblical text literally. Thus, in 2004, the works of the Orthodox rabbi Nossin Slifkin, who attempted to integrate the belief that the earth is millions of years old with Jewish traditional sources, generated a heated controversy and were banned by some authorities. As a result, the teaching of evolution in Orthodox and ultra-Orthodox schools has clearly stalled, and these communities show relatively little interest in ecological or environmental matters. The situation is somewhat better in Israel, where rulings by Ultra-Orthodox authorities at times impinge on environmental issues.

Ecological Strands in Modern Judaism

Ecological thinking is rather marginal in modern Jewish thought, but several modern Jewish

thinkers could be labeled “ecological” because they highlight interaction and connectedness between all living and nonliving things, they reject the notion that nature has only instrumental value as a resource utility for human beings, and they promote a view of nature as a source of moral obligation and/or spiritual vitality. A few examples will illustrate ecological tendencies in Modern Orthodoxy, Zionism, and the Jewish Renewal Movement. The impetus for these ecological reflections does not come from the science of ecology, but it is possible to find within modern Jewish theology a few ecological voices. Some of them view nature as holistic, stable, and balanced, while others recognize that nature as a dynamic, perpetual flux.

Modern Orthodoxy

Modern Orthodoxy was founded in Germany by Samson Raphael Hirsch (d. 1888), as a response to the movement for religious reform. While Hirsch endorsed the Jewish struggle for emancipation and advocated openness toward European secular culture, he defended the traditional doctrine of “Torah from Heaven” and rejected the reformers’ critique of rabbinic Judaism or their tendency to discard traditional practices and introduce new rituals. In accord with rabbinic Judaism, Hirsch argued that God, the Creator of the world, gave humans the *right* to rule nature, but that this right came with the *duty* to treat God’s created order in accordance with divine will. According to Hirsch, the human is part of nature, indeed a “brother to all creatures,” but like the first born in a Jewish family, the human also has special privileges and obligations. Hirsch held that human mastery over nature is about the fulfillment of the human rational, God-given, free will, but the human right of mastery over nature depends on the extent to which the human will corresponds to God’s will. The Torah itself thus discloses how nature is to be treated with justice and respect.

In his classification of Jewish laws, Hirsch placed the commandment “Do Not Destroy” (*bal tashchit*) at the head of the section on the *Hukkim* (decrees), which were legislated by God primarily for the protection of nature from human

avarice and exploitation. Heedless destruction of nature reflects human arrogance and rebellion against God, but the laws of the Torah assure that humans behave wisely and judiciously to protect the integrity of the natural world and its perpetuation. For Hirsch, the created world exhibits not only inherent purpose but also orderliness, intelligence, and interdependence. Given the remarkably wise design of the universe, humans have an obligation to protect the natural world. Indeed, Scripture prohibits copulation of diverse animals, grafting of diverse trees, yoking together of diverse animals, wearing of wool and flax, and mixing of milk and meat. These laws are rooted in the act of creation when God separated His creatures “each according to its kind.” Through the Torah, the Creator of the world functions as the “regulator of the world”; the human who was appointed as the “administrator” of God’s estate executes the rules that ensure protection of nature. In Hirsch’s analysis of the *Hukkim*, nature serves as a model for observance of divine commands and places its own demands or commandments on humans. Hirsch’s approach thus exemplifies how Modern Orthodoxy can support Jewish religious environmentalism.

Zionism

Jewish religious environmentalism accords a place of honor to the Land of Israel, the Holy Land, which serves as collateral in the covenant between God and the people of Israel. The Bible, however, makes clear that the Land of Israel was given to Israel conditionally: so long as Israel observes God’s will and follows His commandments, including the commandments for the treatment of nature, and the land remains fertile and provides the people of Israel with abundance. But when Israel rebels against God and sins against God, the Land becomes infertile and desolate; when sinfulness abounds, God exiles Israel from the Land of Israel. Throughout their long exilic existence, Jews have yearned to return to the Land of Israel, but they postponed the fulfillment of this dream to the Messianic Age of the remote future. At the end of the nineteenth century, however, Zionism rebelled against the passivity of traditional Jewish messianism by insisting that Jews take the

initiative to leave their countries of residence and settle in their ancestral home. Only in the Land of Israel could the Jews become a normal nation with its own political sovereignty, spoken language, and unique culture. For Zionist ideologues, the return of the Jews to the Land of Israel was not only a secularization of the messianic dream, it was also a call for the return of the Jews to nature in order to create a new “muscular Jew,” a physically strong, fearless Jew who celebrates the rhythms of nature and derives vitality from nature.

The return of nature played a central role in the original and highly creative thought of Aharon David Gordon (d. 1922), the spiritual leader of Labor Zionism. Although he grew up in an Orthodox home in Russia, Gordon studied European philosophy and literature and was particularly influenced by Friedrich Nietzsche, Henri Bergson, and Leo Tolstoy. Settling in Palestine in 1904, Gordon joined the agricultural settlements and experienced the hardship of pioneers’ life in order to exemplify his call not just for the Jews but for all of humanity. For Gordon, the Jews’ return to their land symbolized humanity’s return to nature and the renewal of the relationship (indeed the covenant) between humanity and nature which was destroyed by culture, especially modern, urban, and industrialized culture. Gordon contended that human beings should strive “to live with and in nature,” because the universe is an organic totality enlivened by divine energy that pulsates through all levels of reality. Emerging out of the organic totality, humans have reached the most developed state of being: culture and self-consciousness. Yet these are also the causes for human alienation from nature. The human tragedy is especially severe in the case of Jews because they seek to assimilate into western Christian culture, denying their roots in the Land of Israel, the Jewish nation, and in the Hebrew language. Only agriculture and farming could reconnect modern, alienated Jews to the sources of cosmic creativity, enabling them to live most authentically as Jews as well as human beings, an ideal he exemplified in his own life.

Gordon’s thought has a strongly pantheistic character, which could be traced to various intellectual sources, both Jewish (i.e., kabbalah and

Hasidism) and non-Jewish (i.e., Bergson and Tolstoy). He viewed nature as an organic totality out of which emerges human consciousness, and he called the totality of nature *havaya*. Literally, this means “being” but is in fact the four letters of the Tetragrammaton arranged in a different order. Secularizing the notion of divine immanence, Gordon understood “being” as a dynamic, ever-changing living force in constant flux that pulsates throughout all levels of reality. Humans can experience the hidden aspect of nature only through direct intuition arising through manual labor which overcomes the alienation of mankind from nature. For Gordon, the regeneration of humanity and the regeneration of the Jewish people could come only through the development of a new understanding of labor as the source of genuine joy and creativity.

Jewish Renewal Movement

The Zionist call for the return of the Jews to nature illustrates the traditional Jewish idea of *teshuvah*. The term is usually translated as “repentance,” but its Hebrew stem connotes both “to return” and “to reply,” so that *teshuvah* means both a movement of return to one’s source, to the original paradigm, and simultaneously a response to a divine call. *Teshuvah* thus involves a spiritual reorientation or a transformation of the self away from an inauthentic way of life lacking creative force and toward the authenticity that is characterized by continual creativity and renewal. In America, during the second half of the twentieth century, this concept gave rise to the Jewish Renewal Movement.

The catalyst for the birth of this new movement was Rabbi Abraham Joshua Heschel (d. 1972), a Polish Jew who was born into a Hasidic family, but who also received modern university training. Heschel managed to flee Nazi-occupied Poland and settled in America in 1941 where he inspired scores of alienated American Jews to find their way back to the sources of Judaism in order to heal the atrocities of modernity, which culminated in the Holocaust. Heschel’s ecologically sensitive depth theology spoke of God’s glory as pervading nature, leading

humans to radical amazement and wonder, viewed humans as members of the cosmic community, and emphasized humility as the desired posture toward the natural world. Another product of Hasidism and a refugee from Nazi-occupied Europe was Zalman Schachter-Shalomi (b. 1924), who founded the Jewish Renewal Movement in the late 1960s. His creative reinterpretation of Judaism combined a “Gaia consciousness” with psychological interpretation of Lurianic kabbalah and New Age spirituality. Schachter-Shalomi urged a paradigm shift from monotheism to pantheism within Judaism but did not intend to revive neo-pagan pantheism. Instead, he offered contemporary Jews a new way to infuse Jewish life with rituals that envision a God who is an integral part of all human civilization. He articulated the view that all of humanity has a specific responsibility for that relationship. The rituals of the Jewish Renewal Movement are all contemporary variants of traditional Jewish practices (e.g., the pilgrimage festivals), but the movement inspires an ecologically based Jewish spirituality.

Shachter-Shalomi’s ideas were systematized into Jewish ecology by Arthur Green (b. 1941) who, under the influence of kabbalah, presented a holistic view of reality in which all existents are in some way an expression of God and are to some extent intrinsically related to each other. Green combines evolutionary theory (albeit without engaging its scientific details) with kabbalah and neo-Hasidism. He argues that the traditional doctrine of creation can no longer serve Jews in an age of science. Taking the evolutionary theory as descriptively true, Green reinterprets the biblical doctrine of creation that adopted the ontological schema of kabbalah. Offering a progressive interpretation of evolution as the emergence of ever more complex forms of life culminating in human beings, Green presented a holistic view of reality in which all existents are in some way an expression of God and are to some extent intrinsically related to each other. Contrary to those who hold that in Judaism nature per se is not sacred, Green wishes to obliterate the ontological gap between the Creator and the created. Instead, he adopts the monistic and

immanentist ontology of kabbalah and blurs the distinction between creation and revelation. The world and the Torah are both God’s self-disclosure and both are linguistic structures that require decoding, an act that humans can accomplish because they are created in the image of God. From the privileged position of the human, Green derives an ethics of responsibility toward all creatures that acknowledges the differences between diverse creatures while insisting on the need to defend the legitimate place in the world of even the weakest and most threatened of creatures. For Green, a Jewish ecological ethics must be a *torat hayim*, namely, a set of laws and instruction that truly enhances life.

Conclusion

Jewish-revealed legislation about nature constitutes a program for the preservation and conservation of a world that belongs ultimately to God. As God’s viceroys in the world, human beings carry out divine instructions because humans alone are endowed with the capacity to be responsible for others. The most distinctive feature of Jewish ecological thinking is the concept of responsibility and the ethics of care that flows from it, that is, care for the needy, the weak, the vulnerable, and the marginal. Jewish environmental ethics is decidedly anthropocentric, and it calls humans to action toward other humans and toward nonhuman creatures. Jewish environmental ethics of responsibility stands in conflict with any outlook that denies human uniqueness, be it deep ecology or Darwinism, especially in its distorted Nazi interpretation. Most distinctively, Jewish environmental ethics sees a causal link between moral failure and injustice in the social realm and environmental degradation. Greed, exploitation, and a lifestyle of material excesses ruin not only other humans but also the natural world. The Jewish tradition thus extols the merit of moderation and calls one to cultivate virtues such as modesty, humility, and self-restraint. These virtues and the actions that flow from them prevent the tendency for cruelty, including cruelty toward animals.

Although the Jewish tradition has many resources for the articulation of a distinctively Jewish approach to environmentalism, the science of ecology merely provides the information about the current ecological problems that the Jewish thinkers must address.

This is especially evident in the case of the environmental movement in Israel. In the Diaspora, Jewish ecological thinking is mainly theological and could be seen as a Jewish commitment not only for the preservation and conservation of nature created by God, but as a commitment to preservation of life itself. This commitment receives special significance after the Holocaust, since the Nazis were determined to annihilate the Jewish people as a particularly pernicious subhuman species. The most profound ecological response to the atrocities of the Holocaust was articulated by the German-Jewish philosopher Hans Jonas (d. 1993), who showed how to erase the gap between “is” and “ought” which in his view undergirded the instrumentalist attitude toward nature. For Jonas, life itself is endowed with moral significance rooted in the “needful freedom” of every organism. Jonas’s critique of technology inspired the Green movement in Europe, but his anti-utopian thought has made relatively little impact on Jewish intellectual life in the twentieth century.

As awareness of the ecological crisis becomes more prevalent among Jews, it is reasonable to expect that Jewish ecological thinking will become more prominent in the twenty-first century. But for this to happen, a new creative interplay between “science” and “religion” will have to come about as Jewish intellectuals become conversant in the science of ecology as well as in environmental philosophy and ethics, responding to them on the basis of the religious sources of Judaism.

Cross-References

- [Creation in Judaism](#)
- [Judaism: An Overview](#)
- [Natural Sciences in Judaism](#)
- [Natural Selection](#)
- [Process Theology](#)
- [Revelation in Judaism](#)

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Economic Sociology

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Related Terms

[Business life](#); [Economy](#)

Economics is the study of people “as they live and move and think in the ordinary business of life” (Marshall 1890 [1949]: 12). Sociology is “a science which attempts the interpretative understanding of social action in order thereby to arrive at a causal explanation of its course and effects” (Weber 1922 [1947]: 88). Economics is production, consumption, distribution, and exchange. Sociology is meaningful interaction and recognized interdependence. Economics is

the activity. Sociology is the lens that makes sense of the activity. Economic sociology is the synthesis of the bedrock and the filter. It is a combination of making and getting on the one hand, socialization and culture on the other.

At the stage of production the organization hires inputs which have a pulse. Labor is supplied in the light of intrinsic and extrinsic motivation, Weber's work-ethic, and the socialist's class-based perception of injustice and exploitation. Capital is accumulated through gratification deferred and credit extended, normative rationality and unions contained. Land is the property of a third estate, at once return-seeking and history-dominated. Rent in a modern economy is a form of profit. Rent in a traditional economy is how the hereditary aristocracy defines its social space.

At the stage of consumption it is the lesson of institutional comparison that commodities are not just the disembedded bearers of individual utility but also vocal modes of self-presentation and identification (Goffman 1959). As signifiers they confirm that the user is cognizant of the code and conforms to the pattern: "A man would be ridiculous who should appear in public with a suit of clothes quite different from those which are commonly worn" (Smith 1759 [1966]: 284). As trophies they are proof that the contender has played a zero-sum game and defeated his second-best rivals: "In order to gain and to hold the esteem of men it is not sufficient merely to possess wealth or power. The wealth or power must be put in evidence" (Veblen 1899 [1970]: 42). In some societies, esteem is earned through political leadership or acknowledged wisdom. In other societies, standing is purchased through earning and spending: "I am not *ugly*, for the effect of *ugliness* – its deterrent power – is nullified by money" (Marx 1844 [1973]: 167).

That is why the distribution of income and wealth is so important. More spending means more respect. More property means more power. Ownership creates a master-servant relationship which can be perceived as demeaning and undeserved. Alienated lumps of labor might prefer consultative producer-cooperatives in which all surplus value reverts to the productive. The liberal society might find the inheritance of

capital at variance with the free market criterion of achieved status. Sometimes, however, the intergenerational transmission of advantage will be seen in a more attractive light. Sentimental social conservatives will define it as the embodiment of the unbreakable links of kinship and the perpetuation of a going concern.

At the stage of exchange there is the agreed-upon *quid pro quo*. Exchange is theft unless the contract is supported by non-contractual consensus: "There is no truly moral force save that involved in attachment to a group" (Durkheim 1925 [1961]: 87). The protection of title is ensured both by widely diffused norms and by the monopoly of legitimate authority that is exercised by the judges and the politicians.

Exchange presupposes the socially validated standard of reciprocity. This may build upon the convention-driven exchange of Malinowski's *kula* (Malinowski 1922) that is handed on through the non-mercantile custom of Christmas presents and the multi-party social exchange of integrated blood donors who confidently stake their survival on an uninsurable return gift: "In not asking for or expecting any payment of money these donors signified their belief in the willingness of other men to act altruistically in the future" (Titmuss 1970 [1973]: 269). Alternatively, exchange may build upon the neoclassical economist's rational calculation of costs and benefits in a resource-scarce world where optimizing catallactics has the missionary function of satisfying discrete and multiple desires: "It gives people what they want instead of what a particular group thinks they ought to want" (Friedman 1962: 15). Exchange is broader than utility and profit alone.

Exchange is often defended with the argument that the free market is anonymous and impartial. An alternative perspective is that economic decentralization works well precisely because of replicated interactions, return business, reputational capital, and embedded conventions that save on the transaction costs of collecting information and monitoring shirkers. Putnam, writing about who-knows-whom, observes that "social networks allow trust to become transitive and spread: I trust you, because I trust her and she

assures me that she trusts you” (Putnam 1993: 169). Granovetter found that as many as 56% of jobs were secured through personal contacts external to the firm (Granovetter 1974 [1995]: 11): “Economic action (like all action) is socially situated, and cannot be explained by individual motives alone; it is embedded in ongoing networks of personal relations rather than carried out by atomized actors” (Granovetter 1992 [1996]: 270). It is Chinese *guanxi*, Soviet *blat*, and Japanese sequential contracting that is the ultimate guarantor of truth-telling and the categorical imperative. A businessman does not cheat his wife’s brother or a new immigrant from the village where his kinsfolk live. The allocation of resources in this way becomes a path-dependent history of remembered relationships.

Economics is production, consumption, distribution, and exchange. Yet, it is also political economy, situated at the confluence of market homeostasis and the visible hand. The State coordinates entitlements and regulates spillovers. Thus, Pigou maintained that where the marginal social benefit differed from the marginal private benefit, the missing market necessitates corrective action through taxes and subsidies (Pigou 1920 [1932]). Coase argued the opposite, that only the factored-down one-off is in a position to buy and sell an externality precisely because only the isolated utility-seeker can know what will make him feel better off in his own estimation (Coase 1937 [1988]). Ostrom for her own part assigns pride of place to social infrastructure (Ostrom 1990). Tribal loyalties and Tönnies’s *Gemeinschaft* (Tönnies 1887 [2001]) ensure that Pigou’s intervention and Coase’s privatization will not be required to prevent the overgrazing of the commons. Affect and belonging will be enough.

Fred Hirsch writes that “the controllers usually have a large handicap of relevant information. Only I can see everywhere I litter” (Hirsch 1977: 150). He then observes that socialized men and women will be led as if by a guilty conscience to act out the drama for which their evolving society has kindly scripted the scenario. One by-product is voluntary action and nongovernmental organizations. Standing between market and State are environmental

lobbies that speak for the whales, and welfarist pressures that speak for the old. Civil society is not supply and demand and it is not the *diktat* from the top. It is, nonetheless, an economically relevant constituency which is incorporated with great difficulty into Spencer’s Manichean *The Man Versus the State* (Spencer 1884).

Yet globalization is a challenge to a single country’s *conscience collective*. Internationalization could mean the emergence of a worldwide consensus even as it could mean the babel of *anomie*. Local knowledge is becoming a nonlocal thing. Increasing integration takes Keynesian demand-management and the social welfare democracy beyond the territoriality of a Whitehall or a Washington alone. As problems become shared, so shared solutions emerge in the form of the European Union, the European Central Bank, the World Health Organization, and the multinational conglomerate answerable to no polity but the color of money. A multi-societal society is inevitable. In evaluating the new skein of affiliation, the cross-disciplinary subject-area of economic sociology will have an important role to play.

Cross-References

- Epistemology
- Ethics
- Evolution
- Functionalism
- Functionalism in Sociology
- Globalization, Sociology of
- History of Ideas (Intellectual History)
- Political Theory
- Rationality (Philosophical)
- Social Psychology
- Wisdom (Philosophically)

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Economy

- [Economic Sociology](#)

Ecotheology

- [Environmental Theology](#)

Ecumenism

- [Pluralism \(Religious\)](#)

Eddington

- [Relativity](#)

Education

- [Intelligences, Multiple](#)

Education in Buddhism

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Related Terms

[Buddhist doctrine](#)

Education as a term does not exist in early Buddhist scriptures, i.e., the canonical texts of the Pali-Canon. Similar to Plato's Politeia – a political script containing the first systematic theory of education in the Occident – early Buddhist writings expound an educational philosophy and methodology embedded in its philosophical or spiritual content. This becomes obvious when Buddhist texts are screened on behalf of the three main quests of educational theory:

1. The anthropological: What is a human being?
2. The teleological: What is a human being supposed to be or become?
3. The methodological: How can education help the individual to achieve its teleological purpose? (Böhm 1994).

In the following, Buddhist tenets regarding these aspects will be outlined in relation to their educational implications.

Anthropology

Human beings are, according to early Buddhist philosophy, beings among seven other categories of beings, i.e., animals within 31 planes of existence (U Ba Khin 1951). Contrary to other forms of existences, humans are regarded privileged, as due to their mental capacity and the ability of self-awareness, progress and development are easier to accomplish. Furthermore, since human beings experience happiness and pain, the urge to emerge from suffering functions as a driving force, supporting a progressive attitude.

Human beings are born in the plane of *Kāma Loka*, a sensual world with mind and matter. Here, matter comprises of eight to ten qualities that constitute the whole of the material world. The basic components are extension, cohesion, kinetic energy, motion, and space. They can be accompanied by subsidiaries like color, odor, taste, nutritive essence, consciousness, and sex. The smallest unit of matter is called *kalapa*. It is only when a minimum of eight nature elements (four basic components accompanied by subsidiaries) are combined that a *kalapa* is formed. This constitutes mass in the description of Buddhist philosophy. These *kalapas* are in a state of perpetual change or flux. They are merely a stream of energies. The body of a human being is not an entity in Buddhist doctrine but a continuum of matter and life force coexisting. Through meditation, activating the introspective qualities, a human being can develop the ability to perceive his own body and external material objects as mere energy and vibration.

The mental aspects of human beings are divided in 121 categories which are explained in detail in the *Abhidharma*, the scholastic manuals of Buddhism (Bodhi 2000). On a generalized level, they are divided into four main categories: consciousness, feeling, perception, and volitional

energies. Human beings are, according to Buddhist scriptures, a continuum of these material and mental aspects coexisting. In the course of dependent origination and the law of cause and effect, the main cause of human beings coming into existence is determined by ignorance (Ledi 1999). Being the first aspect in the chain of dependent origination, it is also the central issue of Buddhist teleology.

Teleology

The teleological aspect of what humans are ideally supposed to become is expressed in Buddhist philosophy. The following conversation attributed to the Buddha and his chief disciple Sariputta, exemplifies this teleology.

Sariputta: There is talk of great human beings, o Lord. What then is meant by a great human being, o Lord?

The Buddha: Great human beings are characterized by a liberated mind.

Without a liberated mind, there is no great human being. (Nyanaponika 2000)

Liberation of mind is defined as the liberation from ignorance and illusion. Non-liberated beings are, according to Buddhist philosophy, ignorant of their true nature, of the true nature of mind and matter phenomena, and of the ultimate truth of Nirvana (see below). Based on this ignorance, human beings generate suffering by their acts of body, speech and mind. Ignorance, wrong view, and illusive perception are inherent in every non-liberated human being. To liberate oneself from this illusion, therefore, becomes the main purpose of human existence and life.

With the dissolution of ignorance, Nirvana is realized. Whereas all things in the realm of mind and matter are conditioned, Nirvana is not. It is, according to Buddhism, the only ultimate reality, accessible not by annihilation of physical existence but by the purity of one's mind. Nirvana is described as "the Unformed, the Unconditioned, the End, the Truth, the Other Shore, the Subtle, the Everlasting, the Invisible, the Undiversified, Peace, the Deathless, the Blessed, Safety, the

Wonderful, the Marvelous, Purity, Freedom, the Island, the Refuge, the Beyond” (Amaro and Passano 2009; Feer 1898).

Awakening to the reality of Nirvana is, according to the Buddhist doctrine, the ultimate goal of human life and the successive liberation from illusion the highest and ultimate form of education.

Methodology

Buddhist philosophy consists not only of an anthropology and teleology but also of a highly differentiated methodology to accomplish the teleological goal. This methodology is laid down in a threefold training of virtue, serenity of mind, and insight.

Virtue

Virtue is regarded as the foundation for mental development and comprises all actions of body, speech and mind. Actions are virtuous when performed on the basis of non-greed, non-aversion, and non-delusion leading to contentment, peace of mind, and happiness. Actions based on craving, aversion, and delusion, on the other hand, have the seed of suffering inherent in them and are therefore opposed to Buddhist teleology. Moreover, Buddhism emphasizes whoever performs unvirtuous actions is going to be his or her first victim of this deed: “It is impossible to commit an unwholesome action – to insult, kill, steal or rape – without generating great agitation in the mind, great craving and aversion. This moment of craving and aversion brings unhappiness. When we commit unwholesome actions we experience the hell-fire of craving and aversion. When we perform wholesome actions we experience the heaven of inner peace. Therefore it is not only for the benefit of others but for our own benefit, to avoid harm to ourselves that we abstain from unwholesome words and deeds (Hart 1991).”

Serenity of Mind

Serenity of mind is the second aspect of the threefold training. Since, according to Buddhist

philosophy, insight cannot be accomplished unless the mind has the capacity to penetrate the illusive apparent level of appearance, mental training is necessary to acquire such sharpness and clear vision. Buddhist instructions consist of 40 methods to help the mind to lose its unstable, unconcentrated, flickery, conditioned, and highly associative nature and to gain the advantage of a serene mind. The serene mind is the prerequisite for insight, comparable to the still surface of a pond allowing the observer to view its base.

Insight

Insight as the final goal of Buddhist practice eliminates ignorance, illusionary view, and perception. With the realization of the true nature of mind and matter, its causes and effects, relations, and the final realization of Nirvana, distinct of all conditioned phenomena as is the case in the realm of mind and matter, inconceivable happiness arises. Therefore, the educational goal of insight is simultaneously accompanied by happiness. Insight meditation techniques are summarized in one of the most famous Buddhist scriptures: The satipatthāna sutra or the discourse on the four foundations of mindfulness. These four foundations incorporate meditative practices on the body, on feelings and sensations, on the mental and its concomitants, and on phenomena as such.

In recent years, there have been growing attempts to establish mindfulness practices within the educational system and research in the field of mindfulness with youth. Although the research is in its infant stage, results are promising and suggest mindfulness as a meaningful tool in the course of education. So far, results suggest an improvement of attention, academic performance, and social behavior. Research also points toward a reduction of stress, anxiety, and fear and an increase in emotional balance.

Cross-References

- ▶ [Abhidharma](#)
- ▶ [Awakening](#)
- ▶ [Mindfulness \(Buddhist\)](#)
- ▶ [Virtue](#)

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Education System

► [Education, Sociology of](#)

Education, Sociology of

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Related Terms

[Education system](#); [Social component and school](#);
[Socialization](#); [Socialization process](#)

Description

For a Definition

The sociology of education, or educational sociology, focuses on the relationship between society and education. As all the applied sociologies the sociology of education can be specifically understood for its field of study, which regards the educational processes referred to particular societies, institutions and educational models.

Thus, the sociology of education requires different disciplines with connected different methodologies and tools for a grounded understanding of the society-education relationship. The sociology of education is part of the society of knowing it as that particular field of research aiming at studying and understanding the processes of socialization with particular reference to family, mass media, educational institutions, and teaching communities (such as school, university, and religion). It is possible to summarize the phases of study of sociology of education as follows: definition of society and community, determination of the particular context of education, relationship between education and society, social interaction, and study of education as social science (Ottawa [1998](#)).

Sociology and Science of Education Between History and Epistemology

The attention of sociology for education goes back to the end of twenty-first century, when Edward Alsworth Ross in 1898 dedicated the first course of sociology for teachers at the Stanford University, where 3 years later a course explicitly called *Sociology of education* was taken by David Snedden. Other courses specifically focused on the sociological study of education have been organized during the first decade of twentieth century at the University of Virginia and at the Teachers College of the Columbia University of New York (Brookover [1955](#)). Anyway the official birth of the sociology of education is usually referred to the publication of *An introduction to education sociology* by W.R. Smith in [1917](#). This book was a new starting point of the theory and the practice in education for a society complaining the growing neglect of educational practices.

Subsequently the *National Society for the Study of Education Sociology* was founded, and from 1925 it was a landmark for the studies in the field. In 1927 starts the publication of *The Journal of Educational Sociology*. The Editorial (pp. II–IV) of the volume number 1 (1927), provocatively asking if there is a specific aim of the new journal, among other things stated: “The editors and backers of this magazine answer

this question in the affirmative. There are several reasons for this answer. First, while there are a number of magazines that accept articles devoted to sociology in its application to education, no one magazine is devoted exclusively to that field. The sociological aspect of education cannot be properly represented without the emphasis that will come from a journal devoted to educational sociology. Second, sociology is a new science in the process of development, and already there is a body of material, essential to educational reconstruction and practice, which is not available to the educator..." (ib., II).

A determining point for the field is the book *Éducation et sociologie* of É. Durkheim. The following definition is very famous: "The education is the action exercised by adult generations on those who are not yet mature for the social life" (Durkheim 1922). The French sociologist defines the following aim of the education: "at the selfish and asocial being who comes into the world be superimposed another one, who is able to live a moral and social life" (Durkheim 1922). The social function of education is a matter of fact, because the society guarantees itself and above all its conservation exactly through the *process of socialization of education*.

In Europe, through the twentieth century, this approach to education does not have many supporters. In fact, in Germany, Italy, and England, there are few and occasional publications until the 1960s, even if there is a specific attention to the education processes in the books of authors like Comte, Marx, Scheler, Mannheim, and Dewey.

Through all the last century in the United States there is a lively debate (particularly regarding the "educational sociology") and a significant scientific production (Peters 1924). In a country with a flourishing educational tradition, as it was Italy, the socio-educational researches started in the universities only at the beginning of 1960s, with the national meeting *La scuola e la società italiana in trasformazione* (*The school and the Italian society in transformation*), which stressed the desirable relationship between sociology,

pedagogy, and social psychology with different multidisciplinary approaches (Ardigò 1966).

Through the "short century" the sociological study of educational processes has become even more important (Hoyme 1961), as shows the work of Paul Freire, according to whom the education alone is not able to transform the society, but the education is the only element which can help society in its process of improving. In this perspective, education plays a fundamental role, as a practice of freedom from the oppression (Freire 1970). Freire, using a Marxist approach for the critique of contemporary society, between 1960s and 1970s underlines some relevant problems regarding the relationship between socialization of knowledge and social change, starting from a deep analysis of the illiteracy rate which divided the Brazil. From the research started by Freire emerges a social lecture of education and of its fundamental role in the definition of individual and social personality.

It is progressively defined as a *social function of education*, as described by Maurice Blondel with his *philosophy of action*. According to the French philosopher, all emerges from action, because from the social point of view nothing is really "static". The society is fundamentally grounded on human relationship that is by definition dynamic, so driven by the dynamic relationship between persons, even in the commercial or industrial field (e.g., the development of social psychology and the marketing studies on the likings of commercialized products or of products to commercialize). According to Blondel every experience is *Erlebnis*, that is a "lived experience". The voluntary action is an action aimed at building the society. The education is one of its fundamental parts: "the action is for society, and we are tied one to another only through action. And as one is not first a man and then that particular man, so the society does not exist without being that determined society" (Blondel 1893).

Through the time the educational sociology is better understood as study of the experience of the teaching and learning processes.

New aspects and new developments emerge from the recent research in Anglophone area and even in Italy, for instance, the study of the economy's influence on training processes (Brown et al. 2008; Ribolzi 2012). Within the worldwide economic crisis, the speculators often use psychological factors in order to obtain big advantages, at the expense of the States and of the individual investors and citizens. As if it were a sort of battle fought on Wall Street as in Milan or Berlin, using the weapons of economic indicators.

This situation is a cause of uncertainty for the individual existences and for the whole society that are on the chasm of the existential liquidity (as an example Bauman 2000, 2012). Obviously this confirms the "prophetic" role played by education in the transformation of social aims, when society is not able to guarantee the right flourishing of every citizen. Even the religious leaders stress the danger of this situation and advocate a new social model not grounded on the gains, but on the individual good, as the Christian churches (Gutschera et al. 2003) and the last popes do. In the personalist perspective of John Paul II, the education plays a fundamental role in order to develop new life-styles (Encyclical Letter, *Centesimus annus*, 1 May 1991, n. 36).

Globalization, Education, and Project of Life: Toward a New Research

In the educational process, the environment plays a fundamental role, not for determining, but for promoting the processes of growth. The environment, both human and natural, interact with educational processes that are deeply tied to different natural, cultural, and social contexts. In this way, a new role for school and educational processes emerges: They must develop an even more strong coordination with the processes of socialization. This is a consequence, among other things, of the *globalization* even in the field of instruction and knowledge, which has redefined the aims of educational sciences, not only for the economies and the markets (Gallino 2003). Education, in this new scenario, is defined as

proposal and project of life, assumed as a phenomenon which goes on for all the life, going over the spatiotemporal limits of the school and the professional training (Torres and Mitchell 1998; Scanagatta 2002).

Because of the richness and the variety of potential educational and training "objects", the individual is almost obliged to select. He has to responsibly build a personal project of using an ever more available market of symbolic objects. At the core of the modern socialization is the subject, able to manage with growing autonomy the different available training resources, exactly because of the mutual dependence and relationship between educational experience and society (Blyth 2002; Colbati 2006). Saying it in a different way, the training society, that is the school, has to take into account the social community and interact with the different contexts and factors. This model requires that the educational sociology not only observes, but also critically analyzes the effects on the social life that such an educational relationship has.

Thus, it seems fundamental to hope an ever deeper relationship between *paideia* (learning, training, and education) and freedom, quality of life and existential planning (Cambi 2008). It is possible to define an eco-socio-organization of the learning processes which can really stress the resources of the educational environment (in the sense of nature and nurture) connected to the broader social contexts, in order to underline the relationship between learning and development of the person (autopoiesis) (Mangano and Michelin Salomon 1998).

The contemporary crisis of educational systems, of institutions (as school and university), and of family raises the necessity to deeply, but even dramatically reflect on the future of the relationship between society and education. To better understand the contemporary processes of socialization the following statement of Dewey is of great help: "If there is especial need of educational reconstruction at the present time, and if this need makes urgent a reconsideration of the basic ideas of traditional philosophic systems, it is because of the

thoroughgoing change in social life accompanying the advance of science, the industrial revolution, and the development of democracy. Such practical changes cannot take place without demanding an educational re-formation to meet them, and without leading men to ask what revisions they require of the ideas and ideals which are inherited from older and unlike cultures” (Dewey 1930, 386).

Cross-References

- Cognitive Psychology
- Empathy
- Epistemology
- Experience
- Functionalism in sociology
- Globalization, Sociology of
- Personalism
- Phenomenology
- Religious Education Theory, Roman-Catholic, Southern Europe
- Religious Education, Protestant

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EEG (Electroencephalogram)

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An EEG measures the electrical activity produced by the brain (mostly the outer mantle of the brain, the so-called cerebral cortex), which is recorded with electrodes placed on the scalp. Whenever the brain shows large-scale synchronized neuronal activity, as during sleep, rhythms

of certain frequency and amplitude can be observed in the EEG. The EEG is used to define states of awareness, sleep states, and the state of brain death (isoelectric or flat-line EEG).

Eight Fold Path

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Developed by the Siddhartha Gautama, the Eight Fold Path is the way toward the liberation of the individual from his attachments and delusions. The ultimate goal is the cessation of suffering. They are broken up into three categories. (1) Wisdom, comprised of Right View and Right Intention, (2) Ethical Conduct, comprised of Right Speech, Right Action, Right Livelihood, and (3) Concentration, comprised of Right Effort, Right Mindfulness, and Right Concentration.

Electrical Potentials

► [Evoked and Event-Related Potentials](#)

Electricity and Magnetism

► [Electromagnetism and Optics](#)

Electrodynamics

► [Electromagnetism and Optics](#)

Electromagnetic Theory

► [Electromagnetism and Optics](#)

Electromagnetism and Optics

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Related Terms

[Electricity and magnetism](#); [Electrodynamics](#);
[Electromagnetic theory](#); [Optical sciences](#);
[Optics](#); [Physical optics](#)

Description

Electrodynamics

Electrodynamics (or electromagnetism) is a part of physics dealing with the interaction forces between electric charges and currents, nature of electric and magnetic fields, and electromagnetic wave radiation and propagation, as well as the interaction of electromagnetic waves with matter. It involves two fundamental concepts – electrical charge and electromagnetic field. It also involves additional derivative concepts which are related either to the characterization of the sources of the field or to the characterization of the field and its manifestations. Both the fundamental and the derivative concepts are characterized by two types of quantities: (1) local quantities, i.e., related to a particular given point in space, and (2) integral quantities, i.e., related to a given region in space. In addition, both, the local and the integral quantities, have their own specifics in two particular cases – in vacuum and in matter.

The Concept of Electrical Charge

Experiments have shown that the fundamental building blocks of nature, the elementary particles such as electrons, neutrons, and protons, could be electrically neutral or could be characterized by two different types of electrical charges – positive and negative. Like charges repel one another, while opposite charges attract. The interaction between electrical charges can be

quantitatively described by means of Coulomb's law (Charles Coulomb, 1736–1806): The electrical force between two charges at rest is directly proportional to the product of the charges and inversely proportional to the square of the distance between them. Coulomb's law describes the force of interaction between charges at rest, i.e., it works within the realm of electrostatics. The ability to measure electrical charges made it possible to realize that they are discrete in nature and that there is a minimum quantity of electrical charge – the charge of the electron. The absolute measured value of any electrically charged body is proportional to the absolute value of the electrical charge of the electron. Finite physical objects are usually electrically neutral since they contain equal amounts of positive and negative elementary particles as part of their internal structure. The excess of one particular type of elementary particles (positively or negatively charged) leads to the possibility for finite physical objects to possess an electrical charge in one of the two possible types. This is due to the fact that electrical charges are subject to an "addition rule" that follows the rules of addition of algebraic numbers. When summing charge, positive charges are represented as positive numbers and negative charges as negative numbers. However, there is a *charge conservation law* stating that in any closed system, the total electric charge remains constant. The total electrical charge of a physical object is an example of integral characteristic – it characterizes the electrical properties of the object as a whole and does not provide information about the distribution of its constituent elementary particle charge within the body. An example of local characteristic is the electrical charge volume density which characterizes the electrical charge within unit volume at a given point in space. The distinction between integral and local characteristics of electrical charges enables a dual possibility for the specific form of the quantitative physical laws describing them. The laws of electricity and magnetism, and of electrodynamics in general, can be expressed in both integral and differential forms. However, the integral form tends to be more general since it could be applied to arbitrary types of electrical

charges and currents, while the differential form has some additional requirements such as the continuity of the spatial distribution of the charges. Electrical charges are a relativistically invariant physical quantity – they do not change when moving from one coordinate system frame of reference to another. This property is fundamental for the inherent relativistic nature of electrodynamics where the possibility to study electromagnetic phenomena in different coordinate system frames of reference is a key.

It is important to point out that by saying that the concept of electrical charge is a fundamental concept, we mean that it cannot be described in simpler, more basic concepts. In the words of Eugene Hecht: "We know it by what it does and not by what it is – if you like, it is what it does, and that's that" (Hecht 2000, p. 610). We therefore do not know what an electrical charge is in its essence. This statement is equally valid for both classical and quantum electrodynamics. It is also important to point out that when we use the term "electrical charge" we could mean two different things: (1) the physical quantity describing the properties of electrically charged bodies or (2) the body or the particle possessing the electrical charge. Mixing both concepts together does not usually lead to confusion; however, it is important to keep this distinction in mind since it points out the fact that it is always a specific particle or object that manifests the properties of an electrical charge and that these properties are just one type out of several others, e.g., the gravitational ones (characterized by the mass of a particle or an object).

The Electromagnetic Field Concept

The second fundamental concept in electrodynamics is the concept of electromagnetic field which provides a unified picture of the electric and magnetic phenomena. In the case of electrostatic phenomena, we can focus our discussion on the electric field alone. According to Coulomb's law, a charge Q_1 exerts a force on a second charge Q_2 , and vice versa. Coulomb's law however does not explain how this force is transmitted through empty space. In order to answer this question, physicists in the nineteenth century

developed the concept of *electric field*. A charged particle, such as an electron, interacts with other charged particles by creating a web of interaction around itself that extends out into space. We say that one charge creates an electric field in space and another charge immersed in that field interacts directly with it, and vice versa. The field that surrounds an electrical charge is part of it. For example, the total energy of an isolated electron at rest equals its internal energy ($E = mc^2$, where m is its mass) plus the energy of its field. Two different electrons interact through their respective fields. The total energy of the system including the two electrons is equal to the sum of the energies of its parts, i.e., the two electrons and their fields. It is this total energy of the system that is subject to the energy conservation law and that is being conserved during the interaction.

The picture so far seems to be quite straightforward, but it raises (and has raised in the past) some very interesting questions. One of the most interesting of them is why do we need the field concept at all. The answer is that we need – in order to deal with the explanation of the “action at a distance” and the principle of “locality” – the expectation that effects must be colocated with their causes, both in space and in time. One electron causes another, second, electron located at some distance away to experience a certain force. This force seems to have no cause located any nearer to the second electron. It seems, therefore, that there is no visible local cause for the force experienced by the second electron. The introduction of the field concept enabled the description of the interactions between electrically charged bodies in a way that satisfies spatiotemporal locality and explains the action at a distance – the electric force on each of the charged bodies at a given moment in time is caused by the electrical field at its location. One of the key challenges in such an approach comes from the fact that we are dealing with a macroscopic but, at the same time, invisible physical reality – the field is invisible but it becomes visible by its effects. Its energy is manifested by the work done by the electrical field force to move the charge away at a given distance.

This simple exposition of field theory shows that the concepts of energy and field are inherently interrelated. “A field is a region in space in which any point can be characterized by a set of numbers. These may be scalars, for example energy, or vectors, for example forces, and so we may have scalar or vector fields. Energy is a scalar, and as we shall see, it becomes the basic ‘substance’ of field physics, as matter was the basic ‘substance’ of Newtonian physics.” “It is so because the field is characterized by the presence of energy. . . . A field is nothing more than a spatial distribution of energy which varies with time. Energy has thus been freed from its dependence upon physical vehicles such as particles; it has achieved the status of independent scientific existence” (Theobald 1966, p. 50).

The inherent relationship between the energy and field concepts makes the questions about their existence somehow interchangeable. It is interesting to discover that in physics the existence of the physical reality behind the concepts of energy and field might be questioned. The answers of many eminent physicists to similar questions are ambivalent. For example, according to American physicist and philosopher of science Percy Bridgman (1882–1961), 1946 Nobel Laureate in Physics: “The reality of the field is self-consciously inculcated in our elementary teaching, often with considerable difficulty for the student. This view is usually credited to Faraday and is considered the most fundamental concept of all modern electrical theory. Yet in spite of this I believe that a critical examination will show that the ascription of physical reality to the electric field is entirely without justification. I cannot find a single physical phenomenon or a single physical operation by which evidence of the existence of the field may be obtained independent of the operations which entered into the definition. The only physical evidence we ever have of the existence of a field is obtained by going there with an electric charge and observing the action on the charge . . . , which is precisely the operation of the definition The electromagnetic field itself is an invention and is never subject to direct observation. What we observe are material bodies with or without charges

(including eventually in this category electrons), their positions, motions, and the forces to which they are subject” (Lange 2002, p. 41). Such statement may seem strange, but there is one aspect in which it is not so trivial. In the case of the system of two electrons considered above, does the field of the first electron exist when the second one is not present, i.e., independently of it, or its presence is *enabled* by the proximity of the second electron? This question may be considered as being not about the reality of the field in general but about its reality independently of the second electron. Such question, however, does not seem to fall within the scope of interest of the majority of physicists whose reasoning functions under the premises of operationism – the view that the meaning of every scientific term must be specifiable by identifying a definite testing operation that provides a criterion for its application. This entails that for most physicists, “the whole of physics is about operations, chiefly measurements and computations, rather than about nature” (Bunge 1973, p. 1). Such an approach to the definition of a concept is called operational. The operationist attitude to scientific concepts has a long history and, as we have seen, tends to put aside questions of whether the object of the definition exists in reality or not.

Electric fields have a real physical existence and are not just theoretical constructs invented by physicists to get around the problem of the transmission of electrostatic forces through vacuum. The certainty about the real existence of the fields comes exactly from the fact that they possess energy and that it is actually possible to convert this energy into heat or work, and vice versa. The ambiguity of the question about the realism of the electric field seems to appear due to the fact that when we discuss the reality of the fields, we are silently focusing on static fields, i.e., the electric fields of electrical charges that do not move in time and space. Electrodynamics deals with dynamic, i.e., changing in time, electric, and magnetic fields. When an electrical charge undergoes acceleration, a portion of its field “detaches” itself and travels off at the speed of light, carrying with it energy. This is what we call electromagnetic radiation and its reality is

impossible to question. “Its existence invites (if not *compels*) us to regard the fields as independent dynamical entities in their own right, every bit as ‘real’ as atoms or baseballs. . . . But it takes a charge to *produce* an electromagnetic field and a charge to *detect* one . . .” (Griffiths 1999, p. xiv). Thus, taking into account the dynamic nature of the electromagnetic fields resolves the ontological ambiguities associated with their existence.

Electromagnetic Wave Theory

The rigorous electromagnetic theory was developed over the course of the nineteenth century by James Clerk Maxwell (1831–1879) who used his mathematical skills to build on the physical insights and the experimental genius of Michael Faraday (1791–1867) in unifying all known electromagnetic phenomena into a single set of equations – the Maxwell’s equations. Maxwell’s work on electromagnetism has been rightly considered as the second great unification in physics, the first one being the universal theory of gravitation developed by Isaac Newton (1643–1727). Maxwell’s equations can be briefly summarized as follows. The first equation describes how electric charges generate electric fields. It is also known as Gauss’ law and states that the amount of electric field coming out of any closed surface (the electric flux) is proportional to the total charge enclosed by the surface. In short, it is related to the experimental fact that electrical charges are the sources of electrical fields. The second equation is the magnetic equivalent of Gauss’ law and points to the fact that there are no experimentally observed magnetic monopoles, i.e., the amount of the magnetic field coming out of any closed surface (the magnetic flux) is equal to zero. The third equation is Faraday’s law. This equation describes mathematically how changing magnetic fields generate electric fields. The fourth, and final, equation is Ampère’s law describing how electric currents and changing electric fields generate magnetic fields. With these four elegant equations, Maxwell showed that electricity and magnetism were simply aspects of one single electromagnetic force.

Optics

One of the most important results of Maxwell's work was that the electromagnetic field predicted by the theory turned out to propagate at a speed equal to the speed of light as experimentally measured at that time. Maxwell demonstrated that all phenomena involving electricity, magnetism, and light could be explained by means of the concept of electromagnetic field. It was realized that the whole spectrum of radiations, radio waves, infrared, visible, ultraviolet, X-rays, and g-rays, were all electromagnetic radiations moving at the speed of light. Since then, it became clear that optical phenomena are just electromagnetic wave phenomena that could be characterized within a specific frequency range which happens to be visibly perceptible by the human eye and highly relevant for all living organisms. Optics has developed through the ages as an independent part of physics with its own theoretical specifics and practical applications (Hecht 2002). However, the most accurate language of optics is the rigorous language of the theory of electromagnetism (Born and Wolf 1999). In most of the cases, optics deals with the propagation of light through transparent media and its interaction with mirrors, lenses, slits, etc. Optical effects can be divided into two broad classes: (1) effects that can be explained without reference to the fact that light is fundamentally a wave phenomenon, and (2) effects that can only be explained on the basis that light is a wave phenomenon. Let us, for the moment, consider the former class of effects. It might seem somewhat surprising that any optical effects at all can be accounted for without reference to waves. After all, as we have already seen, light really is an electromagnetic wave phenomenon. It turns out, however, that wave effects are only crucially important when the wavelength of the wave is either comparable to, or much larger than, the size of the objects with which it interacts (Hecht 2002; Born and Wolf 1999). When the wavelength of the wave becomes much smaller than the size of the objects with which it interacts, then the interactions can be accounted for in a very simple geometrically intuitive way. Since the wavelengths of the visible light are only of order a micron, it is very easy

to find situations in which its wavelength is very much smaller than the size of the objects with which it interacts. Thus, a waveless approach to optics, which is usually called geometrical optics approximation, has a very wide range of applications. In geometric optics, light propagation is treated as light rays, emanating from a source, which propagate through transparent media. There are three laws of geometrical optics. The first law is the law of rectilinear propagation, which states that light rays propagate in straight lines through homogeneous transparent media. The second law is the law of reflection, which governs the interaction of light rays with conducting surfaces (e.g., metallic mirrors). The third law is the law of refraction, which predicts the behavior of light rays as they traverse sharp boundaries between two different transparent media (e.g., air and glass).

Geometric optics has proven to be a highly successful theory. Its most important applications focus on describing and explaining the operation of commonly used optical instruments: eyeglasses, cameras, telescopes, microscopes, etc. Although geometric optics does not make any explicit assumption about the nature of light, it tends to suggest that light consists of a stream of massless particles. The wave theory of light, which developed in the first half of the nineteenth century, initially encountered significant resistance since scientists thought that, if it were a wave, light should have manifested its wave nature through such phenomena as interference and diffraction – phenomena in which waves do not travel in straight lines and would not cast straight, sharp shadows, the same as water waves do. Later on, however, with the works of Christian Huygens (1629–1695) and Thomas Young (1773–1829), the wave theory of light emerged and was established as an alternative approach to the understanding of optical phenomena. Young's double-slit interference experiment has clearly demonstrated the wave nature of light and became the model for other revolutionary experiments in modern physics demonstrating the complementarity of the particle and wave properties of elementary particles within the context of the emerging quantum physics.

The Photon: The Optical Quantum of Energy and Action

The idea of the quantum of energy was introduced as a kind of energetic atomism, in which energy could not be divided into arbitrarily small amounts but existed as discrete, tiny packets. In its origins, the introduction of the concept of energy quantization was driven by deeply practical reasons. In 1900, it allowed German physicist Max Planck (1858–1947) to create an adequate mathematical model of the so-called black-body radiation. Planck worked with careful experimental measurements of the actual energy distribution trying to develop a correct theoretical model to describe it. Eventually, he found out that he could do that only if he assumed that the emitted energy could change only in jumps, from one energy level to the next. This assumption in Planck's model violated the usual way of thinking about energy – as a quantity that could vary smoothly, increasing or decreasing gradually, rather than being confined to stepwise change. Planck called these discrete energy changes “quanta” of energy. Very soon, other physicists began to see the more universal meaning in Planck's idea. In a paper of 1905, on the photoelectric effect, Albert Einstein (1879–1955) argued that light itself should not be understood simply as wave motion but should also be understood in terms of light quanta – massless packets of energy that were later to be called “photons.” The energy of a single photon E was found to be proportional to the light's frequency ν by means of a universal constant h : $E = h\nu$. The constant h was first derived by Planck and, therefore, known as Planck's constant or the “quantum of action.” Soon after the emergence of the photon, the idea of the quantum nature of energy was extensively infiltrated into microphysics. In 1913, Danish physicist Niels Bohr (1885–1962) opened up a critically important new arena for the use of the quantum concept – atomic spectra. It was the exploration of this arena that led to the emergence of the new or *quantum physics*. Bohr adopted Planck's quantum concept to study the internal structure of atoms in a way that was “in obvious contrast to the ordinary ideas of electrodynamics but appeared to be necessary to account for some

of the unexplained experimental facts” (Dear 2006, p. 144). He started with the commonly accepted “solar system” model of the atom wherein negatively charged electrons orbit around the central positively charged nucleus like planets. “The size of an electron's orbit corresponded to the orbit's energy, and Bohr postulated that the only orbits permitted to such electrons were those whose energy corresponded to discrete, quantized levels – not just any amount of energy, or orbit, was allowed by his model. There were levels, or steps, of orbital energy that the electrons could occupy. Bohr called them ‘stationary states.’ The only changes in orbital levels that an electron could undergo were the ones in which it shifted, in a discrete jump, from one stationary state to another” (Dear 2006, p. 144). Assuming the discrete nature of these changes allowed Bohr to interpret some experimental results that had been known for nearly 30 years. These results concerned the radiation emitted by hydrogen atoms when excited by heat. When the radiation was separated out according to frequency by a spectroscope, the spectrum showed a series of discrete bright lines that were uniquely related to the specific internal structure of the atom. Niels Bohr's achievement consists of the demonstration that the energetic manifestations of light quanta could be identified with the composition of atoms and the structure of matter in general. The dynamic structure of matter is manifested and could be known by the particular mode by which the smallest quantities of energy are presented to the observer. Or, in the poetical theological language of Christos Yannaras, “That means that the hypostasis of matter itself is energy, that matter contains the constituents of light, that light is the ideal matter” (Yannaras 1998, p. 39).

A Relativistic Quantum Theory of Electrodynamics

Unlike Newtonian mechanics, classical electrodynamics is a relativistic theory, i.e., there are no fundamental problems to incorporate in it the effects of special theory of relativity – the explanation of electromagnetic phenomena that involve changes happening at a speed comparable to the speed of light. In fact, it was exactly

electrodynamics considerations that led Albert Einstein to the formulation of the special theory of relativity and to demonstrate that magnetic fields are just the manifestations of electric fields in a different coordinate system frame of reference (Griffiths 1999). Electromagnetism has a particularly elegant relativistic formulation which allows a natural extension of electromagnetic theory to the realm of relativistic phenomena. Quantum electrodynamics (QED) is the relativistic *quantum* field theory of electrodynamics. It was developed by a number of physicists, beginning in the late 1920s, and describes at a very fundamental level how light interacts with matter, i.e., all phenomena involving the interaction of electrically charged particles by means of exchange of virtual photons – the mediator or exchange particles providing the fundamental mechanism enabling the existence of the electromagnetic interaction force. QED was the first satisfactory quantum mechanical description of a physical field involving the processes of creation and annihilation of quantum particles. It has served as a successful model for the development of all subsequent quantum field theories. QED showed that there are both observable and unobservable photons and that the electromagnetic force between electrically charged particles is carried by the unobservable ones – the virtual photons (Fagg 1996). Although virtual photons cannot be directly observed, their existence is certified by the fact that without including them, QED calculations could not yield results which are in agreement with experiments.

Electrodynamics, Optics, and Religion

The relationship between electrodynamics, optics, and religion could be considered from several different perspectives. *The first one* is based on the fact that both Michael Faraday and James Clerk Maxwell – the key figures behind the development of the theory of electromagnetism – were authentically religious people, and, according to some, it was precisely their religious worldview that made it possible for them to create a dynamic theory of the electromagnetic field (Torrance 2002). *The second perspective* is based on the universality and on the pervasive nature of

the electromagnetic force. Fagg (1996) points out that any viable natural theology must understand and meaningfully interpret the electromagnetic force in its “awesome” universality: “The electromagnetic force provides a simplifying and unifying influence that has not yet been seriously considered by natural theologians, and it needs to be. . . . [T]he universality of the electromagnetic force must constitute one of the central ingredients and cohesive bases in natural theology. This hypothesis is based not only on the premise of the universality of the electromagnetic force in general but also on the nature of the photon of electromagnetic radiation, or light, the carrier of this force, in particular. The primality of light as a salient feature of the universe since primordial times, as an indispensable element in our daily lives, as a means of communication for all humankind, and as a manifestation of divine presence suggests a uniquely proximate connection between the physical and spiritual worlds” (Fagg 1996). It should be strongly emphasized that in the cases when this connection is applied in relation to the divine presence in the world, it refers to a relation between the created world and the eternal, uncreated God. According to Saint Augustine, in creation, there is nothing related to God the Trinity, except the fact that the Trinity has created it. The difference between created and uncreated is, therefore, so crucial that all of our human analogies about the two poles of this difference should be taken very cautiously, with a full appreciation of the deep and beautiful mysteries hidden in it (Florovsky 1976).

A third perspective enabling the discussion of the relationship between electrodynamics, optics, and religion could be based on the semantic richness of the field concept in the way it has been used as a metaphor signifying the immanent presence of God and the activity of the divine energies in space and time. According to Pannenberg (2006), “the potential of the field concept for the dialogue between science and theology has not been used until very recently . . .” The actualization of this potential, however, should focus on the similarity between the conceptual relationships (not between the concepts themselves) in the two different domains and on the ways of

their operation within their own proper context (Tanev 2009). Both quantum electrodynamics and theology refer to dynamic “nonclassical” realities, and it is only by taking into account of this dynamism that it is possible to escape potential ontological ambiguities and open additional epistemological opportunities. In both cases, the invisible nature of the dynamic realities leads to the need of interpretation. In both cases, the interpretation of the manifestations of these realities can lead to the danger of their forceful visualization since we always tend to interpret within the framework of our visual experience (Puhalo 2007). The tempting connection between interpretation and visual experience affects our language since the visual is easier to be expressed linguistically, and our linguistic and visual assumptions are not fully decoupled. The struggle against such forceful visualization of invisible, i.e., unseen, realities is common to both theology and modern physics.

Another perspective enabling the discussion of the relationship between electrodynamics, optics, and religion is based on the extensive use of *light* and *energy* as metaphors in theology. This is especially true in Eastern Christian (Orthodox) theology where the two concepts are present and fundamentally interrelated (Tanev 2009; Louth 2004). The theology of the Eastern Christian Church builds on the legacy of the Byzantine tradition where light, both artificial and natural, was extensively used and is still part of Orthodox worship today (Louth 2004). It is not a mere coincidence that one of the oldest hymns in the Orthodox Church is addressed to the joyful light of the glory of the Trinity which is symbolized by the lighting of the evening lamp at sunset: “as the sun sets, and with it the light of the world, the evening lamps symbolizes the eternal light of the Godhead (the light that knows no evening, as it is sometimes put)” (Louth 2004). In addition, the orientation and the architecture of the churches in the Middle and Late Byzantine periods were carefully calibrated to make use of the natural effects of the rising sunlight. “[T]he sills of the windows around the base of the dome were polished and fixed at such an angle that the horizontal rays of the rising sun were directed up on

the icon of Christ Pantocrator that looked down from the top of dome, with the result that in the darkness of the church the icon of Christ would seem to hover in the reflected light of the rising sun” (Louth 2004). This extraordinary care in using natural light has deeply theological reasons. It demonstrates the importance attached to the significance of light as a symbol of the coming of Christ, the Logos, and son of God, in the world in his Nativity and rising over the world in his Resurrection (Louth 2004). It is also profoundly biblical. In John 8:12 (NKJV), Jesus proclaims, “I am the light of the world. He who follows Me will not walk in darkness, but will have the light of life.” He is the One who gives the light of life. In the New Testament, God is light (1 John 1:5). The followers of Jesus are the light (Matt. 5:14), and the faithful shines as lights in the world (Phil. 2:15). In these and other references in the Gospel John (1:4–10; 3:19; 12:35, 36), God is the source of the uncreated, life giving light. The experience of this uncreated light refers to the encounter with the glory of the Godhead Himself and lies at the heart of Eastern Christian spirituality and of Byzantine hesychasm in particular. Hesychasm is a tradition of prayer based on the repetition of the Jesus prayer (Lord Jesus Christ, Son of God, have mercy on me, a sinner), under the direction of a spiritual father, which leads to a conscious experience of the presence of God, often in the form of a vision of light (Louth 2004). The theology of the experience of the uncreated divine light was a fundamental part of Byzantine theology. It was theologically refined on a number of synods in Constantinople in the middle of the fourteenth century to become inseparable part of Orthodox theology up to the present moment. The key theologian behind the doctrinal formulations of the synods in Constantinople is Saint Gregory Palamas (1296–1359), with his distinction between the divine essence and the energies, according to which God is unknowable in his essence but knowable in his energies (Louth 2004). The emphasis of this statement has two interrelated aspects. The first aspect is epistemological – in the divine energies, it is God Himself who is known and not merely something about God.

And according to the Gospel of John, life eternal consists in knowing God (John 17:3). The second aspect is soteriological since it points out that it is God alone who could save His people. God, however, is eternal, invisible, and personal and cannot be approached by means of our human ways of knowing. Our knowledge of Him, therefore, is always associated with His will – everything that we know about God is the result of divine revelation and the manifestation of His energies (or activities). Paramount among these divine energies is the uncreated light of the Godhead, the light in which Christ was transfigured before his disciples on Mount Tabor – the Taboric light (Louth 2004). According to Saint Maximus the Confessor (c. 580–662), the theological predecessor of Saint Gregory Palamas and of his theology of the divine energies, on Mount Tabor, it was actually Christ's disciples who were transfigured by the Spirit and made able to see His divine glory: “They beheld Him transfigured, unapproachable because of the light of his face, were amazed at the brightness of his clothes and in the honor shown Him by Moses and Elijah who were with Him on either side, they recognized his great awesomeness. And they passed over from flesh to spirit, before they had put aside this fleshly life, by the change in their powers of sense that the Spirit worked in them, lifting the veils of the passions from the intellectual activity that was in them. . . . They were taught hiddenly that the all-blessed radiance that shone resplendently from his face, as it overpowered the sight of the eyes, was a symbol of His divinity that transcends mind and sense and being and knowledge” (Louth 1996).

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Electromyography

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Related Terms

[Electroneurography; EMG](#)

Description

Electromyography (EMG) denotes a subdiscipline of clinical neurophysiology and

neurology (See ► [Neurophysiology](#)) recording muscle currents at rest and during activity by surface or by needle electrodes for research and for diagnostic purposes. Motor and sensory nerve conduction studies (electroneurography) are part of electromyography. EMG is of greatest diagnostic value in diseases of motor neurons, nerve, and muscle, while research applications are preferentially concerned with studies of normal and pathological movements and reflexes. The beginnings of clinical EMG after 1930 are associated with the names of D. Denny-Brown (1949) in North America and F. Buchthal (1985) in Europe (See ► [Neurology in Europe](#)), among others. A modern and frequently used summary of the current knowledge on clinical EMG is the comprehensive textbook by J. Kimura (2001).

Self-Identification

Science

The beginnings of EMG were merely scientific and were based on the technical development of modern electrophysiological amplifiers and oscilloscopes for displaying fast electrical muscle and nerve activity in the time domain of milliseconds. Another important step was the introduction of the concentric needle electrode by Adrian and Bronk (1929) and the subsequent observation of motor unit potentials by Denny-Brown (Mayer 2001). EMG has always self-identified as a biological and/or medical science following the rules of scientific work. In a period between 1930 and 1960, many EMG phenomena have been first described which separate normal muscles from those affected by muscle disease or by a peripheral nerve or motor neuron disorder. Findings such as fibrillation potentials, positive waves, fasciculation potentials, or myotonic discharges in resting muscles or myopathic and neurogenic changes in innervated muscles were described and scientifically classified (Caruso et al. 1999). The latter changes were statistically evaluated; normative values were developed and provided for quantitative EMG measurements (see Caruso et al. 1999).

Since then, EMG has remained an important research tool in studies of muscle and nerve in health and disease and could simultaneously be established as a routine diagnosis although it remained, to some extent, an art. In addition, EMG has increasingly been used for studies of physiological movements such as grasping, gait, or sports activities (See ► [Movement Disorders](#)). Consequently, the physiological findings were used to analyze pathological movements such as tremor, myoclonus (jerks), tics, and others in order to understand their pathophysiology (e.g., Dengler et al. 1986).

An important step forward was the introduction of digital techniques into neurophysiology starting in the 1970s. New amplifiers and monitors and also highly selective recording electrodes were developed in conjunction with methods such as single-fiber EMG (Stålberg & Trontelj 1997), allowing to investigate the function of the neuromuscular transmission in the microseconds domain and denervation and reinnervation in a quantitative way. Averaging techniques provided the possibility to record smallest nerve potentials of a few microvolts amplitude as required for sensory nerve conduction studies.

Modern EMG has in part become a routine tool in diagnosis and is still a science with a vast body of literature and several scientific journals dedicated to EMG research. Most modern and also developing countries have their national societies for clinical neurophysiology including EMG.

Characteristics

EMG is distinctive from other specialties of medicine in several aspects.

It is the only discipline to study electrical activity of nerve and muscle in order to conclude on their functional status. Thus, it has the potential to provide information on relevant functional changes of the neuromuscular system and to explain clinical phenomena such as muscle weakness, muscle fatigue, wasting, cramps, and others. This capacity of EMG is used for diagnostic purposes especially

in the field of neuromuscular disorders where EMG still plays a very important role.

Another difference to other helpful diagnostic approaches such as imaging by nuclear magnetic resonance tomography or muscle biopsy and morphological examination is that it is an office method providing immediate diagnostic information. It is to some extent an extension of a clinical neurological examination and can be performed repeatedly. It is economical and highly appropriate for monitoring the course of neuromuscular diseases.

Another important difference to other approaches of analyzing the neuromuscular function is that EMG works in the time domain of milliseconds and has a high time resolution. This is not only relevant in studying neuromuscular diseases but also in central motor or movement disorders (See ► [Movement Disorders](#)) when the exact analysis of movements or of reflexes is of great importance. It allows to detect the exact timing of the interaction of several muscles which is helpful in studying gait and its disorders, the various tremor forms, myoclonic movements, tics, spasticity, and several others.

Relevance to Science and Religion

EMG is clearly a biological science and plays its most important role in neurological medicine. It goes, however, beyond these borders as muscle activity and movement is part of human life in general and is the only possibility of man to get in touch with its environment and with other living beings including speech production. EMG is also used in psychological studies aiming at man-to-man interaction and, in particular, at interindividual communication. This psychophysiological potential of EMG makes it an interesting tool for interdisciplinary activities between neurosciences and humanities (See ► [Neuropsychology](#)).

Sources of Authority

The sources of authority of EMG are formed by neurophysiologists and clinical neurologists

who theoretically and practically developed EMG at the end of the second decade of the last century and made it an attractive and respected science. The approaches to EMG in experimental and clinical neurophysiology have been scientific from the very beginning. A large body of data was collected, analyzed, and published in well-renowned journals. In the following, normative data have been developed for diagnostic purposes which are still valid despite all technical new developments in this field. This material has been published in numerous books on EMG in the Anglo-American literature as well as in German language and is revisited from time to time. In nearly all countries with a developed health-care system, we find scientific societies which are in part or exclusively concerned with EMG. Mostly, these societies have the attribute “clinical neurophysiology” in their denotations, and sometimes, the term EMG appears. These societies take care for ascertaining the quality of EMG and also for education of young scientists and physicians and have contacts with health-care system authorities and industrial companies with regard to commercial aspects of EMG. An international society called “International Federation of Clinical Neurophysiology” (IFCN; <http://www.ifcn.info/>) forms the umbrella for the national societies and organizes communication between them, e.g., via regular international congresses with assemblies of the member society delegates. The IFCN also publishes guidelines for practicing EMG and defines the appropriate EMG terminology (Caruso et al. 1999). It supports the development of high-quality EMG in economically disadvantaged countries.

Ethical Principles

EMG follows the ethical principles expressed in the famous “Oath of Hippocrates.” It has also adopted the rules of the “Declaration of Helsinki.” For scientific use of EMG, it is obligatory to apply to the local ethical committees and ask for permission.

Key Values

One key value of EMG is to make a contribution to the diagnosis of diseases of the neuromuscular or the central motor system. Another is to support research focusing on the normal and the pathological function of the motor system (Kimura 2001; Stålberg & Falck 1997).

Conceptualization

Nature/World

EMG conceptualizes nature as the basic mechanisms of life and the environmental forces with special regard to those influencing the motor system. World has no special meaning in EMG except for the classification of countries according to their economical status and their capacities to develop EMG.

Human Being

EMG has no special definition of human beings. It understands itself as a discipline which serves human beings in health problems.

Life and Death

EMG associates life with muscle activity which is indeed the way how living beings make contact with their environment. Even basic signs of life such as heartbeat and breathing represent muscle activity. The origin of life is closely associated with muscle activity or contractions on a microscopical level as seen in bacteria, etc. Death is the absence of such activity.

Reality

Reality in EMG is recordable electrical muscle activity.

Knowledge

Knowledge in EMG is fairly identical with expertise in the art of EMG.

Truth

Truth is a term not used in EMG. The guideline for EMG is evidence-based knowledge.

Perception

Perception in the field of EMG mainly refers to the awareness of muscle contractions or movements.

Time

Time is an important parameter of EMG as all electrical events have a time dimension. EMG measures phenomena in the domain of milliseconds and even microseconds.

Consciousness

Consciousness is a construct of the brain. EMG does not contribute to the understanding of consciousness although movements may be a sign of consciousness.

Rationality/Reason

Rationality is important in science. EMG can, however, not contribute to its definition.

Mystery

There are mysteries in medicine and also in EMG, i.e., objectively recordable phenomena which can currently not be explained.

Relevant Themes

EMG has always been a biological science and a subdiscipline of clinical neurophysiology. It is part of the world of natural sciences and has little relationship with faith or spirituality which is prevailing in religion.

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Electroneurography

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Related Terms

[Nerve conduction study](#)

Description

Electroneurography refers to the technique used to test and quantify the nerve conduction and impulse propagation along motor and sensory nerves. A synonym is nerve conduction study. In principle, a peripheral nerve is stimulated by a short electrical pulse usually applied transcutaneously. The responses are recorded using electrodes applied over the muscle innervated by the nerve (motor nerve conduction), from the skin (sensory nerve conduction) or from another part of the nerve (mixed nerve conduction). The time the impulse takes to travel from the stimulation to the muscle is called distal motor latency and is measured in milliseconds. The amplitude is a measure of the number of nerve or muscle fibers activated.

The stimulation has to be strong enough to activate all nerve or muscle fibers. By stimulating the nerve at two different sites along the nerve, the motor conduction velocity can be calculated by dividing the distance by the latency [m/s]. In sensory fibers, recordings are done with electrodes applied to the skin. Sometimes, needles are used for recording the signals. The time between the stimulus and the response is measured and the sensory conduction velocity is calculated. The amplitude of the sensory nerve action potential represents the number of sensory fibers activated. The impulse travels along the nerve in both directions. Some of the action potentials travel to the spinal cord and back resulting in late responses called F-waves. This provides information on the conduction of the proximal nerve segments. Electroneurography is used to evaluate the nerve conduction in neuromuscular disorders. Slowing of the conduction velocity is due to acquired or inborn problems of the myelin in patients with demyelinating polyneuropathies or repeated nerve compressions. The lack of conduction across a nerve segment is called conduction block, which can be complete or partial. It is mostly a sign of an acute peripheral nerve compression. In axonal neuropathies, the conduction velocity remains normal or is only slightly reduced, but the amplitudes of the motor compound action potentials are low. Low amplitudes are also found in patients suffering from loss of alpha-motoneurons and in patients with loss of muscle fibers (myopathy). To make a further differentiation of neuromuscular disorders, electroneurography is frequently combined with the electromyography.

Axon	Inner part of a peripheral nerve
Myelin	Outer part of the nerve
Electromyography	Investigation of the muscle using needle electrodes inserted into the muscle
Polyneuropathy	Disorder that damages more than one nerve at the same time, mostly the longest nerves (to the feet) are damaged first

Cross-References

- [Clinical Neurophysiology](#)
- [Electromyography](#)
- [Neurophysiology](#)

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Electronic Circuits in Computers

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Related Terms

[Computing machinery](#); [CPU](#); [Digital electronics](#);
[FPGA](#); [Microprocessor](#)

Description

The development of electronics has a direct impact in computers; the first computing devices were mechanical with limitations in size and processing speed. With the invention of the transistor in 1947 and the integrated circuit in 1958 (Lee 2007), a new approach for computing devices was possible using the binary system for instructions and data in digital computers. Boolean logic is implemented in electronic circuits by using transistors on-off states as true-false (one-zero) logic.

Since the invention of the transistor (electronic switch in digital electronics), research has been focused on the integration of these

building blocks into small chips; integration has reduced the size and cost of computers and other electronic devices (Branscomb 1982). The actual trend in microelectronics is known as Moore's law: the number of transistors in an integrated circuit doubles every 18 months. Some integrated circuits have become classic designs and are still in use today in spite of being fabricated long time ago, for example, the processor Z80 (Santo 2009). Moore's law cannot continue indefinitely, new physical properties emerge when circuits are reduced to the scale of nanometers; fabrication costs and power dissipation are important obstacles to overcome when reducing the size of integrated transistors.

Current research is looking for new implementations of transistors by using materials and devices at the nanometer scale, transistors with carbon nanotubes or graphene. Also new architectures for information processing and memory are being explored such as memristor crossbars (Strukov et al. 2008).

Self-identification

Science

Electronics, computer devices, and integrated circuits are based on first principles from chemistry, solid-state physics, and quantum mechanics. These devices are the result of mathematical theories, models, computer simulations, and experiments. Digital circuits rest on scientific discoveries and follow the laws of nature.

Characteristics

Electronic circuits are modeled, developed, and tested before the actual implementation as integrated circuits in solid state; these circuits follow mathematical models and natural laws. The main characteristic of electronic circuits for computers is a solid background in experiments and theory; years of research and development are needed to produce commercial devices.

Relevance to Science and Religion

There are no links between electronic circuits for computers and religion. This discipline is not interested in the area of science and religion.

Sources of Authority

The discipline rests on physical laws, mathematical models, experiments, and numerical simulations. There are well-known contributors to the field but these people are related to discoveries or ideas rather than authority; all principles can be proved or tested in a laboratory without support from authority. Circuits must follow mathematical models and natural laws independent of authorities.

Ethical Principles

All ethical principles of mankind are valid.

Key Values

Respect for human life, improvement of human quality of life, sustainable exploitation of natural resources.

Conceptualization

Nature/World

Source of inspiration and natural resources.

Human Being

Center of activity, goal, motivation to improve devices, happiness.

Life and Death

Valuable.

Reality

Where devices are tested, continuous work to understand it.

Knowledge

Fundamental and in permanent search.

Truth

Electronic devices must perform without divine intervention or authorities.

Perception

Source for devices operation.

Time

Main variable, computing speed is a goal.

Consciousness

It does not apply.

Rationality/Reason

Digital circuits are designed using Boolean logic.

Mystery

There is no room for mystery; circuits must work in a predictable way.

Cross-References

- ▶ [Algorithms, Computer](#)
- ▶ [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)
- ▶ [Automation, Electronic](#)
- ▶ [Bioinformatics, Computational](#)
- ▶ [Control Theory](#)
- ▶ [Games, Computer](#)
- ▶ [Robot Emotions](#)
- ▶ [Robot Programming](#)

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Electronic Memories

► Computational Memories

Electrophysiological Responses

► Evoked and Event-Related Potentials

Elementary Particle Physics

► Particle Physics

Elite Deviance

► Deviance and Social Control, Sociology of

Embodied Theology

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Related Terms

[Somatology](#)

Description

Embodied theology is a new kind of theology, which has, in recent years, developed throughout the world. It is distinguished by a particular methodological awareness, rather than by a specific theological content. This theology is embodied in the sense of a methodological concern with its own embodiment as a condition for its thought. It is theology through the body and not theology

about the body, as for example a body-theology or somatology would be even though embodied theology always implies a certain notion of the body. Instead, it is defined by its methodological awareness that theological reflection is embodied too. This means that it is not only methodologically concerned with the embodiment of theological reflection in general, but with the embodiment of its very own reflection. It is, however, controversial how this particular methodological awareness should be theologically expressed, since an embodied perspective challenges the very concepts of particularity and method from within. It cannot be defined as a strict method, but must be viewed as an embodied approach, which can sometimes be described as a mood that defines this kind of theological thought. Some emphasize the diversity of the approach rather than its unity.

Embodied theology is motivated by what it takes to be an increasing interdisciplinary awareness of human embodiment and of reflection as embodied in the radical sense of the word. However, it is contested whether this theology is driven primarily by strict, internal, theological concerns for embodiment, as indirectly expressed for example in the doctrines of incarnation and resurrection of the body, or whether it springs from a more external and contextual development, as in the phenomenological discovery of the body or corporeal turn in philosophy. What is clear, however, is that embodied theology has also developed as a reaction against a diverse field of dualistic tendencies in religious thought, for example tendencies toward epistemological dualism (where the subject is considered separate from the object); anthropological dualism (where the soul or mind is considered separate from the body); or cosmological dualism (where human beings are considered separate from the rest of the cosmos). In embodied theology, the effect of these dualisms is generally viewed as distortive, since they are believed to have destructive implications in terms of anthropocentrism, individualism, subjectivism, and intellectualism. Correspondingly, embodied theology typically stresses the importance of what is regarded as the experienced and constitutive relation between

subject and object, mind and body, and human beings and the cosmos. In spite of rejecting dualism, embodied theology does not by definition adhere to monism since it recognizes a theological, philosophical or experiential fact of dualisms.

It is possible to distinguish different movements in embodied theology currently in development. These are embodied theology in traditional theologies, in contextual theologies, in postmodern theologies, in phenomenological theologies, and within the dialogue between theology and science. However, even though these movements are framed within the context of traditional theological debates, it should be noted that the very notion of embodiment is widely recognized as challenging these traditional theological distinctions. A more elaborate description of embodied theology, thus, depends on their various methodological and conceptual assumptions about the body and its context.

In *traditional* (conservative as well as liberal) theologies, embodied theologies are neither common nor well defined. Frequently, embodied theology is viewed as proceeding from the embodied tradition of the church. However, what this means specifically is subject to a great variety of interpretations. This kind of embodied theology presupposes an understanding of the body as a tradition, which is distinct from other traditions, and which, therefore, displays a certain concept of privacy. Consequently, this assumes an understanding of the body as a given, non-constructed, and private context of meaning.

In *contextual* theologies such as Liberation, Black, or Feminist theologies, embodied theology calls for an alternative to traditional theologies, which are seen as dualistic and oppressive. It is claimed that dualism leads to alienated and violated human beings. A notion of the body as a cultural construct and an expression of the most fundamental level of power relations among humans are implied in these theologies. Yet, in embodied contextual theology, the body is viewed as a source of revelation that can be liberated and speak for itself. Because the body is viewed as a political field, embodied contextual theology becomes political theology. However, as

political theology, it does not necessarily move within preestablished political categories. Rather, it can challenge such categories from the perspective of embodied experience. Typically though, it presupposes a fundamental relation between reason and feeling and expresses human becoming through interpersonal relationships as well as through sexual desire. In contextual theologies, embodied theology is therefore not simply to be equated with a theology of context and culture, but more often occurs as counterculture.

Within *postmodern* theologies (radical or moderate), both the construction and non-construction of the body are questioned. It is argued that tradition and culture not only shape the body, but that the body is naturally or phenomenologically given and thus shapes this feature too. Embodied, radical, postmodern theology, which tends to weigh the notion of the body as a potentially liberating construction, implies a theological call for developing a positive distance to the given and consequently more discarnate and disinterested being. However, moderate postmodern theology calls for a third path between total disengagement and absolute engagement. In this moderate context, embodied theology is explicitly aware that the body is not only what we think, but also what we think with. The body is not merely constructed (by tradition or by us) as an object from which we can distance ourselves by creating a new notion, but must be seen as a constitutive feature of subjectivity.

This kind of embodied, moderate, postmodern theology is related to embodied theology as developed from a phenomenological perspective, which is currently affecting the dialogue between *theology* and *science*. The theology-science issue has typically presupposed a view of the body as a kind of object or aspect of objectivity, whether such an object is explained in realist, physicalist, materialist, or naturalist categories – or described within the framework of a non-reductive, dual-aspect monism. As an aspect of objectivity, the body points to a scientific context for theology which gives rise to certain scientific demands, such as greater objective validity and empirical progression. However, in continental

phenomenology the body is described as a third way of being in the world, between the modes of pure subjectivity and objectivity or a way of being, which mediates between or even synthesizes the inner and the outer. According to phenomenology, embodied meaning is enacted, embedded, and extended. This implies that the body cannot be defined in purely private or collective categories, but rather must be addressed through the experience of intersubjectivity. Consequently, embodied theology of this kind explicitly thematizes the notions and relations of its own subjectivity, alterity, and ambiguity. This brings embodied, phenomenological theology into a close relationship with other sciences, but in a way that is quite different from the traditional – whether naturalistic or hermeneutical – manner of relating theology and science.

In describing embodied theology, other distinctions could be used than those applied above. For example, could one distinguish between the traditions of subjective, objective, and phenomenological thought, or between a “body-positive” and a “body-negative” theology. However, such distinctions might be problematic because it might be argued that they are undermined by an awareness of the body as an ambiguous mediator between subjectivity and objectivity.

Cross-References

- [Body](#)
- [Dualism](#)
- [Incarnation](#)
- [Monism](#)
- [Phenomenology](#)

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Emergence, Theories of

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Related Terms

[Emergent phenomena](#); [Fulguration](#)

Our deepest interests in “what there is” and “what it is” traditionally give rise to two quite different approaches: a *diachronic* one on how things have developed and a *synchronic* one on how the makeup of things relates to their particular behaviors, dispositions, and properties. Correspondingly, nearly all religions offer stories about how the universe, matter, living beings, and particularly, human beings came into existence and how they relate to each other. But religious accounts of the origin of life, mind, and spirit do not provide the very context in which theories of emergence enter stage, although many theories of emergence address the same issues. Theories of emergence come into play in the context of

scientific approaches to understanding ourselves and the nature around us, and they, too, comprise diachronic and synchronic versions.

The basic idea of emergence is that as systems become increasingly complex during evolution, some of them may exhibit *novel* properties that are neither *predictable* nor *explainable* on the basis of the laws governing the behavior of the systems' parts. Particularly, complex wholes can come to have properties that are *not reducible* to the arrangement and the properties of their components. Accordingly, in metaphysics, epistemology, and philosophy of science, the meaning of "emergence," being "emergent," and to "emerge" is associated with features such as being "novel," "unpredictable," and "irreducible." Hence, we should be aware of the crucial difference between the technical usage of these terms and their use in ordinary language, where to "emerge" roughly means to "appear," to "rise above a surrounding medium," or to "come into view (or existence)." The only connection between ordinary and philosophical usages of these terms is that entities that emerge in evolution (or otherwise), in the ordinary sense of the word, may be good candidates for being emergent in the technical sense.

After a brief sketch of the historical development of emergentism (a comprehensive overview is offered by Stephan 2007), I will focus on a systematic account of the varieties of the concepts and theories of emergence. Eventually, I comment curtly on the relationship between theories of emergence and religious issues.

The history of emergentism comprises several ups and downs (cf. Brian McLaughlin's "The rise and fall of British emergentism" in Beckermann et al. 1992). It has seen its early heydays at the beginning of the twentieth century when in rapid sequence, the major works of British and American emergentists appeared: in 1920 Samuel Alexander's *Space, Time, and Deity*; in 1922 Roy Wood Sellar's *Evolutionary Naturalism*; in 1923 Conwy Lloyd Morgan's *Emergent Evolution*; and in 1925 Charles Dunbar Broad's *The Mind and its Place in Nature*. Most of these philosophers' theories of emergence are reactions to the philosophical debate on the nature of life

and mind. While vitalists like Hans Driesch and Henri Bergson claimed, for the explanation of vital and mental processes, the existence of supernatural entities such as an *entelechy*, a *psychoïd*, or an *élan vital*, biological mechanists were convinced that they could reduce without residue all phenomena of life and mind to physical and chemical processes. Both vitalism and mechanism, however, were thought to have implausible consequences: substance-dualistic approaches, on the one hand, violate the principle of the causal closure (i.e., If x is a physical event and y is a cause or effect of x, then y, too, must be a physical event), of the physical domain and are hard to square with evolutionary cosmologies; mechanism, on the other, does not seem to capture the genuine organic and mental processes adequately, it particularly failed to explain phenomenal experiences. The emergentists steered a middle course. They denied both substance-dualistic and reductionist theories: they were *nonreductive naturalists*.

The development of early British emergentism itself has its roots in the work of John Stuart Mill, Alexander Bain, and George Henry Lewes. Although we can find some precursors of emergentist thinking already in ancient philosophy, particularly in the work of Galen, and in continental philosophy, the proper development of theories of emergence begins in the mid-nineteenth century in Britain. In his book *Problems of Life and Mind* Lewes (1875) introduced the term "emergent" into philosophy, to distinguish *emergent* from *resultant* effects. Herewith, he picked up on a distinction Mill had drawn between *homogeneous* and *heterogeneous* effects in his magnum opus *A System of Logic. Ratiocinative and Inductive* (1843). Joint effects of causes are called heterogeneous effects (or "emergent") if they are not the *sum* of their separate effects; otherwise they are called homogeneous. His thought was that homogeneous cases obeyed principles of vector composition and were additive; by contrast, in heterogeneous cases, there was a failure of vector composition or additivity. The products of chemical interactions, for example, were evidently qualitatively different from the substrates that grounded the

reaction. Mill's further distinction between *ultimate* and *derivative* laws was also of great importance for the development of emergentist ideas. In particular, Broad took up Mill's distinctions and his subsequent considerations about the limits to the explanation of psychophysical laws when he developed his "classical" notion of strong synchronic emergence (see below; for further details on Mill's impact on British emergentism, see Stephan 2007, Chap. 6).

In the following decades, theories of emergence were discussed vividly on conferences and in special issues. However, the criticism by the logical positivists Carl Gustav Hempel, Paul Oppenheim, and Ernest Nagel seemed to put an early end to emergentism, for their analyses in *Studies in the Logic of Explanation* (Hempel & Oppenheim 1948) and *The Structure of Science* (Nagel 1961), respectively, led to a squarely uninteresting and unpromising concept of emergence being relativistic in several ways and purely epistemic. The upshot of their thoughts is that there is no reason to treat emergence as an ontological trait of any property, rather it should be seen as indicative of the scope of our knowledge at a given time; what may be called emergent with respect to theories currently available may lose this status in the near future when better scientific theories have been developed.

With the decline of positivism, interest in metaphysical questions returned. It is the still unsettled question about the nature of mental states that has helped nonreductive approaches and particularly, emergentism to return to the philosophy of mind (cf. the contributions of Beckermann and Kim in Beckermann et al. 1992). During the last two decades, however, the idea of emergence not only has seen a strong revival in philosophy of mind but in many different fields and disciplines such as physics, biology, social sciences, religious studies, artificial life, robotics, connectionism, dynamical systems theory, theories of self-organization, and theories of creativity (important anthologies are, among others, Beckermann et al. 1992; Bedau and Humphreys 2007; Clayton and Davies 2006; Corradini and O'Connor 2010). In these fields,

the notion of emergence, however, is far from being used in a uniform way.

Hence, it is highly controversial what the criteria are by which "genuine" emergent phenomena should be distinguished from nonemergent phenomena. Some of these criteria are very strong, so that few, if any, properties count as emergent. Other criteria are inflationary in that they count many, if not all, system properties as emergent. One of the consequences of this controversy is a great confusion about what is really meant, when some property is called "emergent." In the next part of this chapter, I therefore offer a structure of the varieties we currently encounter within emergentist thinking.

The various kinds of emergence that have been suggested thus far can be structured according to three different dimensions: first, it is an issue whether the notion of emergence refers to an *epistemological* or a *metaphysical* (i.e., an ontological) relationship; second, whether it refers to a *synchronic* or a *diachronic* relationship; and third, whether it is introduced as a *weak* or rather a *strong* notion.

Most of the more ambitious theories of emergence and in fact, all *classical* approaches of the British emergentists are based on a common basal notion of emergence from which they can be developed by adding further and more demanding features (cf. Stephan 2007, Chap. 4). This *weak*, *synchronic* and *metaphysical* notion of emergence specifies the *minimal* criteria for emergent properties. It comprises three features: the thesis of *physical monism*, the thesis of *systemic properties*, and the thesis of *synchronic determination*.

The thesis of *physical monism* is about the makeup of systems that have emergent properties or structures. It claims that the bearers of emergent features consist of physical entities only and rejects all substance-dualistic positions such as vitalism or Cartesian dualism, which, for example, attribute properties such as being alive or having cognitive states to supernatural bearers (e.g., an *entelechy* or a *res cogitans*, respectively).

According to the second thesis, only *systemic* properties are candidates for emergent properties.

These are system properties that are *different in kind* from those had by the system's proper parts (i.e., parts on a lower level of organization). It is uncontroversial that many systems exhibit systemic properties. Thus, it is among the properties of a horse to neigh and whinny, but no proper part of it (head, heart, nor any cell assembly) can whinny; it is among the properties of a connectionist network to generalize and to recognize patterns, but no single part of it (e.g., a unit or connection weight) has this property.

The thesis of *synchronic determination* specifies the relationship that holds between the systemic properties of a system and its microstructure (i.e., the specific arrangement of the system's parts together with their properties). Systemic properties and dispositions depend nomologically on the microstructure of their bearers. There can be no difference in a system's systemic properties without some difference in the properties or arrangement of its parts. (Often, the latter claim is also referred to as a thesis of mereological supervenience.)

Anyone who denies the thesis of *synchronic determination* either has to admit systemic properties that are not dependent on the microstructures of their bearers, or she has to suppose – contra the thesis of physical monism – that some additional factors, for example, nonnatural entities, are responsible for differing systemic properties and dispositions of otherwise physically identical systems. One may have to admit, for example, that there may exist objects that have the same parts in the same arrangement as diamonds but lack the diamond's hardness. This seems implausible. Equally implausible is the idea that there may exist two physically identical organisms, one viable and the other not. In the case of mental phenomena, opinions may be more divided, but one thing seems to be clear, anyone who believes, for example, that two physically identical human beings could be such that one suffers, say, from aphasia while the other does not, also declines the first thesis of weak emergentism, namely, physical monism.

Weak, synchronic and metaphysical emergence is equivalent to what Robert van Gulick has called *modest kind emergence*

(cf. van Gulick 2001, p. 17). This type of emergence is also compatible with contemporary reductionist approaches. Particularly for this reason, philosopher of science Mario Bunge is emphatic about it, but also several cognitive scientists, for example, Francisco Varela, David Rumelhart, and James McClelland, to mention just a few, adopt this position.

Van Gulick considers an even weaker type of synchronic metaphysical emergence, namely, *specific value emergence*: this obtains whenever a whole and its parts have features of the same kind but have different subtypes or values of that kind (the mass of a whole, e.g., is different in value from the mass of any of its proper parts). Nobody, however, has ever thought to characterize specific values as *emergent* properties. Quite contrary, from the very beginning of British emergentism, features of wholes, which differ only in value but not in kind from features of their parts, have served as a contrast class for emergent properties. This is already present in Lewes's distinction between *resultant* and *emergent* effects, for which nonadditivity is the decisive feature. Hence, there is no reason to treat specific values as emergent properties at all, since usually their bearers share them in kind with their components.

On the other side of the spectrum, van Gulick presents a much stronger type of synchronic metaphysical emergence, namely, *radical kind emergence* (van Gulick 2001, p. 17). In this case, a whole is thought to have features that are not necessitated by the system's microstructure, i.e., the properties of its parts, their mode of combination, and the law-like regularities governing the features of the parts. William Hasker's proposal of what he has coined "emergent dualism" together with the postulation of the mind as an emergent individual (a *soul field*) is a case in point of radical kind emergence, since he explicitly denies that all mental processes are supervenient on brain processes (Hasker 1999, pp. 194–195). Radical kind emergence, thus, rejects one of the core elements of traditional theories of emergence, which also is a center piece of Broad's classical definition (see below) and the third feature of weak synchronic

emergence as introduced above: *synchronic determination*. Jaegwon Kim, one of the most distinguished participants in the current debate on emergence, therefore doubts with good reasons whether radical emergence gives us a form of emergence at all (cf. Kim in Clayton and Davies 2006, p. 192).

Among the more ambitious *epistemological* notions of emergence both a *synchronic* and a *diachronic* version deserve closer attention. While both share the features of weak emergence, they differ with respect to the features of *irreducibility* (synchronic emergentism) and *unpredictability* (diachronic emergentism).

The idea of *strong synchronic epistemic* emergence has its origin in Broad's theory of emergence. Broad's definition of emergence which he developed in sharp contrast to the mechanistic worldview might be the most quoted passage in emergentism; it reads: "Put in abstract terms the emergent theory asserts that there are certain wholes, composed (say) of constituents *A*, *B*, and *C* in a relation *R* to each other; that all wholes composed of constituents of the same kind as *A*, *B*, and *C* in relations of the same kind as *R* have certain characteristic properties; that *A*, *B*, and *C* are capable of occurring in other kinds of complex where the relation is not the same kind as *R*; and that the characteristic properties of the whole *R(A,B,C)* cannot, even in theory, be *deduced* from the most complete knowledge of the properties of *A*, *B*, and *C* in isolation or in other wholes which are not of the form *R(A,B,C)*. The mechanistic theory rejects the last clause of this assertion" (Broad 1925, p. 61). The second clause of this definition is, by the way, Broad's formulation of the principle of synchronic determination that radical kind emergence would deny. As its core feature, however, this definition comprises the *irreducibility* (or nondeducibility) of certain systemic properties, i.e., the principled failure of reductive explanations of these properties.

Closer scrutiny, however, reveals that three different sorts of irreducibility claims are hidden in Broad's definition. They come to the fore by studying the conditions reductive explanations must meet to be successful. Generally, we ask for reductive explanations when we want to

understand *why* a certain entity instantiates a certain property, in fact a property that is only attributed to the system as a whole. So, the aim of each reductive explanation is to explain a system's dispositions and properties solely by reference to its components, their properties, arrangement, and interactions. To be successful, several conditions must be met: first, a property to be reduced must be functionally specifiable; second, it must be shown that the specified functional role is filled by the behavior of the system's parts; and third, the behavior of the system's parts must follow from the behavior they show in simpler systems than the system in question. If all conditions are met, the behavior of the system's parts in other contexts reveals what systemic properties the actual system has.

Since the three conditions are independent of each other, we have to distinguish three different types of strong synchronic emergence, which in turn have three different implications. If a systemic property is irreducible due to the fact that the components' behavior, given their current arrangement, is not reducible to the behaviors they show in simpler systems, then the system itself (or its specific structure) seems to exert some "downward causal influence" on its parts. However, such downward causation would not violate the principle of the causal closure of the physical domain. We would just have to accept additional types of causal influences within the physical domain besides the known types of mutual interactions.

On the other hand, if it is impossible to show that the behaviors of the system's parts fill the causal role adequately attributed to the functionally specified systemic property, this systemic property itself seems to have causal powers different from those of the system's microstructure. If in addition, the systemic property were a nonphysical (mental) property with a causal influence on the physical world, we would have to admit a violation of the principle of the causal closure of the physical realm.

In contrast, the occurrence of properties that are not functionally specifiable at all is neutral concerning downward causation. It neither implies nor excludes downward causation.

Systems with properties that admit of no functional analysis need not be constituted by components whose own behavior is irreducible. Nor is it implied that the system's structure has a downward causal influence on the system's parts. It may just be that some of the system's properties are *nonstructural* properties, i.e., basic properties whose instantiation does not consist in the instantiation of distinct properties by the system or its parts as O'Connor and Wong have claimed. O'Connor and Wong, however, introduce nonstructurality as a metaphysical (and not as an epistemological) feature of emergent properties in a strong sense. In addition, they think that novel causal powers might be conferred on the system by its own emergent features (cf. O'Connor and Wong 2005, pp. 665–667).

Among the properties, dispositions, and behaviors to be reductively explained, mental properties take an exceptional position: they are considered as remarkably intractable. Some authors even doubt that we ever might succeed in reductively explaining certain mental properties, such as phenomenal experience, intentionality, or free agency. Even if we would know everything about the neural correlates of consciousness, even if we could say how each single neuron and how each single synapse behave, we might not be able to reductively explain all mental properties correlated with these neural processes. In fact, such a failure would not be based on a lack of insight on the side of the neurosciences; rather it would come along with the conceptual impossibility to adequately reconstruct phenomenal qualities via their functional role. And this principled failure might be due to the fact that phenomenal properties are nonstructural properties.

Let us now turn to *diachronic* theories of emergence. These theories are all based on a thesis about the occurrence of *novelties* in evolution. According to this thesis, in the course of evolution, exemplifications of genuine novelties occur again and again. Existing entities combine to new configurations and structures that constitute new entities with new properties and behaviors. However, the idea of a sequence of novelties does not by itself turn a weak theory of

emergence into a strong one, since reductive physicalism remains compatible with it. Only the addition of the thesis of *unpredictability*, in principle, will lead to stronger forms of *diachronic* emergentism.

The structure of an arising new system can be unpredictable, in principle, for two reasons: its arrangement may be a result of indeterministic processes or it may be the result of deterministic but chaotic processes. Within emergentism, only the second option is discussed. It is captured by the thesis of *structure unpredictability*, which claims that the rise of a novel structure is unpredictable, in principle, if its formation is governed by laws of deterministic chaos. Likewise, any property that is instantiated by such a novel structure is unpredictable, in principle.

Emergence as *structure unpredictability* has a great deal in common with an approach Andy Clark has called emergence as *uncompressible unfolding*. This expression refers to those patterns or macrostates of a system that can only be derived by *complete* simulations of all interactions at the component's level and the external influences on the system (cf. Bedau in Corradini and O'Connor 2010, p. 52). Such complete simulations of the underlying microdynamics would also be necessary for long-term predictions of structure formations governed by deterministic chaos. Since these simulations are not available – information compressing short cuts are not adequate for longer intervals – structure unpredictability as introduced above is unpredictability, in principle. Mark Bedau who once introduced the simulation-based notion of emergence in the context of game-of-life environments unfortunately dubbed it *weak* emergence, too, to distinguish it from the *strong* synchronic type, which comes with irreducibility. The game-of-life was invented by the mathematician Conway and is a two dimensional cellular automaton, on which, based on a few mathematical rules, one can define complex structures and mechanisms, which exhibit interesting similarities to biological systems.

Recently, Paul Humphreys has argued that the criteria for synchronic emergence are not sufficient for a state or property instance to count as

emergent because the historical development of a system's dynamic is often crucial for them being emergent. This criticism overlooks, however, that both synchronic and diachronic as well as both epistemological and metaphysical notions of emergence have fruitful applications. Important is to keep them apart.

Typically, in scientific and philosophical debates about emergence, religious issues do not play a prominent role. In the history of emergentism, only Conwy Lloyd Morgan and Samuel Alexander, who see themselves in the tradition of Spinoza and who had a strong mutual impact on each other (cf. Stephan 2007, Chap. 1), comment in their works on both divine qualities and the conception and role of God in evolution (Alexander in the fourth book of *Space, Time, and Deity*; and Lloyd Morgan in the first lecture of *Emergent Evolution*, where he discusses Alexander's ideas). Their general goal is to give a philosophical interpretation of nature as a whole by conceiving of emergent evolution as a *natural* development through and through, which is barred from any "alien influx" or a "designing mind" at particular occasions. Alexander, however, holds a rather unique position concerning the ultimate basis and the putative result of nature's development. In his highly speculative metaphysical inquiry, he postulates *space-time* as the basal, ubiquitous, and all-pervasive entity. In addition, he assumes an activity (a metaphysical principle, he termed *nisus*) that leads the universe from certain constellations of space-time to matter and in further succession – via physical structures and chemical syntheses – to life, mind, and consciousness. Eventually or so Alexander thought, mind may be productive of a new emergent quality he called *Deity* – a quality he attributes to the highest natural systems, yet finite beings. In this picture, he equates God (as an actual existent) with the infinite universe with its *nisus* toward deity. Accordingly, Lloyd Morgan transcends what scientifically can be argued for, when he states that *emergent evolution* itself may be conceived as the expression of an omnipresent Divine Activity, which is manifested in every one of the multitudinous entities that emerge in evolution. Understandably, these issues

did not bother many philosophers and scientists when debating the prospects of emergent properties in physics, chemistry, biology, and cognitive science. Only recently, Philip Clayton took up theological questions when discussing the relationship of emergence and transcendence (Clayton 2004). There he weighs the costs of linking emergence with theism to expand the explanatory repertoire for treating our "big questions" about agency, responsibility, and freedom. These questions can, however, also be touched within a pure naturalistic framework of emergence (cf. Corradini and O'Connor 2010, part II).

Cross-References

- [Consciousness, the Problem of](#)
- [Determinism and Indeterminism](#)
- [Dualism](#)
- [Evolution](#)
- [Free Will](#)
- [Functionalism](#)
- [Monism](#)
- [Nonreductive Physicalism](#)
- [Philosophy of Mind](#)
- [Reductionism](#)

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Emergent Monism

- [Nonreductive Physicalism](#)

Emergent Phenomena

- [Emergence, Theories of](#)

EMG

- [Electromyography](#)

Emotion

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Related Terms

[Affect](#); [Affection](#); [Feeling](#); [Mood](#); [Passion](#); [Sentiment](#); [Temper](#); [Temperament](#)

Description

“Emotions” were traditionally viewed and conceptualized as a heterogeneous group of spontaneously arising subjective states associated with a variety of thoughts, behaviors, and bodily responses. The word “emotion” is derived from the Latin word *exmovere* meaning “to move,” “to stir,” “to set in motion” which was referred to as mental movement or agitation. Thus, traditional accounts of emotions represented in various branches of the humanities, such as literature, philosophy, and religion, have been grounded in subjective experience (Damasio 2003; LeDoux 1996). Emotions have been recognized as powerful factors influencing thinking and behavior. As such, they were often regarded to play a crucial role in all the dimensions of human experience, including religious experience and practice (Azari and Birnbacher 2004). In contrast to thinking or reasoning, emotions were often viewed as irrational.

Although historically emotions have been a subject of analysis by many thinkers and philosophers, such as Aristotle, René Descartes, Baruch Spinoza, David Hume, to name the few, the science of emotions started in the second half of the nineteenth century with the works of Charles Darwin, William James, and others. Darwin’s observations described in *The Expression of the Emotions in Man and Animals* pointed at the universal and evolutionary character of emotional responses (Darwin 1872). Evolutionary perspective enabled studying emotions through their expressions independently of subjective (conscious) reports (Darwin 1872; Ekman 2003). It also paved the way to investigating human emotions through animal research. For centuries, emotions were perceived to be connected to various bodily responses, such as changes in heart rate and respiration, sweating, shaking, dilation or constriction of pupils, and many others. It was commonly accepted that emotions trigger and change bodily states. This view was first questioned in the 1880s by William James and Carl G. Lange, who independent of each other proposed that emotions arise from

bodily states (James 1884). At the time when the James-Lange “peripheral” theory of emotions was formulated, there was little empirical evidence supporting their claims. On the contrary, clinical and laboratory findings, such as observations of patients with severed spinal cord or experiments on animals with disrupted major sensory pathways, suggested presence of emotional responses despite the apparent disconnection between the brain and periphery. One of the early critics of the James-Lange theory, Walter B. Cannon, argued that bodily responses would be too slow to generate emotions and would lack the specificity necessary to distinguish between one emotional state and another (LeDoux 1996). Cannon proposed that the hypothalamus, an evolutionary old brain structure, plays a crucial role in emotion. Whereas Cannon’s contemporary, Charles Dana, emphasized the role of brain cortex in generating emotional responses (LeDoux 1996). Thus, with the works of Cannon and others, the focus in emotion research was shifted from studying bodily responses to investigating the brain. The first brain-based model of emotion circuitry was formulated by James P. Papez in 1937. Papez proposed that a network of interconnected brain structures including the hippocampus, hypothalamus, thalamus, cortex, and mammillary bodies works in concert generating emotional states as well as associated conscious feelings (LeDoux 1996). An alternative model of emotion circuitry in the brain emphasizing the role of different brain areas was proposed in 1952 by Paul MacLean. Although, most of Papez’s or MacLean’s speculations did not stand the test of empirical verification, their intuitions that emotions and other functions are related to a coordinated activity of anatomically and functionally interrelated brain structures remained a common way of thinking in neuroscience (LeDoux 1996).

Significant progress in the neuroscientific study of emotion resulted when researchers focused on a particular class of emotions, such as fear or pleasure, instead of developing general purpose brain-based models for all emotions. In particular, studying fear and related brain structures provided new insights into neural mechanisms of emotions (LeDoux 1996).

In 1939, Heinrich Klüver and Paul Bucy observed that monkeys with severed temporal lobes did not express reactions associated with fear or anger (LeDoux 1996). Almost two decades later, in 1956, Lawrence Weiskrantz identified that the structure within the temporal lobe which lesions are associated with the Klüver-Bucy syndrome was the amygdala (LeDoux 1996). Subsequent research provided abundant evidence demonstrating the key role of the amygdala in emotions, especially in fear (LeDoux 1996; Phelps and LeDoux 2005). Receiving information from all sensory modalities, the amygdala is responsible for generating fear responses based on the processing of the sensory stimuli (LeDoux 1996; Phelps and LeDoux 2005). The information about natural threats appears to be evolutionary hardwired into animal brains. In contrast, learning and memory mechanisms in the brain enable acquisition and maintenance of the information about environmental threat experiences by an individual. If the stimuli are evaluated as threatening, the amygdala sends signals to the brain stem and hypothalamus, which further control fear defensive behaviors as well as associated physiological responses. Findings from animal research have been overwhelmingly supported by observations from human brain imaging studies showing the involvement of the amygdala in normal and pathological fear (Phelps and LeDoux 2005).

Animal research demonstrated that the sensory information reaches the amygdala through two independent inputs: the “low road” or thalamic pathway conveying rapid but imprecise signal and the “high road” delivering complex information from association areas in the cortex (LeDoux 1996). The “two roads” model of signal transmission explains why fear responses can be initiated (by the indirect “low road”) before we are aware of the eliciting stimulus (cortical association areas are implied in conscious processes). Human brain imaging studies demonstrate that the amygdala as well as fear responses may be activated by stimuli that are not consciously perceived (Phelps and LeDoux 2005). Although the amygdala circuitry is not the only structure

involved in fear, investigating the amygdala circuitry provided valuable insights into the ways the brain generates emotions.

Existing data demonstrate that brain systems involved in generating emotions are highly preserved throughout the evolution, e.g., even if differences in brain structure are taken into account, similar circuits are involved in controlling and generating fear in various species including fish, amphibians, reptiles, birds, and mammals, including humans. Emotional reactions, such as fear or anger, are evolutionally developed adaptive responses increasing individual chances of survival. Other emotions, such as disgust, guilt, joy, affection, pleasure, interest, etc., play their roles regulating various aspects of individual's psychological or social life (Dębiec 2007; Panksepp 1998). Emotional responses are in most instances generated unconsciously. They may be accompanied by conscious feelings when an animal has the capacity for conscious awareness (Damasio 2003; LeDoux 1996). Further research in psychology provided more evidence that affective and cognitive systems to a large extent may operate independently of each other (Zajonc 1980). Much work has yet to be done to further elucidate the relations between emotional responses and conscious feelings at the neural level.

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Emotional Contagion

► [Empathy](#)

Emotional Robots

► [Robot Emotions](#)

Empathy

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Related Terms

[Agape](#); [Altruism](#); [Emotional contagion](#); [Sympathy](#)

The concept of empathy plays and has played an important role in contemporary and traditional discussions about the psychological mechanisms responsible for our ability to know other minds and our ability to be social creatures who are emotionally attuned to the feelings of others and who are also concerned about their well-being. While the concept of empathy is of rather recent vintage – it has only been coined at the beginning of the twentieth century – empathy-related phenomena have already been at the center of attention among Scottish moral philosophers of the eighteenth century, particularly David Hume and Adam Smith. They, however, referred to such phenomena by

using the term “sympathy.” Given the wide range of psychological phenomena that are collectively constitutive for our social abilities, both cognitive and emotional, it should maybe come as no surprise that the history of the empathy concept is characterized by a great deal of conceptual confusion and divergence. Readers of the literature on empathy are therefore well advised to pay very close attention to how exactly different authors conceive of empathy in order to properly adjudicate between their claims. In the following, this entry will broadly outline the various aspects of the empathy concepts and the associated debates.

The Concept of Empathy and Knowledge of Other Minds

Theodor Lipps (1851–1914) is appropriately regarded as the main source of the modern empathy concept or what he called “Einfühlung” (feeling into), since it was him who most systematically conceived of empathy as the central psychological mechanism allowing us to aesthetically appreciate works of art and objects of nature and who simultaneously also conceived of the very same mechanism as the basic and primary means for knowing others as minded creatures. Equally important, it was his conception that the American psychologist Edward Titchener referred to when translating the German term “Einfühlung” as empathy (Stueber 2006; 2008).

Lipps conceives of empathy as a biologically based resonance phenomenon. By nature, we are constituted so that we internally resonate with and mirror other persons’ mental states when we observe their activities or their bodily gestures. Nevertheless, in resonating with another person, we are also in some sense aware of the fact that we are merely vicariously sharing his or her thoughts or experiences. In resonating with your anger, we are also aware of the fact that it is not us but you who is really angry. We thus project our thoughts and experiences, which are caused by resonance, onto you. In this manner, Lipps suggested, empathy as inner resonance in the

perceptual encounters with others allows us to know what another person is feeling or thinking. Accordingly, for Lipps, knowledge of other minds involves processes of inner imitation and projection.

Lipps, however, did not regard empathy as one method among others for gaining knowledge of other minds. For him, it constitutes the only method since he thought of the ► [inference of analogy](#), which he regarded as the only alternative in this respect, as a conceptually inconsistent undertaking. It requires us to think of another person’s mind as something that is identical to my mind but at the same time also as something that is “absolutely different,” because it is something I do not directly experience (Lipps 1907).

Lipps’ writings were highly influential at his time. Yet philosophers did soon become concerned about whether empathy could be regarded as a reliable method of knowing other people’s mind as Lipps had claimed. Philosophers in the phenomenological tradition, such as Edmund Husserl, Edith Stein, and Max Scheler, generally accepted Lipps’s devastating critique of the inference of analogy as pointing to a fundamental shortcoming of the ► [Cartesian conception of the mind](#), which gives primacy to the first person perspective. Yet they asked why Lipps’s critique would not apply to his own conception of empathy since he still seemed to adhere to the general Cartesian framework of thinking about the mind. Phenomenologists continued to think of empathy as being central for our knowledge of other minds. Nevertheless, they did not conceive of it as a resonance phenomenon but as our unique ability to perceptually apprehend in a direct and non-inferential manner the mental states expressed in another person’s face, gesture, or even tone of voice (Zahavi 2010).

Lipps’s conception of empathy also resonated with hermeneutic philosophers concerned with the concept of understanding, which they regarded as the unique method of the human sciences. Yet while hermeneutic philosophers of the eighteenth and nineteenth century, such as Friedrich Schleiermacher, Johann Gustav Droysen, and the early Wilhelm Dilthey, did think of understanding to a large extent in

a psychological manner as involving rethinking and reexperiencing the mental life of others, philosophers in the hermeneutic traditions in the twentieth century wholeheartedly rejected a psychological conception of understanding and with it the concept of empathy. Particularly, Hans-Georg Gadamer argued that to think of understanding as empathy is epistemically naïve and simplistic. It does not sufficiently recognize that interpretation is always a holistic and culturally mediated affair whereby we understand individual texts and individual agency only by being able to situate them in a larger social and cultural context. Within the context of the philosophy of history, only the followers of the philosopher and historian Robin George Collingwood, like William Dray, for example, continued to defend empathic reenactment as the unique method of appreciating the thought processes of rational agents (Kögler and Stueber 2000; Stueber 2006).

Since the 1980s, empathy has become a topic of broad interdisciplinary research projects, a topic that has received renewed and sustained attention particularly from the neurosciences, but also from philosophy, developmental and social psychology, ethology, and even anthropology (Decety et al. 2009; Engelen et al. 2012; Coplan and Goldie 2011). Within the context of the contemporary ► [theory of mind debate](#), simulation theorists, who in contrast to theory theorists, argue that our ability to understand other minds is based on knowledge-poor mechanisms, again promote empathy or our ability to simulate the mental processes of others as a reliable means of knowing other minds. They generally distinguish between two levels in our simulative abilities. First, they postulate a cognitively and conceptually less complex and developmentally early capacity for making sense of others variously referred to as low-level mindreading or basic and mirroring empathy. Such basic level of making sense of other persons is seen as being neurobiologically realized by so-called mirror neurons, neurons that are activated both in the execution and the observation of goal-directed bodily movements or when feeling certain emotions and when observing others having

those emotions (Rizzolatti and Sinigaglia 2008). They also postulate a cognitively and conceptually advanced capacity of simulating the minds of others depending on our imaginative ability to take their perspective and look at the world from their point of view. Only on this level do we make sense of others in terms of our conceptually more sophisticated repertoire of folk psychological terms such as beliefs, desires, and so on and understand an agent's reasons for acting. Simulation theorists label this cognitively advanced level of understanding as reenactive empathy or more generally high-level mindreading (Stueber 2006; Goldman 2006).

Empathy and Moral Psychology

Empathy so far has been discussed primarily as a cognitive means for gaining access to other minds. Within the context of investigating the prosocial nature of human beings and the psychological foundation of moral agency, researchers however tended to conceive of empathy primarily as an affective phenomenon emphasizing our ability to vicariously share the emotions of others and to be emotionally attuned to their needs. While researchers did not always sufficiently distinguish between different dimensions of a human's affective attunement toward others, one nowadays generally distinguishes conceptually between four affective empathy-related phenomena, that is, emotional contagion, proper empathy, sympathy, and personal distress. Emotional contagion is referring to the human propensity to catch the emotion of others one associates with, such as the tendency to feel happy or panicky in a room full of happy or panicky people. Such propensity however does not involve the ability to recognize that one's happiness or panic has been caused by another person feeling a certain way. Proper empathy is referring to our ability to vicariously share another person's emotion (their grief or anger) and this also implies that we are in some sense aware of the fact that the felt emotion is more appropriate to the other person's circumstances than our own. Sympathy, on the other hand, does

not require that one shares the emotion of the other person. Rather it is a feeling of concern for the other person's well-being and accordingly it is an emotion *sui generis*, which is directed toward the other person. Finally, personal distress is an emotional reaction that is caused by the situation of another person while it is at the same time an emotion that is directed toward one's own self, such as when one feels upset about having to deal with the misfortune of another person when one really has better things to do.

Two comments are important in this context. First, given these conceptual distinctions, it needs to be stressed that human infants are able to experience proper empathy and sympathy only after they acquire the cognitive ability to sufficiently distinguish between self and other (usually in their second year). Second, while it is conceptually important to distinguish between these various affective phenomena, as a matter of fact they tend to occur together when humans encounter other persons, particularly other persons in need. Moreover it seems as if only creatures, which are receptive to emotional contagion, develop later on more mature empathic and sympathetic capacities. For this very reason, various researchers refer to sympathy also as empathic concern (Hoffman 2000; DeWaal 2006).

Affective empathy has been shown to contribute positively to prosocial behavior. With help of a number of ingenious experiments, Daniel Batson has also made a strong case for a causal connection between empathic concern or sympathy and the existence of genuine altruistic-motivation having the well-being of another person as its ultimate goal (Batson 2011). Yet he has also shown that we can be altruistically motivated to violate universal moral principles such as fairness and justice. In addition, it is commonly known that our ability to empathize and sympathize with others is limited and biased in that we tend to empathize more easily with others that in some sense are closer to us. It is exactly for this very reason that David Hume and Adam Smith in the eighteenth century thought that our natural ability for empathy, or what

they called sympathy, needed to be corrected and supplemented by the impartial spectator perspective in order for empathy to play a role as the foundation for moral judgments and for deriving universal moral principles. How exactly one should conceive of the contribution of empathy, in the cognitive or affective sense, as contributing to constituting us as social and moral creatures is therefore the subject of ongoing empirical research and continuous philosophical discussion (Coplan and Goldie 2011; Debes 2011; Slote 2010).

Cross-References

- [Altruism](#)
- [Imagination](#)
- [Hermeneutics](#)
- [Simulation Theory](#)
- [Theory of Mind](#)

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Empiricism

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A philosophical method first articulated by Francis Bacon in the late sixteenth century that shifts the focus of philosophical investigations, and overall the pursuit of science itself, from metaphysical speculation to immediate human experience, its testing, and evaluation. The early British “empiricists” emphasized “simple ideas” derived from sense observation over complex and grandiose philosophical concepts such as God, the universe, the soul, matter, etc. Later generations refined the principles of empiricism to involve mainly the formation of testable hypotheses and their validation through precise means of experimentation. The latter type of empiricism is now called the “scientific method.”

Enactivism and Buddhism

- [Constructivism in Buddhism](#)

Encyclopaedism

- [Science in Islam, Classification](#)

End

- [Eschatology](#)

End of Life

- [Death](#)

End of Metaphysics

- [After-Metaphysical Theology](#)

End Point

- [Eschatology](#)

Ending

- [Eschatology](#)

Endocrinology

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Description

Endocrinology is a biomedical discipline dealing with the origin, effect, and medical consequences of biochemical signals (hormones) that are transported via the blood stream to distant sites of the body to help communication between various organs and tissues. It is like sending email messages to the whole body via the blood. In that,

endocrinology has many similarities with neurology where nerve signals are transported via neurons and humoral neurotransmitters. As a clinical discipline, endocrinology deals with diseases of disturbed function – hormone excess and hormone deficit – and morphological pathologies of endocrine organs as well as diagnostic procedures, therapy, and management of respective diseases. As a science, endocrinology aims at understanding the basic mechanisms involved. Recently a major focus is on the understanding of the molecular mechanisms involved.

Neuroendocrinology describes the interaction between the central nervous system and endocrine systems in the control of homeostasis and its pathologies. For example, the cells of the neurohypophysis are originating from the brain and extend to the posterior pituitary gland from where – upon appropriate stimulation by peripheral or central signals – the antidiuretic hormone or oxytocin is released into the blood stream.

Self-identification

Science

Endocrinology is a clinical subject that tries to understand the physiology of endocrine regulation, to diagnose endocrine disorders and to treat and manage patients with such diseases. For the understanding of the physiology of the endocrine system and of the pathologies underlying endocrine disorders, the discipline takes advantage of chemistry, biochemistry, genetics, statistics, biometry, physics, biophysics, and other basic sciences. The advances in the subject in both clinical and basic endocrinology are driven by scientific methods, i.e., systematic research that allows to provide the clinical and scientific evidence required for appropriate diagnostic and therapeutic decision making. Evidence from published clinical trials as well as clinical observations and the experience of the physician are a basis for such decisions.

Comparative endocrinology clearly shows that the underlying mechanisms of communication between distant organs via fluids in a body are basic paradigms in the development of species.

We can now better describe how endocrine functions and species change in different habitats, such as the development of the water-saving principle of antidiuretic hormone in reptiles that first left the water. However, in most if not all other medical fields of endocrinology, we recognize and have to accept the limits of our knowledge and understanding whenever we try and dig deeper into the basic questions how the system exactly works and why it may get out of order in some cases at a certain time point.

Characteristics

Endocrinology is unique in its level of communication with many systems in the body. Distinct endocrine messages can be distributed to nearly all organs within a short time, and negative or positive feedback regulation is a common feature of endocrinology. The same hormone may have various effects in different organs of the body since the perception of such a signal is dependent on the presence of specific receptors in the recipient cells. The interaction between the ligand and the receptor, and the appropriate triggering of the recipient cell machinery drive the response of the recipient organ and also the endocrine feedback response that is not only provided to the signaling endocrine organ but may also extends to other organs of the body.

Relevance to Science and Religion

The discipline endocrinology does not see itself as relevant to the scholarly area “Science and Religion.” However, many processes in endocrinology are too complex to be fully understood so that we just have to accept them as a fact and describe them as they are, with a scientific strive to find out the origins which we will probably never be able to indicate [1, 7].

Sources of Authority

The word hormone was first coined in 1905 by Ernest Starling (1866–1927) from University

College London who had first discovered the hormone secretin in 1902. The term “hormone” was soon universally accepted [10]. However, there were a number of researchers who had already discovered the principles of endocrinology before that time. Performing a series of experiments, the German anatomist and physiologist Arnold Berthold (1803–1861) working in Göttingen was able to show that the secondary sex characteristics of castrated cockerels could be maintained by implanting the testes to other places and he was able to prove that this was mediated via the bloodstream [6]. In 1855, the physiologist Claude Bernard (1813–1878) from Paris described that glucose synthesized in the liver was secreted into the portal vein, and he thus provided direct evidence for internal secretion. Thomas Addison (1793–1860) from Guy’s Hospital in London described the function of the adrenal glands. Addison’s disease is a complete failure of the adrenal cortex and is lethal when untreated. It was only in 1948 that an extraction and synthesis of the adrenocortical hormone cortisone was achieved and was applied as a life-saving drug in patients with adrenocortical insufficiency. This work was honored with the Nobel Prize to Kendall, Reichstein, and Hench. The most prominent patient with Addison’s disease was John F. Kennedy, the former president of the USA. In 1911, Walter Cannon (1871–1945) described that fear or anger leads to a release of the hormone adrenaline from the adrenal medulla.

Similar developments can be seen along the discovery of insulin [2]. The German pathologist Paul Langerhans (1847–1888) first described the pancreatic islets. Later in the century Joseph von Mering (1849–1908) and Oskar Minkowsky developed a deeper understanding that diabetes mellitus was associated with the pancreas and Gustave-Edouard Languesse (1861–1927) demonstrated that the endocrine pancreatic secretions are to be distinguished from the action of the exocrine acini. It was only in 1921 when insulin could be extracted from the pancreas by John Macleod (1876–1935), James Collip (1892–1965), Sir Frederick Banting (1882–1941), and his student Charles Best

(1899–1978) from the University of Toronto. For this achievement, Banting and Mcleod got the Nobel prize, but Banting shared it with Best, and Mcleod shared it with Collip who was the brain behind all this work. In 1922 the so-called isletin was first injected into the blood of wasting children with diabetes and was able to save their lives. In 1923, the industrial production of insulin was taken up by Eli Lilly in the USA, and in the same year, insulin production was licensed by Hoechst in Germany.

A number of further endocrinologists and pioneers in medicine were awarded with the Nobel Prize, such as Emil Theodor Kocher (1841–1917) for his work on the thyroid gland or Rosalyn Yalow (1921–2011) who obtained the Nobel Prize 5 years after the death of Solomon Berson (1918–1972) with whom she had first described the radioimmunoassay (for the measurement of insulin). There are other great pioneers who were, however, not awarded with the Nobel Prize such as Deborah Doniach (1912–2003) and Ivan Roitt (b.1927) from the Middlesex Hospital London who were the first in 1956 to describe autoantibodies to thyroid microsomes and thyroglobulin that are a key feature of autoimmune thyroiditis. Deborah Doniach was a leading figure in modern immunology opening the concept of autoimmune disease.

In 1986, Pierre Marie (1853–1929) described acromegaly (Pierre Marie’s disease), and it was later realized that both acromegaly and gigantism were associated with pituitary tumours.

In 1912, Harvey Cushing (1869–1939) described the close relationship between pituitary tumors and certain syndromes, and in 1932 he described the basophil tumor that was later called Cushing’s disease [3].

The field of neuroendocrinology is closely linked with the pioneering work by Ernst (1905–1965) and Berta Scharrer (1906–1995) who recognized that neurons in the hypothalamus are the source of the axons that constitute the neurohypophysis [9].

Andrew Schally and Roger Guillemin with their groups elaborated that the anterior pituitary is tightly controlled by the hypothalamus and in a

historic race for the first description they isolated the relevant peptide-releasing hormones. Both of them were jointly awarded the Nobel Prize in physiology or medicine in 1977 [4, 8].

Ethical Principles

Endocrinology deals with many subjects where ethical considerations are key issues. These are, among others, reproductive medicine, transsexuality, diagnosis of diseases in utero, abortion, and preventive medicine in endocrine disorders related to gene aberrations. For most of these issues, the endocrinologists discussed the matter thoroughly and published recommendations for the clinicians and also for health providers and political decision makers. For example, inherited C-cell carcinoma is a genetic trait with such a high penetrance that it is recommended to completely remove the thyroid gland in childhood in order to prevent the cancer to grow and to set metastases. It is well understood that this involves a high responsibility of the doctors involved in the diagnostic and preventive procedures that may also set the individuals at risk.

Key Values

Endocrinology considers the body as a whole as well as the communication between different organs. It also considers the communication between the body and the environment, for example, in the expression of hormonal responses to environmental stress.

Conceptualization

Nature/World

Nature and the world can be seen as a system of homeostasis and eruptions. These are also key issues in endocrinology where basic hormone secretion is regulated by many factors that aim at achieving a balance of the whole system. To achieve a homeostasis, the hormonal system has

a wide array of regulatory mechanisms such as the negative feedback systems. On top of that eruptions of hormones occur mostly in a meaningful way, for example, the mid-cyclic surge of luteinizing hormone that induces ovulation.

Human Being

Endocrinology is closely linked with the processes of mating, conception, growth, puberty, maturity, and senescence which are rather features of most animal species than of human beings. These close links with other species are important unifying factors that reconcile human beings and biology. These important links are studied in the field of comparative endocrinology.

Life and Death

Endocrinology is a system of higher developed life. Programmed cell death (apoptosis) of certain cells is a prerequisite of life and development of organs including endocrine glands. Even in adults ontogenic regression with programmed reversal of reproductive maturation and function may occur during states of acute systemic illness and may be reinstated when the prevailing environment is more favourable [5].

Reality

In endocrinology, most values are not absolute but relative to others, so that the reality is always to be seen in relation to the actual situation. For example, the same cortisol value in the blood may be too high or too low, depending on the clock time we look at it.

Knowledge

Knowledge in endocrinology is a combination of objective accumulation of knowledge, and insight based on clinical experience.

Truth

In endocrinology, facts are considered as true when they are based on clinical or experimental scientific evidence as well as personal experience. For example, the reduction of the number of storks in the Alsace definitely coincides with a reduction of the birth rate but this does not necessarily mean that the storks provide our babies.

Perception

Why do men feel as men and women as women, and why do some women with all the hormonal signs of women feel as men and vice versa. When and where does the sexual programming take place and what is going wrong in the exceptional cases? How do psychological and psychosocial events influence the hormonal homoeostasis and vice versa?

Time

Cyclic processes are immanent to endocrinology, for example, cyclic secretion of hormones with short cycles such as the 90 min peaks of gonadotropin-releasing hormone, the daily rhythm of cortisol secretion, the light-induced release of melatonin, or the monthly menstrual cycles in women. The regulation of clock genes is a fascinating issue underlying these processes on a molecular level.

Consciousness

It is increasingly recognized that endocrine hormones are not only regulated within the endocrine system but they also influence brain functions and psychological activities such as consciousness.

Rationality/Reason

Psychiatric manifestations of endocrine disorders may be elicited by excessive derangements of various hormones. This clearly shows that clinical symptoms of endocrine disorders cannot be completely explained by the known hormone actions.

Mystery

There are plenty of mysteries in endocrinology. It is a general feeling and probably a fact that mysteries turn up at any edge of our scientific achievements, thus pushing further scientific work which leads us to a higher level of knowledge and to mysteries at a higher level.

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Energy

- [Chemical Thermodynamics](#)
- [Energy in Physics](#)

Energy in Physics

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Related Terms

[Classical physics](#); [Dark energy](#); [Energy](#); [Kinetic energy](#); [Potential energy](#); [Quantum physics](#)

Introduction

The concept of energy has a fundamental place in physics – a place that was acquired in the

nineteenth century when its emergence provided a new and unifying framework bringing together all known phenomena within the dominating mechanical view of nature and embracing heat, light, and electricity, together with mechanics, in a single conceptual structure (Harman 1982, p. 2). This new framework led to the development of the concepts of the physical field, electromagnetic ether, conservation and dissipation of energy which, in the beginning of the twentieth century, opened the way to the formulation of the theories of relativity, quantum mechanics, and gravitation. The evolution of these theories still governs our knowledge about the structure of matter, about the world and the cosmos. Yet, the obvious relevance and pervasive use of the concept of energy in physics did not stop Richard Feynman (1918–1988, recipient of the Nobel Prize in Physics in 1965) to write that: “It is important to realize that in physics today, we have no knowledge of what energy ‘is’ (Harman 1982, p. 4-2).”

The Concept of Energy in Classical Physics

The discussion of the concept of energy usually starts with an emphasis on mechanics, but it is only to go beyond it. According to Eugene Hecht “... it influences our thinking about every branch of physics, indeed, about every aspect of our existence. Yet, there is no completely satisfactory definition of energy. Even so,” he continues, “we will quantify its various manifestations as we struggle to define it (Hecht 2000a, p. 222).” In its most popular meaning, the concept was used at least since the late 1500s and was associated with the capacity of physical objects and systems to do work. In 1638, Galileo employed the term *energia* though he never defined it. It was only in the 1850s that the idea had taken on a scientific meaning – a meaning that is not altogether satisfactorily defined. “In very general terms, energy describes the state of a system in relation to the action of four forces” (Hecht 2000a, p. 223) – gravitational, electromagnetic, strong and weak. It is therefore a relational

concept, a concept which is inherently associated with the description of motion, change and the interaction between physical objects and systems in general.

Energy and Change

Energy is a property of all matter and is observed indirectly through changes in physical objects’ speed, mass, position, and so forth. The change in the energy of a system, which is all we can ever measure in an experiment, is a measure of the physical change in that system. Force is the agent of change, whereas energy is the measure of change. Because a system can change through the action of different forces in different ways, there are several distinct manifestations of energy.

By observing the changing behavior of matter, we ‘infer’ the presence of one form or another of energy. Still, energy is not an entity in and of itself – there is no such thing as pure energy. Energy is always the energy of something. The concept of energy provides a means of quantitatively accounting for physical change. When a material system manifests an observable change due to some interaction, we associate an amount of energy with the extent of that change. Interaction is crucial; if matter did not interact, the concept of energy would be superfluous. (Hecht 2000a, p. 223)

Mario Bunge points out that, since it is ubiquitous, the concept of energy must be philosophical and, in particular, metaphysical belonging in the same league as the concepts of thing and property, event and process, space and time, causation and chance. He identifies energy with changeability (Bunge 2000, p. 458).

Kinetic and Potential Energy

It is interesting to point out that the concept of energy is associated with the concept of work. This association makes a lot of sense given the semantic meaning of the word *energeia* in Greek which comes from *energos*: *en* – “at” + *ergon* – “work.” In mechanics, work is defined by the product of force and distance, and happens to be equal to the change of energy resulting from the application of that force to a body as that body moves through a distance in space. This type of energy is naturally associated with motion and is

called *kinetic energy*, a term introduced by Lord Kelvin (William Thomson) in 1849. It was defined as the square of the velocity v of an object multiplied by its mass m divided by two: $mv^2/2$. If, however, the force acting upon the body is naturally present after its displacement and the body is kept motionless but potentially susceptible to the force action, the potential for generating the kinetic energy is still there because of the presence of the force. This type of energy is known as *potential energy* and exists by virtue of the position of the body in relation to a naturally present force. Such is the situation when the gravitational force causes the free fall of objects which are left on their own without any support at some height above the surface of the earth. In summary, kinetic energy is associated with the capacity to do work by virtue of motion; potential energy is associated with the capacity to do work by virtue of position.

Energy Conservation Law and Symmetry

R. B. Lindsay defines the concept of energy through the concept of change pointing out, however, that the basis of its usage today is the idea of *invariance*, which means constancy in the midst of change (Lindsay 1971, p. 384; 1972, p. 219). Lindsay's shift of focus from change to invariance alludes to the energy conservation law – the empirical fact that, whenever an amount of energy is transferred from one entity to another, the total amount of energy always remains unchanged. This shows that “the importance of energy springs not just from its variety of form, but from its conservation: the total amount of energy in the cosmos remains always the same, since the loss of one kind of energy is always being compensated by the gain of another kind of energy (Word 2005, p. 18).” It is important to note that the conservation of energy applies to systems and not to individual bodies. The total energy of a system of bodies includes contributions from both, kinetic energy of motion, and potential energy that reflects the interaction between the bodies. The potential energy contributions depend on the distances between the bodies, their electrical charges, and, possibly, other things. It is only the total energy that is conserved.

Conservation laws are commonly considered as the deepest and most significant types of scientific laws because they give insights into the symmetry of the physical systems but, more importantly, into the symmetries of space and time (space-time). More involved mathematical manipulations of the classical physics laws of motion reveal that energy conservation stems from the “smooth” nature of time, i.e., from the fact that “it spreads smoothly from the past into the future with no squashed bits or stretched bits” (Atkins 2003, p. 98). What this really means is that the energy conservation law could be mathematically derived from the invariance of the physical laws to forward and backward time changes. So deep is the relationship between conservation laws and the symmetry of space-time that the conservation laws survive even when classical physics laws of motion fail and there is a need to move into the realm of relativity and quantum mechanics. This relationship shows that the stability and the sustainability of the physical world are deeply rooted into the symmetry principles of its most fundamental inner structure (Atkins 2003, p. 98).

From Visible to Invisible

Historically, the concept of kinetic energy was introduced first. The introduction of potential energy provided continuity to the idea of energy in general since its change was associated with the work done on a body against a naturally present external force. Its relevance to the development of physics was found to be critically important:

The concept of kinetic energy, as it stands, is a derivative concept since it is directly definable in terms of observables, namely mass and velocity. To this extent its usefulness is limited, and it affords no deeper understanding of the nature of mechanical systems; its logical distance from observation is too slight. But the value and significance of the concept are immeasurably increased, both for mechanics and as it turns out for physical science as a whole, by the introduction of the additional concept of potential energy. This move at one stroke places energy among the most important of physical concepts. The new notion of energy thus created, represents a considerable conceptual sophistication of the old one; its logical distance

from observation is now very much greater, and the concept casts its net more widely. (Theobald 1966, p. 39).

It is, therefore, the logical distance from observation that provided the concept of energy its metaphysical relevance. It is the shift from the description of the visible properties of physical objects and systems to the manifestation of their invisible ones that makes it universally meaningful.

Energy and Fields: The Electrical Field as an Example

The relevance of the concept of potential energy is inherently associated with the emergence of the field concept. To clarify what a field is, we could use an example from electrostatics – the part of physics dealing with electrical charges, fields, and their interactions. The concept of electrical charge is fundamental and cannot be described in simpler, more basic concepts. In the words of Eugene Hecht: “We know it by what it does and not by what it is – if you like, it is what it does, and that’s that (Hecht 2000b, p. 610).” A charged particle such as the electron interacts with other charged particles by creating a web of interaction around itself that extends out into space. We say that one charge creates an electric field in space and when another charge is immersed in that field, it interacts directly with it. The field that surrounds an electrical charge is part of it and becomes the media or mediator of the interaction with the other charge. The picture is quite straightforward, but raises many questions. The main question is why do we need the field concept? The answer is: to deal with the explanation of “action at a distance,” and the principle of “locality” – the expectation that effects must be co-located with their causes, both in space and in time. One electron causes another, second, electron located at some distance away, to experience a certain force. This force seems to have no cause located any nearer to the second electron than the distance to the first one. It seems, therefore, that there is no visible local cause for the force experienced by the second electron. The introduction of the field concept by Michael

Faraday enabled electric interactions to satisfy spatiotemporal locality and explain the action at a distance, i.e., that the electric force acting on a charged body at a given moment in time is caused by the electrical field at its location. The field is invisible, but it becomes visible by its effects. Its energy is manifested by the work done by the electrical field force for moving the charge away at a given distance. Even this simple exposition of the field theory clearly shows in what sense the concepts of energy and field are interrelated. Energy “becomes the basic ‘substance’ of field physics, as matter was the basic ‘substance’ of Newtonian physics. Energy is not a way of characterizing particles, but a way of characterizing processes in the field” (Theobald 1966, p. 50). “It is so because the field is characterized by the presence of energy. . . . A field is nothing more than a spatial distribution of energy which varies with time. Energy has thus been freed from its dependence upon physical vehicles such as particles; it has achieved the status of independent scientific existence” (Theobald 1966, p. 98).

How should we interpret then the comment of Richard Feynman that in physics today, we have no knowledge of what energy *is*? In his comment Feynman continues as follows: “We do not have a picture that energy comes in little blobs of a definite amount. It is not that way. However, there are formulas for calculating some numerical quantity and when we add it all together it always gives . . . the same number. It is an abstract thing in that it does not tell us the mechanism or the reason for the various formulas. . . . Conservation of energy can be understood only if we know the formula for all of its forms” (Theobald 1966, p. 4-2). Such an approach to the definition of energy is an example of operationism – the view that the meaning of every scientific term must be specifiable by identifying a definite testing operation that provides a criterion for its application. This means, unfortunately, that for most physicists “the whole of physics is about operations, chiefly measurements and computations, rather than about nature” (Bunge 1973, p. 1).

The Concept of Energy in Modern Physics

Energy in Quantum Physics

Max Planck and the Quantum of Energy and Action

The idea of the quantum of energy was introduced as a kind of energetic atomism, in which energy could not be divided into arbitrarily small amounts but existed as discrete, tiny packets (Dear 2006, p. 142). In its origins, the introduction of the concept of energy quantization was driven by deeply practical reasons. In 1900, it allowed the German physicist Max Planck to create an adequate mathematical model of a troubling problem – the so-called black-body radiation, i.e., the radiation that is emitted by a specific type of heated bodies. Planck worked with careful experimental measurements of the actual energy distribution trying to develop a correct theoretical model to describe it. Eventually, he found out that he could do that only if he assumed that the emitted energy could change only in jumps, from one energy level to the next. This assumption in Planck's model violated the usual way of thinking about energy – as a quantity that could vary smoothly, increasing or decreasing gradually, rather than being confined to stepwise change. Some people consider Planck's assumption as a “desperate” but the only possible move enabling him to fit the empirical data on black-body radiation. Planck called these discrete energy changes “quanta” of energy. He assumed that their necessity in the theory would soon be explained, and that the explanation would not require energy itself to exist only in bundles of specific sizes. He, however, was not able to come up with such an explanation himself.

The Universal Meaning of the Energy Quantum Concept

Very soon other physicists began to see the more universal meaning in Planck's idea. In a paper of 1905 focusing on the photoelectric effect, Albert Einstein argued that light itself should not be understood simply as wave motion but should also be understood in terms of light quanta – massless

packets of energy that were later to be called “photons.” The energy of a single photon E was found to be proportional to the light's frequency ν : $E = h\nu$. The constant h was first derived by Planck and, therefore, known as Planck's constant or the “quantum of action.” Soon after the emergence of the photon, the idea of the quantum nature of energy was extensively infiltrated into microphysics.

In 1913, the Danish physicist Niels Bohr opened up a critically important new arena for the use of the concept – atomic spectroscopy. It was the exploration of this arena that led to the emergence of quantum physics. Bohr adopted Planck's quantum to study the internal structure of atoms in a way that was “in obvious contrast to the ordinary ideas of electrodynamics but appears to be necessary in order to account for experimental facts” (Dear 2006, p. 144). He started with the commonly accepted “solar system” model of the atom wherein negatively charged electrons orbit around the central positively charged nucleus like planets. “The size of an electron's orbit corresponded to the orbit's energy, and Bohr postulated that the only orbits permitted to such electrons were those whose energy corresponded to discrete, quantized levels – not just any amount of energy, or orbit, was allowed by his model. There were levels, or steps, of orbital energy that the electrons could occupy; Bohr called them ‘stationary states.’ The only changes in orbital levels that an electron could undergo were ones in which it shifted, in a discrete jump, from one stationary state to another” (Dear 2006, p. 144). Assuming the discrete nature of these changes allowed Bohr to interpret some of the experimental results that had been known for nearly 30 years. These results concerned the radiation emitted by hydrogen atoms when excited by heat. When the radiation was separated out according to frequency by a spectroscope, the spectrum showed a series of discrete bright lines that was uniquely related to the specific internal structure of hydrogen atoms. Even though quantum theory was still in its initial stages, there was a major epistemological breakthrough that was associated with Niels Bohr's

achievement – the demonstration that the energetic manifestations of light quanta could be identified with the composition of atoms and the structure of matter in general. The dynamic structure of matter is manifested or known by the particular mode by which the smallest quantities of energy are presented to the observer.

Quantum Versus Classical Energy

One of the most obvious and important differences between classical and quantum physics is that the exchange and transformation of energy is not regarded as a continuous process. In classical physics, the use of the energy concept is process driven and descriptive in nature. It presupposes continuity and needs to be abandoned when moving into the realm of quantum physics (Theobald 1966, p. 117). But concepts such as conservation of energy which do not require following the actual process of change are still naturally valid in quantum theory. In other words, the radical newness of quantum theory is associated with the way it describes the states of systems and has nothing to say of the processes by which states of affairs are realized. This does not mean that nothing ever happens; it simply means that continuous processes escape the conceptual apparatus of quantum theory. This “new” physics deals with the energetic manifestations of physical realities, which are invoked or actualized in acts of observation performed in a way suitable to the dynamics of their inner nature (Wilczek 2008, p. 74). Quantum objects are not only invisible but also unimaginable, i.e., the fundamental concepts of quantum physics are not accessible to human imagination. This leads to a continuous need of interpretation. Such an interpretation could happen only within the framework of activities of a given scientific community driven by its historically developed ontological and epistemological presuppositions.

Energy in Relativity and Cosmology

Special Theory of Relativity and $E = mc^2$

The special relativity of Einstein came out of the study of electricity and magnetism. It arose from a description of the world based on the concept of field. As we have seen, fields are physical realities

filling all space and mediating the interaction between physical particles such as electrons, protons, and neutrons. This was a world different from Newton’s world that was based on particles exerting forces on one another through empty space. The insights of special relativity, however, go far beyond electromagnetism since its essence is rooted in a symmetry principle – that the laws of physics should take the same form after an increase of the velocity of all objects by the same constant value. What Einstein really did was to change Newton’s laws of classical physics of motion so that they obey the symmetry principle found in electromagnetism.

The first of Einstein’s insights about the concept of energy was the association of mass with energy: “One more consequence of the electrodynamical paper has also occurred to me. The principle of relativity, together with Maxwell’s equations, requires that mass be a direct measure of energy contained in a body; light transfers mass. . . . The argument is amusing and attractive; but I can’t tell whether the Lord isn’t laughing about it and playing a trick on me” (From a letter to Conrad Habicht in 1905). Einstein obviously talks about his famous equation $E = mc^2$ which holds for isolated bodies at rest (m is the mass of the body and c is the speed of light). For moving bodies, the correct mass-energy equation becomes $E = \gamma mc^2$ and includes an additional factor $\gamma = 1/(1-v^2/c^2)^{1/2}$ which depends on the velocity of the body v . Einstein’s result implied that the mass of any body was equivalent to its energy at rest.

“Energy of Being”

The message coming from the equation $E = mc^2$ was rather radical – the concept energy associated with physical particles is not necessarily related to motion (kinetic energy) and positioning (potential energy), “. . . there is also an energy that a particle has from its mere existence, an energy that depends directly on the mass” (Feynman 1994, p. 65). Therefore, in the world of isolated elementary particles “there are two significant forms of energy: the mass energy and the kinetic energy of motion. The mass energy of a particle is its energy of being”

(Word 2005, p. 18). Energy of being is proportional to mass. “Twice as much mass means twice as much energy, and no mass means no energy. . . . So mass represents a highly concentrated form of energy” (Word 2005, p. 19). It took many years before Einstein could assume in 1932 that his equation $E = mc^2$ was experimentally confirmed and it is now well known that it is correct.

Energy, Gravitation, and the Geometry of Space-Time

The second of Einstein’s insights about energy is related to his theory of gravitation. After the development of the special theory of relativity, Einstein started looking for a way to include gravity into the new framework and, in the end, produced a field-based theory of gravity – general relativity. The fact that general relativity is a field theory should be of no surprise. One of the main insights from the special theory of relativity was the postulate that the velocity of light, c , is constant but, even more importantly, limited. Therefore, the influence of one particle to another cannot be transmitted faster than that. Newton’s law of the gravitational force did not obey that rule and was not consistent with special relativity theory. General relativity arose as an update of Newton’s gravitation theory by fixing this inconsistency with the help of a field-based approach. Using the relativistic principles, Einstein showed how energy creates a gravitational field playing the role that was previously occupied by mass alone. In his gravitation theory, Einstein related the metric or the curvature of the geometry of space-time to the strength of the gravitational field arising from any energy present, showing that gravity could be deeply encoded in the geometry of space-time. Mass and energy distort space-time, and the distorted space-time in turn accounts for gravitational effects on matter and energy (for example light) moving through it.

Matter, Dark Matter, and Dark Energy

The third of Einstein’s insights about energy is related to cosmology. In 1917, based on his two initial insights, Einstein derived the set of equations describing the metric of the space-time of

the universe as a whole. He thought that the universe had a constant density in time and space but eventually found out that there is no solution with those properties. To get the constant density solution, Einstein added to the equations for gravity a new term called the “cosmological term” or the “cosmological constant.” The solution he found corresponded to a closed static universe – a big sphere with finite radius that stayed constant over time. This solution happened to be unstable. In addition, in 1929, Edwin Hubble provided convincing evidence that the universe is in fact expanding, leading Einstein to admit that the introduction of the cosmological term was his “greatest mistake” or “blunder.” Nevertheless, the possibility he identified, of adding a new term to the equations of general relativity to describe the universe, did not go away and became a matter of serious study in the following 70 years. Cosmological observations remained consistent with a cosmological constant equal to zero until about 1998, when convincing measurements began to indicate that there is indeed an accelerating cosmic expansion that could be explained by the presence of a cosmological term with a cc having a very small positive value. Subsequent observations provided additional support for this and Einstein’s introduction of the term in 1917, although introduced for the wrong reasons, was found to be prophetic.

The cc or the cosmic density was recently estimated by measuring its effects on the curvature of space through the distortion such curvature causes in images of distant galaxies (Wilczek 2008, p. 108). It is a powerful new technique measuring some of the properties of the cosmic microwave background radiation (CMB). Using this technique, by 2001, several groups made several important conclusions. First, the universe is made up of 30% matter. Second, only 5% of these 30% is the matter as we know it – the kind of matter we study in biology, chemistry, engineering, and geology and the kind of matter we are made from. The remaining 25% is a special type of (dark) matter – it is not uniformly distributed in space and its density is not constant in time. Observations suggest that it is based on

a special (probably new) particle, but it is not clear what this particle is. The new Large Hadron Collider (LHC) in Geneva is expected to help in identifying the source of dark matter. Third, there is a 70% missing component which is not matter and which is considered as being contributed by the so-called dark energy. It appears to be very uniformly distributed in space and time and has been observed only through its gravitational influence on the motion of normal matter. This makes it look like a property of empty space. It has not been observed to absorb light, i.e., it is not dark in the usual sense but transparent. The dark energy concept is directly associated with Einstein's cosmological term – although there are slight differences in the interpretation, they may refer to the same physical phenomenon (Wilczek 2008, p. 105). “The theory of dark energy is in bad shape. It's a problem for the future” (Wilczek 2008, p. 195). The current guesses are that it is some sort of force field which permeates the vacuum but there is no currently known theory of physics that could explain it. On the other hand, “the dark-matter problem, . . . , is ripe for solution” and there are promising ideas that could explain what dark matter is (Wilczek 2008, p. 196). Some physicists believe that, with the addition of his cosmological term, Einstein had in fact identified a new form of energy that is associated with space-time itself – it is not carried by matter and not the result of the known forces, i.e., a kind of vacuum energy. This is the first time in physics when a new form of energy is identified together with a claim that there is nothing carrying it. There are two other logical possibilities. Either we are now seeing the effects of some new substance that was not previously seen before, or there is something wrong with our current theoretical worldview (Taylor 2008, p. 41).

The Concept of Energy within the Context of Religion

The concept of energy is often considered within the context of specific religious worldviews.

One of the most representative examples can be found in Eastern Christianity where the distinction between essence and energy has been playing a significant role since the fourth century A.D. This last section will briefly focus on the concept of energy in Eastern Christian theology (Tanev 2009).

It was probably St John of Damascus (c. 676–749) who defined it in a most straightforward way:

... energy is the natural force and activity of each essence: or again, natural energy is the activity innate in every essence: and so, clearly, things that have the same essence have also the same energy, and things that have different natures have also different energies. For no essence can be devoid of natural energy. . . . Natural energy again is the force in each essence by which its nature is made manifest. And again: natural energy is the primal, eternally-moving force of the intelligent soul: that is, the eternally-moving word of the soul, which ever springs naturally from it. And yet again: natural energy is the force and activity of each essence which only that which is not lacks. (John of Damascus 2000, Writings, “Concerning Energy,” *Orthodox Faith*, Book II, Chapter XXIII)

One of the key aspects of the definition is the universality of the distinction between essence and energy: “of each essence,” “in every essence,” “no essence can devoid of natural energy.” St John of Damascus makes a careful distinction between four related terms:

But observe that energy and capacity for energy, and the product of energy, and the agent of energy, are all different. Energy is the efficient and essential activity of nature: the capacity for energy is the nature from which proceeds energy: the product of energy is that which is effected by energy: and the agent of energy is the person or subsistence which uses the energy. Further, sometimes energy is used in the sense of the product of energy, and the product of energy in that of energy, just as the terms creation and creature are sometimes transposed. For we say ‘all creation,’ meaning creatures. (John of Damascus 2000, Writings, “Concerning Energy,” *Orthodox Faith*, Book II, Chapter XXIII; Book III, Chapter XV, “Concerning the energies in our Lord Jesus Christ”)

This text was used as a reference for the criterion of Orthodoxy used during the Byzantine

Church Council in Constantinople, 1351. The Council confirmed the orthodoxy of the theology of St Gregory Palamas (1296–1359) – a monk of Mount Athos in Greece and later the Archbishop of Thessaloniki who became known as a preeminent theologian of the Divine energies (Kapriev 2005). The distinction between essence and energy in God is the fundamental epistemological premise of the theology of St Gregory Palamas:

With respect to the fact of its existence but not as to what it is, the substance is known from the energy, not the energy from the substance. And so, according to the theologians, God is known with respect to the fact of his existence not from his substance but from his providence. In this the energy is distinct from the substance, because the energy is what reveals, whereas the substance is that which is thereby revealed with respect to the fact of existence. (Palamas 1988)

For Palamas, the energy differs from the essence but is not separated from it. The essence refers to the immanent, self-identical being of God, while the energy means that God does something and He does it willingly. The energy does not denote something other in God than His essence but is the same Divine being as active *ad extra* (Tollefsen 2008, p. 141). This activity *ad extra* includes God's works such as creating, sustaining, providing, deifying, etc. "When the activity is spoken 'objectively' as a divine work (*ergon*) or being, ... we are not to imagine a something existing between the divine essence and creatures. The terms work and being denote, ..., the reality of God's activity as a powerful presence (Tollefsen 2008, p. 141)." God's works represent his activity or energies in relation to His creatures and God, as He is in Himself, should be distinguished from God as He related to something other than Himself. The Divine energy is what manifests that God is, while the essence is what He is. If there was no distinction between Divine essence and Divine energy, the fact that "God is" would have remained unknown. The focus here is on the knowledge of God, i.e., the distinction between essence and energy and the meaning of energy itself is articulated within an entirely epistemological context.

It is important to underline the personal dynamic nature of the Divine energies. Although God affects things and persons on each occasion through a particular energy or operation, it is always Him personally acting and wholly present in it:

The operations which produce the attributes of the world are, therefore, bearers of certain attributes found in God in a simple and incomprehensible way. The operations, therefore, are nothing other than the attributes of God in motion – or God Himself, the simple One, in a motion which is, on every occasion, specific, or again, in a number of different kinds of motion, specified and unified among themselves. God Himself is in each of these operations or energies, simultaneously whole, active, and beyond operation and movement. ... We only know the attributes of God in their dynamism and to the extent that we participate in them. ... we only know them through the prism of the effect they produce in the world. God Himself changes for our sake in His operations, remaining simple as the source of these operations and being wholly present in each one of them. (Staniloae 1998, pp. 125–126)

The nature of the Divine energies cannot be grasped except dynamically and as a result of God's personal activity and will. It is exactly this Divine personal dynamics that makes the invisible God visibly present in the world. In a way similar to the situation in quantum physics, these dynamic personal (hypostatic) presence and manifestations cannot be considered apart from us. We are co-participants to the measure of our personal cooperation which is borne within the specific context and status of our own spiritual "devices" and sacramental life.

One could summarize therefore that the meanings of the concept of energy in Orthodox theology and physics intersect at the epistemological level. The similarities are definitely more visible in relation to quantum physics, the theory of relativity, and cosmology than in relation to classical physics where the concept plays a more descriptive than epistemological role. In both cases, orthodox theology and quantum physics, the concept deals with the articulation of the hypostatic manifestations of the realities which are invoked or actualized within the

experiential acts of Divine-human and object-instrument interactions. The hypostatic nature of the energetic manifestations in physics is expressed by the fact that energy is always associated with something – a physical entity, such as particles, bodies, fields, or a physical system. There is one single occasion in physics where there was a claim about the existence of a kind of vacuum energy or energy of “nothing.” This is the so-called dark energy in cosmology which is believed to be associated with space-time itself and which is not carried by any known fundamental particle. This belief, however, appears to be more of a speculation. The fundamental difference between the two concepts is rooted in the different nature of the realities they are dealing with and can be expressed as the difference between “created” and “uncreated,” “person” and “thing,” “personal” and “impersonal.” The Divine realities are the dynamic personal realities of a living and loving God Who has a will. God does what he wants and human spiritual efforts make sense only within the context of a personal relationship with Him.

Cross-References

- [Electromagnetism and Optics](#)
- [Epistemology](#)
- [Particle Physics](#)
- [Physics and Orthodoxy \(Physics and Eastern Christian Theology\)](#)

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Enlightenment

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In this context, it refers not to the experience of awakening as in the Buddha's enlightenment, but rather to an era in European history, beginning in the last half of the eighteenth century.

The era represented a paradigm shift in European culture that elevated the light of Reason as the best tool for determination of what is true and valuable. The Enlightenment era produced a challenge to the ancient regime in politics and culture. It celebrated the new ideals of egalitarianism, fraternity, liberty, freedom of speech, assembly, religion and the principle of democracy, and self-government. In Religious Studies, the Enlightenment era produced the foundational norms in scholarship and academic investigation of the subject of religion.

Cross-References

- ▶ [Awakening](#)
- ▶ [Deism](#)

Entelechy

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In Greek, an entity that “bears its goal within itself.” The Vitalist Hans Driesch (1867–1941) reinvented the word to refer to a nonphysical, nonspatial causal factor in living beings, which he claimed would direct the physical and chemical processes during an organism’s development.

Entropy

- ▶ [Chemical Thermodynamics](#)

Environment

- ▶ [Ecology in Islam](#)

Environment of Evolutionary Adaptedness (EEA)

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The natural habitat or environment to which humans were originally adapted. This is assumed to be the hunter-gatherer lifestyle and habitat where humans spend over 99% of their evolutionary history. However, it must be recognized that each adaptive trait has its own unique evolutionary history and therefore its own particular EEA. For example, the human fear response is particularly sensitive to signals associated with the presence of snakes and spiders. This reflects the fact that these threats were prevalent in the ecological environments of our ancestral past. Human reasoning, however, exhibits characteristics reflective of the social environment of the past, where concerns about cheating on social agreements would have been of particular concern. So while both of these adaptations reflect elements of our hunter-gatherer origins, they reflect different aspects of those origins: one ecological, one social.

Environmental Ethics

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Holmes Rolston III is widely known as the “father of environmental ethics” for his relentless articulation of the presence of natural values in nature. He is also known for his work on the reconciliation of Christian theology and evolutionary biology during which he characterizes nature as “cruciform.” In 1997 he presented the

Gifford Lectures in Edinburgh, and in 2003 he was awarded the Templeton Prize in London. He retired as Distinguished University Professor of Philosophy from Colorado State University in 2008 (Preston 2009).

At the start of the 1970s, several environmental thinkers including Richard Routley and Arne Naess had begun to ask whether a new type of ethic for nature was needed, one that centered not on people but on the environment itself. Answering this call, Rolston published "Is there an Ecological Ethic?" in the leading philosophy journal *Ethics* in 1975. The publication of this article was thought by many to mark the birth of the field of environmental ethics. Rolston argued in this article that morality "is a derivative of the holistic character of the ecosystem" (Rolston 1975, p. 17). Ecosystems themselves held value that deserved our respect irrespective of their usefulness to humans. Over the next decade, Rolston cemented his place at the vanguard of those philosophers arguing for this "intrinsic value" of nature. For Rolston, intrinsic value existed objectively in nature, independent of any human value judgments. Other environmental philosophers, such as J. Baird Callicott, agreed that nature had value, but insisted this value could not exist objectively in nature, requiring instead a human judgment to actualize it. Rolston's position remained uncompromisingly objectivist about the existence of this value.

In Rolston's view, intrinsic value in organisms accumulated in the form of biological "achievements" that got "locked in" by the DNA of a species over time. Above and beyond individual organisms and species, the system itself was also a source of value, generating complexity and diversity through geological, hydrological, and evolutionary forces operating relentlessly through time. Value in nature was therefore not only instrumental, reflecting the usefulness of particular organisms and species to others; it was also intrinsic and systemic. These latter two types of value resided in the organisms that employed their selective advantages to secure their own goods and in the ecosystems that provided the supporting matrix in which those forces could operate.

A collection of essays titled *Philosophy Gone Wild* (Rolston 1986) was quickly followed by a systematic work *Environmental Ethics: Duties To and Values In the Natural World* (Rolston 1988). In these two books and dozens of articles that came after them, Rolston pressed his case for intrinsic and systemic natural value. Against those who argued all value is a derivative of human interests, Rolston countered that "systemic nature is valuable intrinsically as a projective system, with humans only one sort of its projects" (Rolston 1988, p. 198).

While this view on objective intrinsic value was his central position in environmental ethics, his work branched out into other areas of the new field including environmental aesthetics, environmental law, environmental economics, the ethics of wilderness preservation, and endangered species protection. In all of these areas, Rolston distinguished himself from many philosophers by the scientific rigor he brought to his arguments. In his position in environmental aesthetics (scientific cognitivism), for example, Rolston argued that "science becomes the primary avenue for perceiving landscapes, better than any other – necessary though not sufficient for their most adequate understanding" (Rolston 1995, p. 380). Rolston's prolific work ethic and devotion to the new field he helped create led to him becoming the founding president of the International Society for Environmental Ethics and the cofounding editor of the first journal in the field *Environmental Ethics*.

Rolston's work in environmental ethics had by necessity taken a largely secular form in order to satisfy his philosophical critics. But his idea of natural value accumulating in the biota over evolutionary time also had strong theological undercurrents. At the same time as he was publishing books and articles for philosophy audiences, he was also publishing for theological audiences. His 1987 book *Science and Religion: A Critical Survey* (Rolston 1987) sought to find room within the latest physical and biological sciences for a divine presence. In his version of evolutionary theism, Rolston insisted that, while evolutionary theory was the correct mechanism for explaining the changes in biological forms over time,

evolution by itself was not quite explanatory enough. “The universal principle (the best adapted survive) never entails any particulars (dinosaurs exist) not even when given the initial conditions (microbes, trilobites)” (Rolston 1987, p. 120). He suggested that there needed to be some other principle at work. Natural selection, he argued, is “only a fraction of some bigger truth” (Rolston 1987, p. 121).

As the debates about the anthropic principle and intelligent design unfolded around him, Rolston found his Calvinist background helping to inform his theological understanding of nature. The anthropic principle, which held that the universe had its initial conditions fine-tuned from the start by a divine being so that humans might eventually evolve, contained too much of the heavy determinism within double-predestination that he had rejected years earlier. Intelligent design, which insisted that a divine power was required to build certain complex biological structures that resisted evolutionary explanation, did not give adequate account of the contingency and chance pervading earth’s history. In *Genes, Genesis, and God* (Rolston 1999), a book based on his 1997 Gifford Lectures, Rolston found room for God in the evolutionary epic as the source of information, opening up the “possibility spaces” through which the mechanical processes of evolution operated. Rolston noted how biologists John Maynard Smith and Eörs Szathmáry had identified several key moments in evolutionary history when unlikely adaptations – such as the swim bladders in fish becoming the lungs that enabled them to survive on land – opened up vast new possibility spaces (Maynard Smith and Szathmáry 1995). Rolston suggested the presence of a divine power as the “ground of information” offering “the most adequate account of the origin of these information channels” (Rolston 1999, p. 359). The three moments of greatest historical significance – the start of the universe, the beginning of life, and the emergence of mind – are described in Rolston’s 2010 book *Three Big Bangs: Matter-Energy, Life, Mind* (Rolston 2010).

According to Rolston, the role of divine grace operating in the background of evolution finds its

parallel in human life. Individual persons, like individual organisms, suffer and die in the face of a harsh processes. God’s grace intervenes to ensure that there is benefit to all this suffering. Rolston’s theodicy worked the same way in both the human and the natural worlds. Environmental necessity was the mother of both cultural and biological invention. Nature is thus “cruciform” with Jesus, “not the exception to the natural order but a chief exemplification of it” (Rolston 1999, p. 307). Life is a passion play, well symbolized by the pasqueflower that emerges from snowbanks in the Colorado high country each spring. The discovery of the pasqueflower’s bloom at the end of a long winter leaves Rolston compelled by “the grace of life renewed in the midst of its perpetual perishing, generating diversity and complexity, repeatedly struggling through to something higher. . .” (Rolston 1999, p. 370).

Cross-References

- [Biology](#)
- [Christianity](#)
- [Creationism](#)
- [Environmental Theology](#)
- [Ethics](#)
- [Evolution](#)
- [Gene](#)
- [Gifford Lectures](#)
- [Intelligent Design](#)
- [Natural Theology](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Environmental Theology

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Related Terms

[Ecological theology](#); [Ecotheology](#)

Description

As the notion of “nature” is essential for the self-understanding of the European/Western civilization also theology has in its long history contributed to the development of the concept of nature. In the Abrahamic religions, “nature” is “creation” which exists out of its relation to God. God is regarded as the Creator of everything between heaven and earth, and classical Christian theology has interpreted God’s work as a making, preserving, and fulfilling of nature. The doctrine of creation offers the horizon for the whole understanding of Christian faith even if it historically often has been opposed to soteriology, the doctrine of salvation. A general challenge for Christian theology therefore is to relate God’s creation and God’s salvation to each other (cf. Conradie 2012). Are human beings as “images of God” placed above or among creatures? Is only man/woman or also nature in the need of liberation?

The view of nature and the use of it have undergone several changes in the history. In antique and medieval times, the notions of

“physis” and “natura” signified everything that existed, and the so-called natural theology, for example Thomas Aquinas, shaped the path for modern science by investigating Gods being through studying nature and by explaining the world from the image of God. The view of nature changes then radically in the nineteenth century. Humans and nature are distanced radically from each other and the human identity is not longer understood as a double belonging to divine-spiritual and natural-bodily spheres of reality.

In time with a progressing secularization and modernization, the change of the life-systems, for example in climate, reveals with an increasing clearness man as a rational and technical ruler over nature. Human codes of knowing about and acting in nature are out of balance with the codes of nature. Older natural theology does not any longer fit into this challenge and late modern theology is challenged to reconstruct the traditions of creation theology and to interpret in a new key the God who acts in, with and for a world threatened by his/her own image.

There is an indissoluble connection between one’s understanding of nature and God. A shift in the understanding of any one of these invariably causes the other to appear in a different light as well. Accordingly, any change in the modern understanding of nature simultaneously calls into question the understanding of God inhering within Christian life and Christian faith. From the 1970s, we can observe such a change in the image of nature and the image of God.

As “nature” turns into “the environment,” that is, nature affected radically by human social and technical activities, also beliefs in Creation and the Creator change. The emergence of environmental science and the worldviews and values of environmentalism in the increasing social movements catalyze this process even more. Theology has since then faced and responded in a manifold of modes to what we can call the environmental challenge. The emergence and rapid and dynamic development of the subdiscipline of ecotheology mirrors – in analogy to the connected subdiscipline of environmental ethics – this change of the interconnected concepts of nature and God. Are human beings the only ethical

subjects? Can one speak meaningfully about the intrinsic value and rights of nature? What are the pro et contra for anthropocentrism versus ecocentrism? Who and where is the Creator in the suffering of his/her creation? This change takes its course in the ethical challenge, but it is far from limited to this; rather, the ecological perspective expands to cultural, aesthetic, scientific, technical, political, and economical spheres. This complexity of environmentalism can also be observed in different approaches in ecotheology.

After Lynn White's famous blaming of Jewish and Christian faith as the "roots of our ecological crisis" in 1967, theologians have responded and revisited their biblical sources and traditions in the context of the environmental discourse. Even if White's historical description has been rejected by environmental historians, the deep interlinkage of religion and environmental practices and ideologies is at the core since then. While Protestant theologians have been in the forefront of academic ecotheology in the beginning, Orthodox theologians contributed with important perspectives on liturgy, aesthetics, and cosmology in the 1980s in the frame of ecumenical processes, mainly the "conciliar process for justice, peace and the integrity of creation" (JPIC). Catholic theology awakened late in the 1990s and has for example recently focused on sustainability as a central ethical principle.

Since the 1970s, churches and theologians have met the ecological challenge in three ways. Either one has regarded the environmental crisis just as reason to reformulate conventional doctrines of faith, or one has eclectically mixed up elements from ecological science and spirituality with selected elements from Christian tradition. A third way has sought for critical-constructive mediations of ecological insights and interpretations of God. This way, where theology works as a part of a larger ecological discourse as well as it asks for specific Christian reconstructions, represents the mainstream of creation theology in the second part of the twentieth century. The understanding of God itself is challenged by the suffering of nature caused by men and women who supposed to be images of God, the creator. Methodologically, one can differ two modes of doing

theology, one dogmatic in a direction from faith to environment (ecological doctrine of creation) and another contextual, departing from the state of nature and moving toward the reflection on God (theological ecology).

A pioneer of ecological theology in the USA was Joseph Sittler who already in 1961 clearly viewed the "new situation" confronting the proclamation of faith, which he encountered with his cosmic Christology. While process philosophy, for example John Cobb, offered an important background warrant for ecotheology in the USA, European theologians have met this with a far more skeptic attitude. German biologist and theologian Günter Altner was the first who since 1974 interpreted the environmental degradation in the light of a Christian theology of the Cross, where nature revealed a civilization at crisis (cf. Altner 1991). Several theologians related the conflict between humanity and nature to the conflicts between different classes, regions and people, and also to the gender conflict, and a wide-open perspective of liberation and reconciliation was brought into the heart of the ecumenical social ethics after 1970.

A first extensive and influential reinterpretation of Christianity was offered in 1985 by Jürgen Moltmann in his "ecological doctrine of the creation" (Moltmann 1985). Different themes from Christian tradition were loosely linked to new scientific insights and eco-ideology in order to work out the relevance of Christian faith for finding ways out of the contemporary crisis of society and nature. Disciples from different confessional traditions – as from, for example, Karl Barth's antinatural revelation theology or from neothomistic universalist Catholicism – tried to respond to the ecological challenge, even if one not always did succeed to find synthetic correlations with the fathers of tradition and the challenge of the new situation.

Ecofeminism reflects about the interconnection of gender and the environment and has created a significant impact on ecotheology. Catharina Halkes, Anne Primavesi (Primavesi 2000), Sallie McFague, Rosemary Radford Ruether (Ruether 1994), and Heather Eaton (Eaton and Lorentzen 2003) have from different

angles produced alternative visions of human encountering of nature.

After the widening of the academic ecotheological discourse from the first to the third and fourth world in the 1990s, the approach of an ecological theology of liberation emerged. Leonardo Boff revisited ecological themes in the continuity of Latin American liberation theology (Boff 1995), Yvonne Gebara combined feminist and ecological reflections about liberation, and Sigurd Bergmann developed a normative approach where soteriology and ontology are interpreted in the notion of the “Gods liberating movement in creation” in a constructive correlation with Eastern Early Church theology, especially its Trinitarian and pneumatological traditions (Bergmann 2005).

Ecotheology was from the beginning an ecumenical affair. Especially the Eastern-orthodox contributions to the new discourse on nature were developed in the institutions and conferences of the ecumenical movement, especially in the World Council of Churches (WCC) and the Conference of European Churches (CEC). It was due to the orthodox representatives at the WCC assembly 1983 and especially to the Syrian-orthodox theologian and church leader Paulos Mar Gregorios that the WCC programme on “Justice, Peace and the Integrity of Creation” (JPIC) was enriched with the environmental issue so that the main agenda for ecumenical social ethics since then could focus on peace, justice, and ecological problems as the most prioritized challenges for Christians. Orthodox theologians enriched the somehow limited perspectives of Protestant thinkers with themes like sacraments, liturgy, trinitarianism, and beauty. A breakthrough for ecumenical ecotheology in Europe adapted by the churches took place at the concilium in Basel in 1989. For the first time after the schism between Eastern and Western Europe, all churches met in one common conference, and they were even able to make a strong consensus on the need for a more just and ecological order of world economics. The heritage of this strong ecological commitment in the European churches is developed in the “European Christian Environmental Network” (ECEN).

The European Ecumenical Forum of Christian Women has a subgroup on Ecofeminism and Ecology.

Together with an academically vital and manifold reflection, the ecumenical movement consisting of both many independent Christian groups and networks and of institutionalized church bodies constitutes a strong and sustainable basis for the further development of ecological constructive and critical theology and praxis (cf. Hallman 1994, and Hessel and Ruether 2000). This development is not just only about ideology reconstruction but also about the reacting and renewal of Christian community-life and mission. Alternative church banking, forests and land owned and ecologically used by churches, green parish economy, Christian church aid for women preserving nature, sustainable livelihoods, urban greening, and treeplanting are just a few among lots of examples where ecotheology and ecopraxis are in an intermutual exchange.

In its early phase, ecotheology dealt with large-scale problems in connection to The Club of Rome’s survival issues. In a second phase, it related to the issues of sustainability with regard to the Brundlandt-programme even if the position of the churches developed a much more dynamic and constructive view of “our common future” than the weak consensus of the United Nations. While the nations agreed on limits and extrinsic values for the ongoing exploitation of nature, the churches defined sustainability with regard to the intrinsic value of creation and made the claim of a radical conversion. In a third phase, ecotheology investigates the interconnection of economy and ecology by focusing on the question for what functions as God in the ongoing globalization process. Through their committed involvement in ecological discourses and alliance-building churches, Christian groups and theologians have shown the relevance of Christian faith as a transformative countervailing power in opposition to the forces of destruction, such as for example in work around environmental racism and ecojustice in solidarity with the victims. The dignity of the question where and how God acts in the ecological destruction and reconstruction is increasing in accordance with

the increasing environmental problems. At present one observe a new phase where the consciousness about accelerating climate change produces new challenges to all faith communities. In general, one can claim that climatic change also changes the conditions for faith communities and belief systems and that religious processes therefore essentially contribute to sociocultural processes of mitigation and adaptation. The history of 40 years of environmental theology has prepared the Christian faith communities to respond to the need of creative climate adaptation and since 2005, one can observe an increasing interreligious communication about how different faith communities can cooperate with regard to the painful challenges of the future.

Four international societies and networks represent not only environmental theology but the broader field of the study of religion and the environment in the global academic landscape. Mary E. Tucker initiated in 1996 the Forum on Religion and Ecology in the USA, while Heather Eaton developed the analogous Forum in Canada. After 2003, the European Forum for the Study of Religion and the Environment was initiated and chaired by the undersigned and the International Society of the Study of Religion, Nature and Culture was initiated by Bron Taylor in the USA. Networks in Africa, Latin America, and Asia are developing.

Self-Identification

Science

Theology develops as a scholarly self-critical reflection about different expressions of Christian faith and their contexts and relations to other religions and worldviews. Research and teaching take place in the universities either at theological faculties or departments at faculties of social science or humanities. Theological institutions are either hosted by a church organization or part of the national universities. In some countries such as Germany, agreements between the state and the church regulate their relation. Theological schools educate students for services in the faith congregations, schools, media, and other

social institutions. Historically, medieval theology represents the cradle of modern science. Environmental theology is usually not taught as an isolated subject but included in the different subdisciplines of systematic theology, biblical theology, and sometimes church history.

Religion

Environmental theology explores belief systems with regard to God, nature, and the environment, but it does not presuppose an individual belief or confession. Many scholars and students although are committed to different belief traditions and seek for to apply insights from environmental theology in their religious practices and in the ideologies of their faith communities. Also the so-called public theology includes the environmental theme at its heart and scholars of environmental theology therefore strongly influence the public self-understanding of faith communities. Insofar as one might regard also the environmental movement as a belief system one can also state important points of contact between the scholar's academic activity and his/her political commitment, a fact that is true even for many life scientists.

Characteristics

Environmental theology is distinguished from the other disciplines of theology by its focus on the interaction of human beings with their environment, and it highlights especially the ethical implication of this interaction. Also the connection between feminist theology and ecotheology represents a distinctive subdiscipline.

The rather amorphous field of Christian ecotheology is currently characterized by a number of distinct discourses, each with its own interlocutors, guilds, and forms of rhetoric. These include at least the following:

- Multi-faith collaborative discourse on “religion and ecology,” for example, in the context of the Forum of Religion and Ecology where “religion” serves as an umbrella term for various distinct theologies and “earth” for the one world within which various human cultures and religions emerged.

- Ecumenical discourse on ecojustice with regard to the threats of economic injustices and inequalities and ecological destruction.
- Numerous contributions to applied ethics on environmental themes such as climate change, biodiversity, and animal ethics.
- Discourse on an ecological biblical hermeneutics, for example, in the context of the Earth Bible series.
- Reconstructive work on the ecological ambiguities and wisdom embedded in particular Christian traditions (e.g., the Franciscan tradition).
- Theological reflection on Christian beliefs and symbols (e.g., within the context of the Christian Faith and the Earth project).
- Theological reflection on liturgical renewal, for example, on the celebration of a “Season of Creation”.
- Reflections on a wide variety of Christian earthkeeping projects, missionary endeavors, and the greening of Christian institutions.

It is striking that such discourses remain somewhat disjointed from one another and that the methodological differences between the various theological subdisciplines remain unresolved in this context.

Relevance to Science and Religion

While the discourse about “science and religion” has prioritized “big science” as a dialogue partner – and neglected environmental science and also technology – and while it only to a limited degree has included reflections about the ethics of science and the power alliances of science with other social institutions, environmental theology is driven by the ethical problems that arise when science is applied to nature. Sometimes big science has been used to develop a theological vision that makes use of science to develop an ecological moral to the story of evolution. While classical natural science has been driven by anthropocentric interests to use nature for humanity’s sake, environmental science certainly contains methods and insights from science but applies these with a higher ethical

consciousness in alliances with political and economic institutions. Environmental theology is closely connected to the emergence and development of environmental science, and it contributes dynamically to the establishment of the “environmental humanities” which organize themselves at present in order to achieve a better balance of faculties in environmental science. The contributions from environmental theology to the discourse on science and religion are therefore not mainly interested in ontological or epistemological questions but formulate critical perspectives to the ethics of science and to its sociopolitical significance as either life-destructive or life-enhancing scholarly practice. Environmental theology contributes – by operating with a central idea of the intrinsic value of life and ecojustice – to the ongoing transformation of science as a human rational practice for the best of both man/woman and nature.

Sources of Authority

Environmental theology is still a young discipline in its dynamic development, where an increasing number of committed scholars on different continents are contributing to its rapid growth and scientific and public progress. Some important scholars have been mentioned above. Following the advancing institutional structuration of the field, one should mention Mary C. Grey, Celia Deane Drummond (Deane-Drummond 2008), and Sigurd Bergmann in Europe; Heather Eaton, Larry Rasmussen, John Cobb, and Dieter Hessel in North America; Denis Edwards and Norman Habel in Australia; and Ernst Conradie in South Africa (Conradie 2006). The World Council of Churches has furthermore offered a significant international arena to develop environmental theology. With regard to the broader field of the study of religion and the environment, one should also mention Mary E. Tucker and Bron Taylor in the USA who have established influential academic bodies. Both the European Forum for the Study of Religion and the Environment and the International Society for Religion, Nature and Culture arrange regular thematic events which

are published, and a couple of journals, such as “Worldviews,” are prioritizing reflections from environmental theology. The former journal “Ecotheology” has been taken over in 2007 by the International Journal for the Study of Religion, Nature and Culture.

Ethical Principles

The main ethical principles for all academic disciplines are of course valid also for environmental theology. Furthermore the respect for the intrinsic value of nature and life generates a self-critical perspective which runs through all investigations of the discipline. The concept of ecojustice/environmental justice, which expands the concept of justice from the human to the ecological sphere, is deeply and widely explored in the discourse of environmental ethics, and ecotheologians have contributed with significant perspectives about how such a concept is rooted in deeper cultural and religious beliefs. Other ethical concepts have been investigated such as feminist ethics, discourse ethics, and virtue ethics, and recently, climate ethics and animal ethics have been explored extensively by ecotheologians.

Key Values

The increase of human self-critical consciousness about his/her interactions with nature, where the human skills are interpreted in the light of faith in the triune Creator, a belief that relativizes all total power claims of humans as rulers over nature.

Conceptualization

Nature/World

Nature/world is perceived as creation. In its origin and development as well as in its perishability, it exists out of its relation to God.

Human Being

According to the biblical story, man/woman has been created as “the image of God.” The old

church has interpreted man/woman as a “microcosm” of the whole creation and a “mediator” between the Creator and all creatures. Environmental theology rejects that this implies a superiority of humans over other beings.

Life and Death

Life is not a commodity but a gift; life includes death as a natural component.

Reality

As all that exists is connected to God, also reality in its manifold is sacred.

Knowledge

According to the classical apophatic tradition, knowledge about God can never encompass the nature of God but only the God who acts. Only human experiences with God in nature can be studied. Ecotheologians use a broad range of scientific epistemological concepts from the humanities, social sciences, cultural studies, life sciences, and environmental science.

Truth

Truth appears as an approximation of insights into the interplay of religious belief systems and environmental practices and ideologies.

Perception

The perception of the environment is an essential human skill which underlies all thinking and acting in, with, and through nature. Environmental theology has in its beginning mainly dealt with cognitive and moral dimensions of the human-nature interplay but explores in its later history also the aesthetical dimension through studies of imaginations, artifacts, perceptions, and awareness.

Time

Time and space are central categories of the human conceptualization of nature and the environment. Environmental theologians have criticized reductionist understandings of time as crucial for anthropocentric and instrumentalist worldviews, and they emphasized the entanglement of different time modes in deep

understanding of sustainability. The significance of space has been accentuated by “theology in its spatial turn,” where environmental theologians have overcome Newtonian concepts with reflections about lived space which unites physical, social, and imagined space. Concepts of both time and space have been investigated in their embedment in religious beliefs.

Consciousness

Consciousness is a central term in psychology and neuroscience, which as such is not dealt with extensively in environmental theology.

Rationality/Reason

Concepts of reason and rationality belong to the central parts of the Western self-understanding through the ages. As environmental theology also includes the philosophy of religion, it investigates also how concepts of reason are transformed by ecological worldviews. Especially ecofeminist theologians have reflected about how images of gender and images of nature affect concepts of rationality, and how rationality not at all can be understood in an universalistic way but must be analyzed in its contextual (including natural and cultural) embeddings.

Mystery

The term “mystery” emerges in religious contexts, and is also frequently at work in different approaches of environmental theology. In the dialogue between science and religion, it can help to express common attitudes to nature which one can never fully but only partially analyze. Mystery further appears in combination with other terms such as wisdom, the Sacred, and sacraments.

Relevant Themes

The concept of “the Sacred” has been crucial in the invention of modern sociology as well as the history of religion. Environmental theology uses the notion to analyze what people regard as sacred and how these images relate to religion and faith traditions. Especially the sacredness of nature and earth seems to characterize

worldviews and values in late modernity. As ecological worldviews develop belief in the earth as one common animated space, also concepts of space are at core in environmental theology which investigates how images of nature, space, and the sacred interact.

Cross-References

- [Animal Theology and Ethics](#)
- [Bioethics in Christianity](#)
- [Body](#)
- [Christian Cosmology](#)
- [Christian Ethics](#)
- [Creator – Co-creator](#)
- [Ecology in Islam](#)
- [Ecology in Judaism](#)
- [Feminist Philosophy of Religion](#)
- [Liberation, Theology of](#)
- [Worldview](#)

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Environmentalism

- [Ecology in Judaism](#)

Epilogue

- [Eschatology](#)

Epistemology

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Related Terms

[Theory of knowledge](#)

Definition

Epistemology is an academic discipline and area of inquiry within both philosophy and psychology. As a result, epistemology holds a vitally important place in the boundaries between the sciences and the humanities. Accordingly, epistemology is the central focal concern within the philosophy of science. Broadly defined, epistemology is the study of knowledge, including the nature of knowledge, the sources of knowledge, the structure of knowledge, and the limits to knowledge. On the side of philosophy, the emphasis has historically been on the limits of knowledge and how it might be distinguished from belief and opinion. On the side of psychology, the emphasis has been on the development of knowledge and cognitive

structures associated with knowledge. In modern times, the two approaches have both focused on what might be called naturalistic epistemology which further blurs the boundary between philosophy and science in the area of epistemology.

Discussion

Historically, philosophy attempted to draw distinctions between knowledge and belief, with knowledge associated with certainty and justification and belief associated with doubt and lack of justification. In the *Republic*, Plato (309 BCE, [estimated](#)) went so far as to associate knowledge with eternal, unchanging truths about immutable objects of knowledge (forms); Plato associated beliefs with the world of change, perception, and everyday experience. Much of Plato's epistemology did not survive classical times, but the association of knowledge with eternal truths and certainty persisted until the modern period. In Descartes' (1637) *Discourse on the Method*, there is the application of an early form of the scientific method to philosophical issues in an attempt to establish with certainty what can be known. Descartes' (1641) *Meditations on First Philosophy* carries his method of doubt further in an attempt that it can be established with certainty that the self is essentially a thinking being and that the existence of God can be demonstrated with certainty.

It is perhaps ironic that Descartes' (1637) method of doubt ultimately led to a fundamental shift in philosophical epistemological away from deduction a priori methods (logic aimed at establishing conclusions with certainty) to what can be called naturalistic epistemology, which is an approach to use scientific methods to examine the sources and structures of knowledge. In naturalistic epistemology, there is no longer a strong distinction between beliefs and knowledge. On the philosophical side of naturalistic epistemology, one will find ongoing attempts to map out the boundaries between sense and nonsense – a mainstream philosophical enterprise – based on findings in psychology. On the psychology side of epistemology, one will find scholars

addressing questions about (a) the sources of belief and knowledge (e.g., perception, habits, etc.), and (b) the structure of knowledge and belief networks (e.g., mental models, schema, etc.). Happily, there is a fair amount of interaction between philosophers and psychologists, which suggests that epistemology will remain a viable and important area of inquiry indefinitely.

Traditional epistemology approached these questions using deductive methods and with *a priori* notions of the nature of knowledge (e.g., knowledge involves certainty), the sources of knowledge (e.g., valid deductive arguments and perhaps direct and immediate perceptions), and structure of knowledge (e.g., knowledge structures are based on undeniable truths).

Naturalistic Epistemology

Naturalistic epistemology embraces a scientific approach when exploring questions about the theory and nature of knowledge (Spector 2012). For example, epistemologists investigating the nature of knowledge look at what people in fact accept as well founded and reliable rather than restrict knowledge to that which is absolutely certainty (e.g., mathematical knowledge). When investigating sources of knowledge, epistemologists are likely to examine what people actually use and report using as sources rather than be constrained to deductive argumentation. When considering the structure of knowledge, epistemologists are likely to consider groups of beliefs and their interconnections rather than focusing on a few undeniable axioms of truth (Quine 1992; Quine and Ullian 1978).

In naturalistic epistemology, there is primary emphasis on knowledge development and the formation of beliefs (Kornblith 1994; Spector 2012). Knowledge is now viewed as something that can and does change, both within the individual knowing subject and within a community of believers. Knowledge is no longer about fixed object. However, beliefs that comprise a body of knowledge are still viewed and critiqued as more or less well justified, and the interrelationships and interdependencies among a set of beliefs

become a critical aspect of a belief or knowledge network.

In naturalistic epistemology, the process of coming to know receives as much or perhaps more attention than discrete bits of knowledge that might result from learning and experience. In educational research that draws on epistemology, this is evident in the emphasis now placed on collaboration, interactions with peers, motivation, and self-regulation. Naturalistic epistemology humanizes knowledge, which is no longer viewed as something possessed by an elite group of scholars. Everyone comes to know and believe a variety of things. Not all beliefs are equally well justified or equally acceptable, but everyone has beliefs, and how they are developed and how they change is of interest to naturalistic epistemologists. Naturalistic epistemology provides a basis for the examination and evaluation of controversial beliefs: (a) Does a particular knowledge claim fit well with other beliefs previously accepted claims? (b) Can the person making the claim produce and/or reproduce evidence in support of the claim? (d) Is there a reasonable cognitive basis for accepting a particular claim made by a person?

Historically, the success of the scientific method roughly coincided with a shift in emphasis within philosophy from metaphysics (what kinds of things exist?) to epistemology (what kinds of things can we know?). A subsequent shift from deductive to naturalistic epistemology occurred as more was being learned about human cognitive and noncognitive processes (Kim & Pekrun, in press). While philosophy was reacting to changes in the role and prominence of science and in particular psychology, there has been a resulting influence of naturalistic epistemology on science and psychology. Kuhn (1996) basically argues that epistemology (the philosophy of science) grounds all science. More recently, the concept of a web of belief (Quine and Ullian 1978) is a key concern with many cognitive scientists and learning researchers investigating how individuals and groups form beliefs and how those beliefs change over time and through experience. Quine & Ullian's view is that beliefs change as a whole – it is an individual's entire belief network that one

brings to an experience rather than a single belief. This constructivist perspective is even evident in Wittgenstein's (1922) *Tractatus* when he remarks that the world of the happy man is not the same as that of the unhappy man and that our beliefs wax and wane as a whole.

There are two critical foundations for naturalistic epistemological. First, there is the widely held view that people construct internal representations to make sense of new experiences and unusual phenomena. Understanding how these internal representations form and shape beliefs and knowledge is a core area of investigation in epistemology; this also happens to be a key concern for learning psychologists and educational researchers. As Wittgenstein (1922) stated, we picture facts to ourselves – we create internal representations in response to and in order to make sense of our experiences; cognitive psychologists call these internal representations mental models, schema, and scripts. The second important foundation concerns language. Not only do we create internal representations that no one ever directly observes in order to make sense of an experience, we talk about these representations (and many others things as well). There are what Wittgenstein (1953) would call language games associated with the discussion of mental models, schema, and other hidden internal mental states. These two foundations will be recognized as the foundation of social constructivism by many, which further emphasize the notion that philosophy does shape and influence both the natural and social sciences as Kuhn (1996) and many others have argued.

Important and Open Questions

There are alternative perspectives about epistemology and many open questions. Alternative perspectives include: (a) philosophical epistemology should be distinguished from psychological epistemology and remained focused on the philosophical questions concerning the nature of truth and certainty; and (b) philosophical epistemology should focus on the philosophy of science and continue to help differentiate scientific

inquiry from other domains (such as religion, politics, and esthetics). There are probably other legitimate perspectives as well. It is likely that a humanistic epistemological perspective can be elaborated that helps everyone develop critical reasoning skills and serves to frame discussions about important social issues (e.g., distinguishing creationism from evolution, framing the abortion debate, reconciling individual responsibility and national policy).

The fundamental thread underlying a naturalistic approach to epistemology is that the focus should be on how people in fact form and change their beliefs, how belief networks evolve, and what cognitive, noncognitive, and social factors influence beliefs and knowledge development. Within epistemology broadly considered, there are a number of open questions. For example, there is an ongoing debate with regard to the sources of knowledge – the internalism/externalism debate. The basic question in this controversy is whether a chain of beliefs must be grounded on or linked in some to an internal mental state or an external state of affairs (or both) in order to be considered well justified. While some epistemologists come down on one side or the other, it should be noted that many naturalists do not take sides; rather, they change the question into something more pragmatic, such as what is required for a particular belief or set of beliefs to be considered reliable and useful to a community of practice?

A second area of investigation in epistemology concerns the nature and status of *a priori* beliefs. Are there beliefs that can be considered well justified that are not related in some way to human experience? Those who might be called pure empiricists would insist on the notion that all belief and knowledge are based on and proceed from experience. However, when one examines how people actually come to form beliefs and expectations, many naturalists have noticed that *a priori* beliefs apparently can and do play a role in expanding what one (or a community) knows or relating what one has learned to something else one believes (Goldman 1986).

A third area of investigation in epistemology concerns the problem of induction which is

regarded as the fundamental way in which we learn about the world. While deductive methods, when correctly applied, result in certainty, inductive methods, when correctly applied, result in more or less probability. One way to characterize the problem is to ask what underlies the inductive method. For example, suppose the induction is of this form: 90% of the randomly examined cases of X have involved Y; so, we can expect that about 9 out of 10 new cases of X will also involve Y. There is an unstated assumption – namely that the sample was sufficiently large and representative; this is worth determining before accepting the claim. In addition, there is a hidden premise – namely, the future (at least with regard to X's and Y's) will remain the same or resemble the past in relevant ways. But where is the evidence to support this unstated premise? Indeed, because it is a claim about the future, the evidence does not exist. One naturalistic way around this dilemma is to simply argue that humans do in fact apply or accept this unstated premise and have been doing so for a long time; perhaps it is even our nature to apply some kind of basic probabilistic sense about the association of events; perhaps, there is an evolutionary advantage to holding the view that the future will resemble the past. Is this a claim that can be empirically investigated? The answer is not all that clear.

Epistemology as practiced in the twenty-first century emphasizes how people come to believe and form their beliefs. The concept of a learning community associated with social constructivism is widely accepted among most epistemologists. The notion of language games and communities of discourse and practice are closely associated with modern naturalistic epistemology and the emphasis on practical norms and reliability of beliefs (Wittgenstein 1953).

Cross-References

- [Coherentism](#)
- [Naturalism](#)
- [Philosophy of Science](#)
- [Social Constructivism](#)

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Epistemology, Evolutionary

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Description

If we accept that, at the level of immediate causes, human beings are as totally the products of ► [evolution](#) as any other living forms, many traditional philosophical questions must be radically reconsidered. The assessment of the nature of human knowledge is a major case in point. Evolutionary ► [epistemology](#) (EE) is the working out of such an assessment, starting on the basis that

not only our bodies in all their features – including sensory and nervous systems – but also mental functions are wholly the products of ► [natural selection](#) on the surface of this earth.

The Biological Aspect

The evolutionary viewpoint provides a perspective on the limitations of our sensory and mental capacities and yet, simultaneously, an assurance that the judgments we make about the material world are reasonably reliable. Considering sensory functions first, our eyes can detect only a narrow range of the electromagnetic spectrum, yet it is a range to which most material objects which we might wish either to avoid or grasp are opaque, so we can see them by utilizing this waveband. Also, our brightness sensitivity self-adjusts over a range of about 10^8 , and when maximally dark-adapted, our vision reaches the ultimate physical limit, one photon being sufficient to excite a rod. For hearing, there is no similarly absolute physical limit, but we can hear sounds sufficient to vibrate our eardrums just 1/10th the diameter of a hydrogen atom – yet only in a frequency range safely above those of body noises, which otherwise would deafen us. On the other hand, predatory birds which hunt from many metres above the ground have higher visual acuity, many animals can hear higher frequencies, our touch and smell capacities fall far short of those in species to which one or other of these sensory modes matters more, and we have no capacity to detect electrical signals as some fish do, the polarization of light like some insects, etc. Electrical signals are the sequence of electrical impulses generated and transmitted by neuronal populations, which as a whole, at systemic level, are considered synonyms of EEG and/or EPs. What determines the capacities each species has? The inescapable constraint is, of course, physical feasibility: an X-ray eye will never be more than a fictional concept. Within what is physically possible, however, the determining influence has been the evolutionary cost/benefit ratio. “We have developed ‘organs’ only for those aspects of reality for which, in the interests of survival, it was imperative for our species to take account” (Lorenz 1977).

Similar arguments apply to brains. Much of the detail is highly technical, but some points are easily understood. For instance, in human beings, the areas of the ► [sensory cortex](#) devoted to thumb and finger tips, and to lips, are much larger than those to limbs and trunk – the relevant factor being the importance of tactile discrimination in the respective body parts, not their own surface area. Nor should it be assumed that the mechanisms determining innervation density are entirely genetic. A fetus at about three-quarter term has far more nerve ► [synapses](#), sensory and motor, than it will have a year or two later: extensive ► [perinatal](#) elimination of less useful synapses occurs in parallel with reinforcement of others (Edelman 1987). Such selective shaping of the nervous system by the environment is accomplished very rapidly compared with the geological timescale of the genome’s evolution. “The Darwinism of synapses replaces the Darwinism of genes” (J-P Changeux) and occurs much faster. However, whichever the mechanism of selection, we may conclude that, within the limits of feasibility, both the information captured and the data-processing capacity applied to it are biologically determined by their cost/benefit ratio. Looking back to the previous quotation from Lorenz, not just our physical but our mental “organs” – our capacities to undertake particular forms of thought and formulate particular kinds of concept – have been selected by their contributions to our ancestors’ survival and reproduction.

The fundamental driving force behind this fact was put “crudely but graphically” by Simpson (1963): “The monkey who did not have a realistic perception of the tree branch he jumped for was soon a dead monkey – and therefore did not become one of our ancestors.” It is no longer thought that monkeys, *sensu strictu*, are direct evolutionary precursors of human beings, but Simpson’s comment can be read with no loss of impact in terms of the common precursor of *Homo sapiens* and modern monkeys. Furthermore, what is true of spatial and other physical judgments must, from a Darwinian standpoint, be true of biological and social judgments also. The consequences of being wrong would in many cases have been fatal, and in all others, they

would have been failure to thrive in the competitive world. But we *have* survived, and emerged from a network of ancestors who all survived, so our social dispositions have, over the course of history, been on balance valuable, and our objective concepts highly trustworthy. Of course, we are not born with detailed knowledge of our individual environments, let alone anticipation of the uncountable number of events which will occur in a given life. What is conveyed in our DNA, and more finely tuned by synaptic competition, is responsiveness to particular forms of regularity in our environments – initially, in the evolution of the species, the physical environment; later, increasingly the social one. An example of the first kind is that nervous systems are not predisposed to judge the leap to a particular branch but to make spatial judgments generally. An instance of the second kind is that the brains of human infants are not adapted to the learning of German in one child and Chinese in another but in each to the learning of *language* generally. However, the extraordinary speed with which we do learn the language(s) heard all around us in our early years must give the strongest indication to any doubter that the propensity for such learning is, indeed, inborn.

The Philosophical Aspect: Part 1: Fundamentals

Simpson continued from his comment on the tree-dwelling monkey: “Our perceptions do give true, though not complete, representations of the outer world because that was and is biologically necessary, built into us by natural selection. If it were not so, we would not be here!” By the same token, we may add that not only *perception* but also many aspects of *conception* must be reasonably accurate. Competition searchingly tests those concepts which have direct survival consequences, though not those for which this is not the case. Some of the latter category will be considered under heading “[Relevant Themes](#).” The former inextricably embody and imply the reality of the world perceived – we may know that world imperfectly, but we know it adequately for our survival. EE therefore gives us justification for cautious confidence in the approximate validity

of our concepts of the world: it makes sense of common sense! Proponents of EE contend that no other philosophical stance justifies such confidence.

Readers with any knowledge of the history of philosophy will by this point have perceived that EE represents a distinctive position in relation to the debate, extending from Plato to the present, about the existence or otherwise of innate ideas. Empiricists, of whom probably the most extreme was Locke, have always denied that we have such ideas – the mind of a newborn baby is, to them, “*tabula rasa*,” a clean slate. The opposite school, broadly classed as Idealists, has maintained that we perceive the world in terms of ideal concepts with which we are born. The earliest fully recorded version of this stance is that of Plato. But Darwin himself commented in his notebooks: “Plato says in *Phaedo*, that our imaginary ideas arise from the pre-existence of the soul, are not derivable from experience. Read monkeys for pre-existence!” Before this, he had already said, “He who understands baboon would do more towards metaphysics than Locke.”

An account of innate ideas more acceptable to the relatively modern mind was that of Kant. For him, concepts such as of space and time (concepts fundamental to Newtonian physics) are possessed by us *a priori*: they are not products of our personal experience but instead are the basics in terms of which we interpret all experience. Yet this has the unhappy consequence that, as we can never assess the world without these *a priori* concepts, we can never know if they are right. Nor can Kant’s approach explain how such concepts arose. William James, at the turn of the twentieth century, and more recently and consistently Konrad Lorenz, argued that they are not mysterious but products of natural selection – and consequently trustworthy: if not perfectly correct, they are pretty sound: “In the early years of the Second World War, when by coincidence he was a professor in Königsberg [Kant’s home city], Konrad Lorenz used Darwin’s idea about the formative role of the past to put the finishing touches to Kant. He argued that Kant’s scepticism about what the world is really like was unjustified because the cognitive structure

which enables us to know what the world is like had evolved through natural selection. The reason why our minds have this particular, and no other, cognitive structure ... must be that we have evolved and not flown in, so to speak, from outer space. Our cognitive structure has been selected by and, therefore, reflects or represents, the real world" (Munz 1993).

So what is inborn in the individual has arisen by the accumulated actions of natural selection upon countless generations of ancestors. In technical biophilosophical language, such inborn propensities to form concepts are "ontogenetically *a priori*, but phylogenetically ► *a posteriori*" (Lorenz 1977). Thus, "The great resistance of the empiricists to innate knowledge is made irrelevant ... in the form of a more encompassing empiricism" (Campbell 1974). To take an even broader view: "From the perspective of biology, knowledge ... is a form of self-reference.... The knower is part of the known, and has been shaped by what is known. The reflector reflects, more or less adequately, because it is itself part of what is being reflected. The biological perspective, therefore, provides an assurance that the reflector is adequate and also explains at the same time how it has been shaped by natural selection to be adequate" (Munz 1993). Again: "... the impressive order in nature is not, as has been claimed by idealistic philosophy, a product of our thinking and imagination., on the contrary, human thought itself is a product of the emerging order in nature" (Wuketis 1984).

One more instance is the inveterate human disposition toward generalization and induction. Hume pointed out that induction can be justified only psychologically, not logically, but EE explains why we all have this psychological drive: living beings can only adapt to consistent features of the world, but it is imperative for their survival that they *do* so adapt: conscious beings must therefore have the propensity to look for such consistencies.

The Philosophical Aspect – Part 2: Exploratory Knowledge

If human understanding were limited to that which could be directly derived through innate

concept-forming propensities, its rate of progress would be restricted to that at which DNA could mutate – either the DNA which directly affects these propensities or that which modifies rates of synapse change. Individuals could learn from experience, but there is no evident *physical* mechanism by which their learning could be passed on faster than the mutation rate. (The assumption that it could be conveyed by inheritance would be an instance of Lamarck's mistake.) Yet the most superficial glance at the human world shows that individuals can transmit their learning at rates many orders of magnitude faster than that of mutation. The processes involved are, of course, sociocultural, not mechanistically biological.

Mainstream evolutionary epistemologists, such as Lorenz, Campbell, and Vollmer, regarded each actual concept we form on the basis of our inherited propensities as a hypothesis about the world: "hypothetical realism" is the label given to the resultant epistemological stance. These "hypotheses" are, of course, challenged by our encounter with our surroundings, and where they prove unfruitful, either *we* shall be eliminated (if they have drastic short-term consequences) or *we*, as conscious beings, will eliminate *them* in favor of alternative hypotheses which will in turn be put to experiential test.

An even more eminent philosopher, Popper, although only fully espousing Darwinism quite late in his intellectual life and never using the term "hypothetical realism," took what was effectively this idea forward to form the basis of his mature philosophy of sophisticated knowledge and particularly of science. Although asserting the consistency of knowledge growth "from the amoeba to Einstein" and regularly referring to his viewpoint by the label "EE," Popper (e.g., 1972) had little concern with the biological history, or the mechanisms, of *natural* selection. His chief interest remained, as it had always been, the process of successive "conjectures and refutations" by which knowledge advances in human societies. This is an aspect of the contention, sustained throughout his writing, that hypotheses can never be proved but should instead be so stated that they make

specific predictions vulnerable to challenge; their success, if these predictions are not refuted, is merely that they have for the time being evaded disproof. This is analogous to natural selection, but the mechanism is different. Of the other authors cited, only Campbell *passim* and Munz, in much of his writing, have had in mind this conscious level of conjecture and potential refutation when they used the term “EE.” From Darwin, through James and Lorenz to Vollmer (1984) (other authors cited by Campbell 1974) the earlier, biological processes, affecting the unconscious propensity to form basic concepts and the selection of the better ones by preferential survival, not the highly conscious formulation and frequently rapid, purely mental rejection of sophisticated ones, is what “EE” refers to. Each is a valid meaning, but they should not be confused. Bradie (e.g., 2004) has distinguished them by the labels “EEM” and “EET,” respectively.

Nonetheless a final, but highly important, point must be that in neither mode of learning is a model of the external world considered to be imposed on the living entity by that world. Unicellular and other simple organisms do not even have body systems which could learn this way, yet by natural selection, they become increasingly adapted to the world over evolutionary time and so may be regarded as having acquired information about it. They have done so by “random mutation and selective retention” (Campbell). This of course is not epistemology, but the learning processes which are within the province of epistemology are considered to be contiguous with such primitive learning. Animals with nervous systems, to which the concept of an epistemology begins to become applicable, might more reasonably be thought to acquire information receptively by the action of the outside world upon the individual. However, it is argued that such a concept tacitly pictures the world as consisting of discrete bits of information, which could be picked up by passive response or painstaking observation. Yet the world “is not labeled” (Edelman), and the radical evolutionary epistemologist contends that such passive information acquisition never happens. Instead, the “labeling” is done by the organism, imposing its

comprehension patterns on the world which it experiences. Random “conjecture” and the risk of refutation are thus the picture of all learning in EE – slowly, through the evolutionary elimination of less appropriate “conjectures,” among organisms without conscious thought (EEM), and much more rapidly, within the individual, where the effectiveness of a conjecture can be consciously assessed (EET).

Justified and Practically-Effective Belief

The core of mainstream epistemology is a search for the characteristics of justified, true belief. It has therefore, as Bradie (2004) stresses, been less concerned to describe the processes of knowledge acquisition and concept formation than to prescribe how these activities should be undertaken for their outcome to be trusted. EE is equally concerned with justification but looks to the fact of concept survival to provide it rather than to the method by which the concepts were arrived at. And it regards the beliefs so justified, not as ever being certainly true but as being “well-formed and reliable hypotheses” (Tomas Hançil) – reliable, that is, in making our practical way in the world. Thus, EE (with emphasis on EEM) offers strong grounds, independent of traditional philosophical speculations, for believing that the world we sense is objectively real, that our fundamental concepts of it approximate usefully to that reality, and that we can gradually extend those concepts in the direction of yet better understanding by formulating our conjectures tightly enough that they can be subject to experiential test – ideally, by direct experiment (EET).

Among philosophers who are in the mainstream yet sympathetic to the evolutionary approach, the most common challenge is to the radical version of EET upheld by Popper and Campbell. This challenge concerns their contention (designated “Thesis Darwinism” by Nicolas Rescher) that human hypothesis generation is initially completely random, albeit that a large percentage of our hypotheses are rejected as soon as we are aware of them. Such a claim may soon become susceptible to empirical test by the developing techniques of cognitive

psychology. Meanwhile, Michael Ruse characterizes it as a “disanalogy” between biological variation (which seems truly random) and hypothesis formation. Philosophical critics such as Rescher and Ruse argue, and almost all practicing intellectuals, scientific, and otherwise would agree, that only hypotheses which appear to have some prospect of success are ever formulated, though the subsequent selection processes are as radically refutational and Darwinian as Lorenz, Vollmer, and all other evolutionary epistemologists have steadfastly maintained.

Self-identification

EE is a philosophical position based upon science.

Characteristics

EE offers the only understanding of human knowledge which takes its origin from the standpoint that human beings are products of evolution by natural selection.

Relevance to Science and Religion

EE is clearly compatible with simplistically naturalistic thought and thus with an atheistic view of the world. However, if one holds a concept of different levels of causation, operating in parallel upon the same observed phenomena, such a conclusion need not follow. Sympathetic exploration of the implications of EE for the science-religion dialogue is nevertheless in its infancy. Stanesby (1985) treated the subject broadly, suggesting that Popperian “conjecture and refutation” (EET) was appropriate as an account of theological as well as of scientific thinking – though, perhaps inevitably, it is less clear what would constitute the refutation of a theological conjecture, not concerned with this world, than a scientific one. By contrast, Burhoe (1972), and more recently Tomas Hançil, contended that human beings have access to nonphysical information, and the resulting concepts are as subject to

evolutionary challenge as physical ones. Yet this surely departs from the principles of EE? Nevertheless, Van Huyssteen (2006) urged that “... for theologians the following should be true: if we take the theory of evolution seriously, we should take evolutionary epistemology seriously,” and “... it would be a serious mistake to think that ... one could conceive of an epistemology independently of biology.” In turn, Spurway (2009), while endorsing these sentiments, questions whether van Huyssteen has in fact followed through the theological implications of EE radically enough. He argues that the more metaphysical and other worldly theological contentions have never been, and can never be, subject to the reality checks which justify our trust in the utility of physical world concepts, and so must be viewed with the greatest caution and restraint. See also section “[Relevant Themes](#)”.

Sources of Authority

The primary authority of EE is rational argument; support from individuals must, by its nature, be of secondary account. Nevertheless, the fact that Darwin himself was clearly thinking along such lines (as indicated by the two notebook quotations in section “[The Philosophical Aspect: Part 1: Fundamentals](#)”) encourages those inclined toward such a position. The subsequent commitments of such great figures as James (psychology), Lorenz (ethology), and Popper (philosophy) reinforces this.

Ethical Principles

The ethical principle guiding EE is fearlessness in the search for truth.

Key Values

The key value of this discipline is that evolution by natural selection should be recognized as the paramount influence determining human sensory, cognitive, and rational capacities.

Conceptualization

Nature/World

For EE, nature has been the crucial influence on the emergence of cognition, until supplanted very recently (on the evolutionary timescale) by organized society.

Human Being

It is of the essence of EE that human being is a state inextricably and totally integrated with that of all other organic life.

Life and Death

Life is conceptualized within EE as wholly a product of natural selection, operating on random changes originating at the molecular genetic level.

Reality

Reality for EE is all that of which we are a part, with which we can in principle interact directly or indirectly, and which we can know by observation or deduction.

Knowledge

Knowledge, though never perfect, always has some degree of adequacy as a contribution to survival. It takes two forms: implicit knowledge of (some region of) the world, embodied in the physical structures of every living form, and explicit knowledge, held in the minds of advanced animals and humans. Both forms are considered to be the consequences of variation and selective retention. The physical variation (EEM) is always random, but whether the conceptual variation (EET) is equally random is contested.

Truth

Truth, for EE, is that totality of facts about the world to which we increasingly approximate as our knowledge advances.

Perception

Perception is the formation of a sensory image of some aspect of the world in a conscious mind.

Time

The real passage of time is a concept fundamental to evolution and therefore to EE.

Consciousness

EE conceives consciousness as that property of a complex brain which, inter alia, enables the individual to advance his/her understanding by making repeated conjectures and, in comparing their predictions with experience, subjecting them to potential refutation.

Rationality/Reason

Rationality, for EE, is that process of analysis of concepts and their implications which, though in itself abstract, brings to bear a set of criteria honed by natural selection, over the period of evolution during which consciousness has existed, to tally with experience of the world.

Mystery

EE has no specific concept of mystery but seeks to explain many aspects of human cognition which would otherwise be mysterious, such as the universal disposition toward induction and why many of our practical concepts fit the world so well, by the operation of natural selection.

Relevant Themes

It is of the essence of scientific method to subject explanatory conjectures about the world to potential refutation by checking their specific predictions (predictions which they make but rival explanations do not) against experimental or other observation (Popper 1972 *et prec.*). Religious conjectures which are also about the world (sooth sayings, prophecies) are in principle open to similar tests and, where they differ from scientific predictions on the same topic, are therefore liable to result in conflict. The same may sometimes be true of explanatory retrodictions, such as those of creationism and intelligent design – areas in which the conflict is currently active and intense. By contrast, religious conjectures about events and affairs not in this world – whether in a hypothesized “other world” or

“before/after” physical time – should have no interface with science, and thus, no basis for conflict with it.

Those comments are not specific to EE. It has, however, recently been argued that religious concepts themselves – not their predictions but their claimed truth content – are vulnerable to critique from the standpoint of EE (Spurway 2009). This is because what is subject to natural selection is behavior. Concepts of the physical world lead to behaviors which will only be advantageous if the concepts are highly accurate – if the monkey’s space concepts are not correct to within a very small percent, it will miss the branch. From the standpoint of EE, it is precisely for this reason that we can place very considerable trust in the validity of such concepts. By contrast, the behaviors promoted by religions – social bonding, mating practices, self-sacrifice for the good of the group, etc. – depend on the strength of the belief which promotes them but not on its truth (e.g., Munz 1993). Thus, the survival of such beliefs provides no grounds for trusting their validity, and since there are an infinite number of ways of being wrong but only one of being exactly right (and probably only a very limited number of ways of being nearly right), the basis for any such trust is tenuous in the extreme.

Cross-References

- [Epistemology](#)
- [Evolution](#)
- [Evolutionary Psychology](#)
- [Evolutionary Theology](#)
- [Natural Selection](#)
- [Philosophy of Mind](#)

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Epistemology, Reformed

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Related Terms

[Christian epistemology](#); [Protestant epistemology](#); [Rationality of theistic belief](#); [Religious epistemology](#)

Reformed epistemology – one of the most widely discussed issues in contemporary Anglo-American philosophy of religion – was promulgated in the early 1980s primarily by the analytic philosophers and reformed Christians Alvin Plantinga and Nicholas Wolterstorff, whose pioneering papers on this topic were published in the anthology *Faith and Rationality* (1983). Reformed epistemology was developed mainly as a response to the so-called evidentialist

challenge to theistic belief, urged, for example, by W.K. Clifford and Bertrand Russell, according to which theistic beliefs such as “God exists” cannot be rationally held without successful proofs or arguments for the existence of God. Reformed epistemologists respond to this challenge not by seeking to show that there are successful arguments for the existence of God, although there may very well be such arguments, but by rejecting the evidentialist challenge.

A first reason that reformed epistemologists give for rejecting the evidentialist challenge is that it is poorly motivated. Many have motivated the evidentialist challenge by appeal to some form of classical foundationalism, according to which beliefs are rationally held only if they are more or less undeniable or can be derived from beliefs that are more or less undeniable. Beliefs that are more or less undeniable have often been taken to be of three basic sorts: self-evident beliefs, for example, the belief that “ $2 + 2 = 4$ ”; incorrigible beliefs, for example, “I seem to see something green”; and beliefs concerned with what is directly evident to the senses, for example, the belief that “there is a tree in front of you” when there is a tree in front of you. Reformed epistemologists reject classical foundationalism for two reasons: first, because it is self-referentially incoherent since the position is itself neither self-evident, incorrigible, or concerned with what is directly evident to the senses, nor is it entailed by beliefs that are, and hence does not satisfy its own criterion; and second, because it entails that numerous beliefs that are obviously rational are irrational, for example, the beliefs that “the world has existed for more than five minutes,” “there are other minds,” and “I ate cornflakes for breakfast” (supposing I ate cornflakes for breakfast), none of which are self-evident, incorrigible, or concerned with what is directly evident to the senses nor derivable from beliefs that are. Whether there are grounds for the evidentialist challenge other than classical foundationalism remains to be seen, but until they are put forth, the evidentialist challenge remains little more than a promissory note (Plantinga 1983, 62).

A second reason that reformed epistemologists urge for rejecting the evidentialist challenge, which brings us to the heart of reformed epistemology, consists in the claim that certain theistic beliefs can, for certain people in certain circumstances, be properly basic. A “properly basic” belief is here understood as a belief that belongs to that class of a person’s beliefs that the person is *prima facie* rationally entitled to hold noninferentially and on account of their immediateness and obviousness. The “circumstances” spoken of are given primarily by way of example; examples include people who upon having acted wrongly feel guilty in God’s sight, or who when life is sweet feel a sense of gratitude to God, or who have a sort of background awareness of the constant presence of God, and so on (see, e.g., Plantinga 1983, 80–81; Alston 1983, 108). People in circumstances like these will naturally form beliefs such as “God disapproves of what I have done,” “God is to be thanked,” or “there is a God.” According to reformed epistemologists, people who in these circumstances form these beliefs are *prima facie* rationally entitled to hold them. The term “*prima facie*” is important and indicates that the rational entitlement to hold the beliefs at hand is open to defeaters should the process by which the beliefs have been formed be shown to be defective. The general epistemological principle underlying this position is called “the innocent-until-proved-guilty principle” and is formulated by Wolterstorff as follows: “A person is rationally justified in believing a certain proposition which he does believe unless he has adequate reason to cease from believing it” (Wolterstorff 1983, 163).

There are various misunderstandings of reformed epistemology in the literature. One misunderstanding has it that reformed epistemology affirms the rational entitlement to take God’s existence as properly basic without regard to specific circumstances. This is incorrect; reformed epistemology affirms the rational entitlement to hold theistic beliefs as properly basic only given certain circumstances (e.g., Wolterstorff 1983, 155; Plantinga 1983,

78–82; Alston 1983, 103–105). Another misunderstanding has it that reformed epistemology, in affirming the rational entitlement to take theistic beliefs as properly basic, is taking them to be objects of knowledge (e.g., Zagzebski 1993, 199–208). This is incorrect; when reformed epistemology speaks of beliefs as “justified,” it means not that quality which distinguishes knowledge from true belief but rather rational entitlement in the sense of being within one’s epistemic rights or violating no epistemic duties. Plantinga has written much about theistic beliefs as objects of knowledge also, most importantly in his *Warranted Christian Belief* (2000), but these more recent writings do not redefine reformed epistemology but represent instead explorations of further topics. A third misunderstanding, which probably also results from confounding Plantinga’s earlier with his more recent work, has it that reformed epistemology presupposes the theological doctrine of a *sensus divinitatis*, that is, a cognitive faculty supposedly inherent in human beings by virtue of which human beings can sense God. This doctrine may be added to reformed epistemology as an explanation of how certain theistic beliefs are prompted in certain circumstances and has been so added, for example, by Plantinga, but reformed epistemology as such does not presuppose the truth of such explanations. The underlying epistemic principle of reformed epistemology is instead the above-mentioned innocent-until-proved-guilty principle; the *sensus divinitatis* doctrine is an optional addition to the central claims of reformed epistemology.

Among objections to reformed epistemology, the so-called Great Pumpkin objection is probably the most famous one. According to this objection, the epistemological principles that reformed epistemology draws on could just as well be used to say that people are rationally entitled to believe in all sorts of bizarre entities, say the Great Pumpkin. The claim is that if people are rationally entitled to believe in a supernatural entity such as God, then they ought also to be rationally entitled to believe in supernatural

entities other than God. A problem with this objection, however, is that it overlooks that reformed epistemology’s claim is that it is in specific circumstances that it can be rational to hold theistic beliefs, not that it is rational to hold such beliefs without regard to circumstances. A prerequisite for rational theistic belief is the existence of specific circumstances that call forth theistic belief in a person as something immediate and obvious. Thus, if belief in the Great Pumpkin’s existence is to be as rational as theistic belief, it must be prompted by analogous circumstances and present itself to the prospecting believer as something immediate and obvious. It is far from obvious that such circumstances obtain, however, for people do not spontaneously form beliefs about the Great Pumpkin. A similar objection, which Plantinga calls the son of Great Pumpkin objection, says that the epistemological principles of reformed epistemology entail a radical relativism in which various suspicious communities – the voodoo community, say – could legitimately claim that their distinctive beliefs are properly basic relative to their community and hence can be rationally believed by members of that community. A problem with this objection, however, is that it once again overlooks that it, according to reformed epistemology, only is in specific circumstances that people can be rationally entitled to hold theistic beliefs. So reformed epistemology does not as such entail that voodoo practitioners can legitimately claim that their distinctive beliefs are properly basic; it would only entail this if it were committed to holding that there are justification-conferring circumstances that prompt the voodoo beliefs at hand as immediate and obvious and, moreover, that there are no defeaters for these beliefs. But reformed epistemology is as such committed to neither of these claims and, hence, does not entail radical relativism.

Cross-References

► [Epistemology](#)

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Equality

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Equality is defined essentially in four ways: Equality of opportunity, equality of outcome, social equality, and political equality. Equality of opportunity is everyone having the same chance at a desired outcome. Equality of outcome is ensuring that the desired result or outcome occurs. Social equality seeks to provide consistency and sameness in the distribution of wealth, property, education, and other resources. Political equality is typically understood as no one individual having greater influence or control over the government and its ultimate use of power.

Eros

► [Love \(Affective, Sexual\)](#)

Eschatology

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Related Terms

[Apodosis](#); [Consummation](#); [Day of judgment](#); [Death](#); [Destiny](#); [End](#); [End point](#); [Ending](#); [Epilogue](#); [Fate](#); [Goal](#); [Judgment](#); [Last days](#); [Last things](#); [Soteriology](#)

Description

Eschatology (from the Greek *eskatos*, “what is at the end” or “last”) is the study of the final end of all things and the resolution of all creation in its ultimate goals. In fact, the long sweep of evolution, when studied from a theological point of view, may suggest a creation whose theological “goodness” may be viewed as fully accomplished only in the eschatological future. Although in the Christian theological tradition, the eschatology has a primary place, the idea of an *afterlife* is present – in a greater or lesser extent – in almost all world religions.

The only exception is Buddhism which, referring to a *beginningless samsara*, namely, the endless cycle of birth and death, states that it is not possible to say a “starting point” of the universe (as well as of the individual) neither an end of it. In this sense, Buddhism has in common with other Indian religions (particularly Hinduism and Jainism), the idea that the universe passes through an unending series of cycles of manifestation and non-manifestation. Buddhism speaks of an ultimate and final end only on the level of the individual (living) being: all the teaching of Buddha, in fact, is aimed to provide to his followers the resources in order to definitively escape from the *samsara*.

To achieve this goal, every believer must carry out a process of self-training that will lead it to a definitive enlightenment and a complete understanding of reality as it is, the experience commonly known as *nirvana*. By replicating the awakening of the Buddha, his followers too could finally escape from the painful process of rebirth.

Islamic tradition, on the contrary, not only speaks extensively of death, end of the world, and resurrection, but, according to the *Sunnite* tradition, eschatology is directly related to one of the six fundamental articles of the Islamic faith (seven according to the *Shiite* tradition). The Qur'an calls the end of this world (and the beginning of the next world) the "day of resurrection," in which the living God, the Most Merciful of the merciful, will descend in order to carry out an interrogation: people will be called one by one, and they will be asked not what they did, but why they did it. Consequently, the righteous will be rewarded with the pleasures of the heavenly life, while the unrighteous will be punished in the hell. The Qur'an, using colorful depictions as well, clearly claims that both the ultimate joys and sufferings, resulting from the divine judgment, make reference to deeper realities which are proximity to God, on the one hand, and distance from him, on the other.

Christian eschatology may instead be seen as a *dimension* inherent in all theological studies, orienting them toward an analysis and an understanding of the God's plan of creation and redemption through the study of the *future* prospects. This is the *last* (extreme, insuperable, and definitive but also inaccessible or only partially deducible) stage of the existence of individual beings, of the human race, and of the creation at all. Therefore, its main and primary task is not to know – in a comprehensive, descriptive, or even representative way – the *afterlife* or the realities *beyond* the death.

So considered, Eschatology cannot be defined only as the *science of the afterlife*: instead it is a daring hope, an attempt, a *provisional wandering*, and an approach to the *threshold* without ever reaching it. Any easy materialization of

eschatological realities must be avoided since they must be considered as "something" that happens or occurs without any participation by the involved *actors*.

Nevertheless, in the academic context, eschatology is treated quite literally and considered as an autonomous discipline which finds its place in the end of systematic area because it is related both to the belief that the *last things* are the final intervention of God in the history and to the reflection on the *Novissimi* – death, judgment, heaven, hell, and purgatory – and the final resurrection, with "new heavens and new earth" that follow on from it.

At the center of eschatology's concerns, there is not *the end* as such, but the end as the *new creation* of all things, that is to say both the conclusion of God's salvation plan – that encompasses the final destiny of all things – and the "return" of Jesus Christ at the *end of time*.

Consequently, three main features mark eschatology. First of all, it is a reflection on the individual and on the relationships between him and the *others* (the mankind and God). Secondly, it accounts the future in the light of the past, characterizing itself as a *theology of history* aiming at understanding – even more and even better – the meaning of human actions and their not always positive outcomes. Thirdly, it regards the *cosmic* perspective, which considers the man as *a part* of the creation and *inside* it, because his fate is strictly tied to it (Schwarz 2000).

Already in the ancient Indo-European traditions is possible to recognize an abundance of evidence for various beliefs about death and afterlife, but it is not possible to identify an original belief; from an anthropological point of view, the eschatological reflection stems from the human need to create an *order*, giving organization to every form of chaos. Human beings at a certain point of their evolution felt the need of a *structure*, even external, in order to think of and to say about space and time.

Hence, what Abraham J. Heschel called the "architecture of time" – the evaluation of time as a substantial dimension for Jewish (and, later, Christian) thought – can be seen as an ideal

foundation of the conventional division of the time flow into measurable and *structural* units (Heschel 2005).

If the *eskatos* is the word of God that *breaks* the silence of the human present *breaking into* it and stimulating a reflection on the *signs of the times*, which are not *continuous* but discrete and discretizable, then it is an announcement, it is the *good news* that cannot be set aside considering it as connected with a future *potential* and yet to come; rather, the *eskatos* must be seen as anticipated in the concrete instants of the present and, for this reason, as an “invitation” to a different future.

The Old Testament is not very clear about the contents of the Jewish eschatology, but it certainly underlines two polarities: the *expectance* and the *promise*. In fact, Israel is the nation that expects the realization of the promise made by God, what J. Moltmann calls the experience of the *not yet* that becomes, just *now*, a direction to take and to follow (Moltmann 2000). In recalling God’s actions, Israel remembers the *indefinable something* that makes it the *chosen people* and that, at the same time, in an even more painful way highlights its infidelities (and its betrayals) to this promise. God sets the future: the task assigned to Israel is to realize – in its present – the contents of that future.

Everything starts with the creation and will end with the *age* (not only with the *world*) that is yet to come: while the Hebrew word *olam* indicates both the “time” (more properly the “century”) and the “world,” *olam ha-bah* directly refers to a *new era* that is yet to come, qualitatively *other* and *different* from the present – the epoch of history – if not even its opposite. For the Jewish tradition, God is the Lord who establishes an end to the world and introduces a new era; He is the King, every believer observing the Torah may receive in his own life. Nevertheless, the full realization of His kingship belongs only to Him: the whole history is placed under the dominion and the judgment of the Most High.

In the Jewish tradition, the human concern for history, based upon the fact that everything has a beginning, finds its central point in an equally strong concern for the last things: if, in order to

understand *where we are*, we talk about the initial event (a fact we did not watch), in the same way we must try to define the final events, even if we will not witness them.

Subsequently, according to the Christian tradition, God is the Lord of all events in space and time; He is the Lord of creation and history. These ones, in turn, can be considered as marked by the faithfulness of God to His ancient and new promises. Furthermore, the Christian hope finds an additional eschatological foundation in the victory of Christ over the death: according to the Pauline literature, in the final times He *will gather* the whole creation *in one*, initiating a *novum* unattainable by human forces only and, at the same time, solving the *unde malum* question in new categories.

The NT eschatology arises from the need to set the initial and the final boundaries of the human experience of time, and it has a *utopian* feature: it corrects the imperfect nature of human life in the *here and now* and allows men to hope in an age wherein imperfections and defects will disappear. Gospels frequently return to this facet, insisting both on the value of the present and on the imminence of the end of times. The “waiting-promise” polarity, proper of Israel, once again is confirmed in Jesus Christ, who announces a kingdom to be waited – it surely *will come* in the future – but, paradoxically, *already present*: choosing Jesus Christ (thus operating a *decision*) in the years to come, the evoked future, *just now* can find a mode of action in the present history of every man, of the entire humanity, of whole creation (Vorglimler 1980).

In the last 50 years, the theological reflection has emphasized the uninterrupted presence, in creation, of both Christ and the Spirit – almost in a foretaste of that *eskaton* which will find its full and final stage in the future. In fact, the meaning and the value of things in the world consist not only of what they are or have been, but also of what they can become. The hope in the future, that the eschatology invites us to sustain, is not a wishful thinking, nor an easy expectation. Rather, it is *hoping against any hope*, moving in an obstinate and opposite direction compared to any apparently positive result, tracking down that

“something” unifying all mankind in the deep of its own being. On a cosmic scale, the eschatological hope arises when considering all the imperfections of this world, all faults that challenge us every day as well as all unfinished dimensions of our personal life. The ultimate hope is the eschatological hope: somehow and somewhere, there will be a time (and, perhaps, a place or, rather, a *non-place*) where all the imperfections, all defects, and all unfinished things will disappear.

Obviously, we should not forget that the eschatological language is a symbolic and mythic one, where the word *myth* keeps its original meaning standing for *word*, and then *speech*, recount, and *narrative*.

In this sense, along with the language on the last things, eschatology contains a reflection on the meaning of both history and the *absolutely ultimate* (a valuable asset in a more and more relativized world).

The prophecy, which is a hopeful expectation, encourages the witness and then becomes a lifestyle. For this reason, in Christ eschatology becomes relationship between the human life and the *eskaton* in its final form as fulfillment, and not a mere description of the *eskata*. “God hath raised up” him (Acts 2:24) and then He is present in the Church’s life and in the life of each believer. Consequently, the *here and now* can only be opened to the future and constitutively related to it. Therefore, the eschatological thinking brings together two asymmetric realities: the *historical future*, that is man-made, and the *future that comes*, work of God. In the middle of them is Jesus Christ, the only one who can reconcile this asymmetry and make up the opposites. He is the divine-human *eskatos*, the subject of the eschatology and not an element of it, He is the eternal Son who has chosen to come in contact with the cosmic-human reality because he wants to take it upon himself, in order to renew and heal it.

The eschatological dimension, rather than a *geographical* one, is an *historical* one – giving meaning to the present as it is seen projected into the future – and, even more, is a *teleological* one, because things will reach their end when they achieve the purposes for which God created them. The eschatological thinking, consequently,

pertains to the novelty inherent in the ultimate destiny of creatures and of all the creation: it attempts to, at least stammering, answer the Kantian question “What can we hope for.”

In brief, three elements can be found within the eschatological question: the ultimate destiny of the universe (the *universal* element), the whole humanity (the *collective* element), and every human being (the *individual* element) (Ratzinger 1977).

This last element is ignored by the so-called *scientific eschatologies*, especially the most recent of them, which, starting from the (scientific) cosmological idea of a universe *open* that will continue to cool and expand forever, claim that these characteristics will have an impact on all the structures that compose it, from galaxies to living organism, which will vanish forever without a trace (Polkinghorne and Welker 2000).

Nevertheless, the *individual* element, it is indeed in the heart of the Jewish-Christian tradition which, however, is also concerned about the fate of both the elementary particles and the macroscopic elements of the universe. However, while the fate of the universe, when scientifically analyzed, is considered as oriented in a completely deterministic way (the universe began its growth probably with the Big Bang and will continue its course, come what may), the Jewish-Christian tradition sees the end of all things as an initiative that arises solely from the will of God.

In this sense, sciences can offer many significant contributions to theology: biology, paleontology, geology, and astronomy can in fact help to value both the *contingency* of the existing things (recalling that the created things will not exist forever) and the perennial *novelty* of the things created in nature.

Reflecting on the final perspectives of the cosmos, religion and science can both learn how to cope with a reality that is literally *beyond* any possible human experience. On this aspect, and without any reductionism, it is possible to state that, trying to explain the observable world, both religion and science make reference to an unseen world. Pursuing the ultimate description

of what is immediately visible they choose – and postulate – a world that is invisible and, at the same time, is the reason for which things are as they are.

Cross-References

- [Hope \(Life After Death\)](#)
- [Hope, Theology of](#)
- [Reality in Buddhism](#)
- [Theological Anthropology](#)

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Esotericism or Esoterism

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A term with two basic meanings. In the dictionary sense of the term, it signifies the holding of esoteric opinions, and derives from the Greek *esôterikos*, meaning “within,” thus “pertaining to the more inward,” mystic. In the scholarly literature, the term designates a series of historically related religious currents including Gnosticism, Hermetism, magic, astrology,

alchemy, Rosicrucianism, the Christian Theosophy of Jacob Böhme and his followers, Illuminism, Mesmerism and Swedenborgianism, Spiritualism, and the theosophical currents associated with Helena Blavatsky and her followers. There are competing views regarding the common traits uniting these currents, none of which involve “inwardness,” mystery, or secrecy as a crucial trait. *Esoteric* knowledge, in the non-scholarly sense, is thus that which is available only to a narrow circle of “enlightened,” “initiated,” or specially educated people.

Eternal Life

- [Grace](#)

Ethics

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Related Terms

[Moral philosophy](#); [Morality](#); [Philosophical ethics](#)

Ethics is a lively field of argument, exploration, and creativity that thrives today because of the history of science and religious contention in the European context and the perpetuation of alternate versions of a good life in cultures worldwide.

The term “ethics” is categorized in several characteristic ways. First, ethics can designate actual conduct and character, and the principles, values, and rules that people use to regulate themselves and their relationships in small social settings or large social, economic, and political networks. Discussion of ethics in this sense is often descriptive, although it may verge into prescription, that is, views about what conduct and character ought to be. In formal academic settings, anthropology, sociology, psychology,

and religious studies may engage in descriptive study, although they often explicitly reject any effort to prescribe what ethics should endorse. A second category for understanding the term “ethics” specifies the systematic and reasoned study of right conduct and good character as essential elements of a good life. Ethics as elaborated in these endeavors is primarily “prescriptive,” aimed at specifying what character and conduct and their bases in thought and human life should be (Korsgaard et al. 1996). For this meaning, “moral philosophy” and “philosophical ethics” can be used as rough synonyms, although theology and religious teachings may also speak systematically to the good and the right in individual and social human existence.

These categorizations of ethics permit three limitations on the present discussion: First, ethics in philosophy is so broad that reflection on ethics in non-European religions and philosophies would require a separate entry. Second, particular codes of professional ethics are a subset of prescriptive ethics. An appeal to professional ethics alone as a justification for action is unlikely to satisfy the range of ethical considerations. Rather, professional ethics depends on the wider discussions outlined here. Third, ethics as discussed here readily encompasses morals, sometimes defined as specific prescriptions for behavior and virtue. Some writers distinguish between “morals” so defined and “ethics” delineated as the conceptual bases for morals. While clarification of these aspects of thought about ethics is helpful, experts’ terminology for conceptual bases and actual prescriptions may vary from this nomenclature.

Three standard approaches to moral philosophy are character-oriented, teleological, and deontological ethics. The deontological focuses more on prescriptions of duty than on outcomes of action. The teleological emphasizes attaining the right goal (Greek *telos*) of action or character. Utilitarians have dominated the nineteenth- and twentieth-century teleological discussions of action, while the character-oriented approach comprises a full field of inquiry. Character ethics may also be referred to as “aretic” ethics from the Greek *aretē*, meaning excellence.

Character ethics takes Aristotle’s *Nicomachean Ethics* as its preeminent reference point for expanding on ancient Greek philosophy. Aristotle conceives of good character as directed toward the *telos* of a happy life. Dispensing quickly with fame and wealth as happiness (Aristotle 2002, I.5), Aristotle expands on the notion that happiness is “activity of soul in accordance with virtue.” In this instance, virtue is the human soul’s particular excellence, which is its ability to use reason properly (Aristotle 2002, I.7). Proper use of reason will guide the appetites or passions to a mean between extremes. Reason thereby allows the person to control the passions or appetites rather than being subject to them (Aristotle 2002, II.6). Good conduct shapes virtuous character and in turn flows from it as a person matures (Aristotle 2002, II.2). If the soul can achieve virtue, Aristotle says, happiness and a good life can be assured, independent of chance, except in extreme conditions (Aristotle 2002, I.9).

Aristotle’s writings directly influenced ethical thought in Western Europe for several centuries and then indirectly through other thinkers’ treatises, until, by the middle of the thirteenth century, Latin translations made his own works familiar again. In the thirteenth century, Thomas Aquinas wove Aristotle’s ideas explicitly into moral theology in the then dominant Roman Catholic Church (Hare 2008). Also in the medieval period, Aristotle heavily influenced Muslim moral theology and encyclopedic Jewish thinkers like Maimonides.

Aquinas’s theological ethics with its Aristotelian structure was weakened, however, by armed conflict between Catholic rulers of Europe and Muslim powers from its south and east, violent challenges to Catholic dominance during the Protestant Reformation of the sixteenth and seventeenth centuries, and rise of modern science. The violence alienated many Europeans from any religious ethics. Scholars were impressed by scientific advances and sought to give ethics a nonreligious grounding, composed more exclusively of claims to reason. Justification of ethical prescriptions by appeals to the authority of the ancients and biblical revelation was undermined.

One response to the chaos of the sixteenth and seventeenth centuries was the deontology of Immanuel Kant, the eighteenth-century Prussian philosopher with whom twenty-first-century philosophers must still contend. Kant is best known in ethics for his “categorical imperative,” his formulation of a command that applies no matter what else must be considered: “Act only according to that maxim by which you can at the same time will that it should become a universal law” (Kant 1785, p. 38 [421]). Kant appears to believe that careful examination of the ideas so stated yields a second form of the same imperative: “Act so that you treat humanity, whether in your own person or in that of another, always as an end and never as a means only” (p. 46 [429]). Briefly recapitulated, the second form enjoins us to weigh our proposed actions against the consideration that every person is a worthy aim of action, is someone whose well-being is worth promoting. Yet a third statement of the categorical imperative, according to Kant, affirms “the Idea of the will of every rational being as making universal law” (Kant 1785, p. 48 [432]).

Despite challenges to them, all of Kant’s formulations of the categorical imperative have reached far into world thought. In addition to applications of the first form to daily life, they have influenced notions of the just formation of political entities. For instance, participatory forms of government are required by the conceptualizations that people are ends in themselves and not just means to political ends and people are capable, with education and thought, of giving themselves laws based on reason. The imperatives also speak to human and civil rights and to the specification of those rights through limitations on research on human subjects in science. These limitations often derive from questions like, “Could this or that scientific treatment of a person be a universal law? Would it treat the person as only a means to an end?”

The best-known teleological approach emphasizing conduct is utilitarianism. Utilitarianism has its roots in the philosophy of Epicurus (341–270 B.C.E.) and developed through the writings of the eighteenth-century Scottish philosopher David Hume, the British philosopher

Jeremy Bentham around the turn of the nineteenth century, and his friend’s son John Stuart Mill, author of *Utilitarianism*. Mill makes a case for the principle of utility as the basis for all further moral judgments. He presents the utilitarian movement as holding that conduct is right as it tends to promote pleasure and minimize pain, when moral reflection accounts for the largest number of sentient beings affected by the action. He insists on utilitarianism’s accordance with biblical teachings, without letting any religion displace utilitarianism as the ground for ethics (Mill 1861, ch. 2). Although utilitarians often note that pleasures and pains can vary and philosophers disagree about whether to maximize goods different from pleasure, utilitarian reasoning today has major philosophical proponents, like Peter Singer (Singer 2002).

Philosophers arguing for deontological or teleological approaches to conduct, like exponents of character before them, often seek certainty in the idea that human nature has universal aspects that would ground ethical principles for all human beings. Yet their conceptions of the nature of human beings, their downplaying of religion and ancient systems of thought, and their preference for universals have all produced sharp criticism of and alternatives to the three major approaches. For instance, three intellectual giants of the nineteenth and early twentieth centuries now affect notions of human nature in ethics. Karl Marx points out unacknowledged effects of wealth on moral philosophy and judgments (Marx 1978). Friedrich Nietzsche concentrates on the unacknowledged role of power in ethical thought and action (Nietzsche 1998). Sigmund Freud highlights unconscious desires, especially sexual ones, in the origins and later judgments of ethics (Freud 1990). These challenges form the bases of many postmodern critiques, such as those from postcolonial theory and deconstructionism, of the three standard approaches to ethics.

Two outstanding and strikingly different criticisms from within the twentieth-century philosophy speak to previous conceptions of reason and ancient philosophical systems. Michel Foucault challenges the eighteenth- and

nineteenth-century conceptions of human reason as fundamentally a function of individual thought, independent of the workings of societies. Alasdair McIntyre brings Aristotelian thinking back to prominence in *After Virtue* and argues that philosophical ethics must acknowledge its dependence on the ways of life in which people find themselves, much as ancient Greek philosophy formulated its moral judgments with reference to the accepted practices of its day.

Alternatives to the three standard approaches often emerge, perhaps unexpectedly, from the emphasis of the eighteenth- and nineteenth-century philosophical ethics on the universality of its conclusions. People previously excluded from discussions of philosophical ethics began to argue that moral claims aspiring to universality would have to attend to experiences and activities that European male philosophers and their heirs ignored or derogated. Collaboration of women, especially in philosophy and psychology, on ideas and practices of caring has produced a major strand of investigation in ethics. Similarly, formerly colonized peoples have advanced ethical proposals from the perspective of their peoples' traditions. Scholars of religion and anthropologists have promoted these discussions and been challenged by them. From these efforts emerge ethical arguments that value highly religious practices and texts, non-European customs, and the natural universe (e.g., Sullivan and Kymlick 2007).

These lines of inquiries do not exhaust the field of ethics. Many moral philosophers and theologians treat the relationships of ethics to metaphysics (ideas of what must be true for the world to appear to us as it does). They may debate epistemology, our ability to know the bases of ethics and draw conclusions even without complete certainty. Scholars of ethics search the natural sciences and the social sciences for evidence of what is possible for human conduct and character and for description of situations calling for ethical reflection. And always the arts and cross-cultural and historical studies of actual ethical systems challenge claims to ethical certainty and propose visions of a good life to unsettle and inspire reflection, character, and action.

Cross-References

- [Animal Theology and Ethics](#)
- [Bioethics in Christianity](#)
- [Bioethics in Islam](#)
- [Bioethics in Judaism](#)
- [Deontology](#)
- [Neuroethics](#)
- [Utilitarianism](#)
- [Virtue](#)
- [Virtue Ethics](#)

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Ethics of Duty

► Deontology

Ethics/Moral Theology, Roman-Catholic, Europe

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Self-description

Roman Catholic moral theology is a subdiscipline of Catholic theology in general. It seeks to describe, critically analyze, and methodologically justify the implications of biblical revelation for the Christian conduct of life: How one is to act or behave in the light of the Christian faith, according to the Bible and in consonance with Catholic tradition and doctrine? Throughout the patristic and scholastic period, moral theology was an undifferentiated part of Christian theology and it was only after the Council of Trent (1545–1563) that it developed as an independent discipline. It is generally divided into fundamental moral theology (*theologia moralis fundamentalis*) and special moral theology (*theologia moralis specialis*), the first including questions of ethical theory, individual conscience, sin, and remission; the second is equivalent to the different topics of applied ethics.

Since its beginnings, Catholic moral theology as a religious ethics encompasses a strong tradition of natural law. Man, as a creature of God endowed with freedom and reason, is capable of having insight into a natural moral order, called natural moral law (*lex naturalis*). This leads to the assertion of a twofold source of moral insight – supernatural revelation and nature and natural reason –, founding two, partly overlapping spheres of moral truth, i.e., natural and

supernatural moral law (*lex naturalis* and *lex supranaturalis*). As a consequence, it is typical for Catholic ethics to mediate between theological and philosophical, religious and secular notions and descriptions.

Recent Developments in Europe

Catholic moral theology in Europe has undergone a renewal under the impact of Vatican Council II (1962–1965), and German theologians have played a prominent part in it. Already before Vatican II, after a long period of neoscholasticism, characterized by rationalism, legalism, casuistry and high inner theological uniformity, a reception of existentialistic and personalistic thought, as well as a general desire for a more existential and spiritual outlook, led to a fruitful period of new accounts, commonly known as “christocentric moral theology,” e.g., Bernhard Häring’s “Das Gesetz Christi” published in 1954. A more decisive breach, by no means concurrently in all European countries, occurred after Vatican II, when Catholic moral theologians like Josef Fuchs, Bruno Schüller, Franz Boeckle, and Alfons Auer tried to lay new foundations for their discipline. For some decades, discussions centered on questions of normative theory and metaethics. Schüller (1973) tried to show that the Christian commandment of love is compatible with a modified consequentialist model of ethics rather than with traditional natural law theory. Auer (1971), stimulated by the inner church crisis that had been provoked by the promulgation of the encyclical *Humanae Vitae* (1968) on artificial conception, developed the model of Autonomous Morality. His ethical account advocates the freestanding authority of human practical reason in the secular moral sphere (“Weltethos”), in contrast to the Catholic magisterium whose genuine and exclusive competence is seen in questions of faith and praxis of faith (“Heilsethos”). The debate that followed is known as the controversy on the *Christian proprium* because – according to Auer – Christian faith does not give an extra

insight into moral problems beyond natural practical reason (instead of this, it motivates and stimulates rational insight and ethical behavior). Some assertions of Auer and Schüller have been subsequently rejected by Pope John Paul II in his encyclical *Veritatis Splendor* (1993). In spite of such controversies, Auer's and Schüller's work has deeply influenced post-Vatican European moral theology. Apart from this, the post-Vatican period has been marked by ongoing conflicts between the Roman magisterium and moral theologians in the field of sexual ethics (artificial contraception; AIDS and condoms; homosexuality; divorced and remarried Catholics).

Today European moral theology exists in a plurality of different theoretical approaches. This is due above all to divergent philosophical positions theologians are in dialogue with, to an asynchronous development of theology in Western and Eastern European countries, to language barriers (German- vs. Romanic-speaking regions), and also to some tendencies to restore classical, neoscholastic thinking. Nevertheless, there are common challenges that foster dialogue and communication between theologians: the ecological crisis, the growing secularization of the European societies, legalization of active euthanasia and same-sex marriages in some European countries, and a wide range of biotechnological challenges.

Under the influence of the encyclical *Evangelium Vitae* of Pope John Paul II (1995), there has been a general turn to life-questions in the Catholic Church. Catholic moral theology in Europe as an academic discipline took part in the evolving bioethical discussion in Europe (Korff 1998) and many moral theologians became members of ethics-committees or were involved in the teaching of medical ethics. Also feminism had an impact on Catholic moral thinking, although less than in other theological disciplines, e.g., exegesis, and not as productive as in the Anglo-American world.

There have been considerable ecumenical efforts between Catholic and Protestant ethicists during the last decades of the twentieth century as the ecumenical "Handbook of Christian

Ethics" (Hertz et al. 1978–1982) shows. After a period of consensus, however, differences are reappearing in the field of life-ethics (e.g., positions on embryonic stem cell research) and recently Protestant theologians are propagating an "ecumenism of difference." While Catholic moral theology favors objective moral truth and moral judgments, Protestant theologians commonly emphasize individual conscience and responsibility and the necessity of moral compromise. Because of this and the absence of an authoritative magisterium, moral positions within the evangelical and protestant churches are more heterogeneous than Catholic positions are.

Self-identification as a Science and Questions of Epistemology and Methodology

In the course of the last century, Catholic moral theologians have become more and more aware of the necessity to clarify epistemological and methodological questions in confrontation with modern science and philosophy. At the first step, Catholic moral theology identifies itself as an ethics with a cognitive, normative, anti-relativistic, and universalistic outlook. As such, it goes beyond approaches that want to give scientific explanations to or mere descriptions of the phenomenon of morals (e.g., evolutionary ethics, neurobiological ethics, studies of moral systems within cultural anthropology), but also differs from individual ethical subjectivism. In contrast to philosophical ethics, it not only refers to human reason but also to particular religious beliefs as a source for ethical reasoning. As a consequence, one of its most challenging theoretical problems is how to integrate the two sources of knowledge, natural human reason and supernatural belief (divine revelation), in an all-encompassing theory.

According to Klaus Demmer's (1985) transcendental-hermeneutical approach, value claims and normative judgments are derived from a two-stage interpretation of factual (empirical)

judgments: interpretation of *facts* on a (philosophical) *anthropological* level (e.g., exploring the notion of human freedom on the basis of neurobiological facts) and interpretation of *anthropological* “truths” in the light of *religious* beliefs (e.g., exploring the notion of human freedom in the light of faith). According to Demmer, we therefore are confronted with three levels of truth-claims, namely, factual, anthropological, and theological, which are related to specific methods and standards of verification and which, together, constitute the epistemological background for the inquiry of moral theology (articulating the *value* of human freedom and correlating moral *norms* in the light of faith). Another approach holds that a narrow set of basic, universalistic norms can be demonstrated by convincing rational arguments (e.g., by some type of transcendental argument), whereas other moral claims emerge from an interpretation of human traits in the light of particular religious beliefs; e.g. Schockenhoff (1996).

Religious sources of authority are the Bible, authorities of the ecclesiastical and theological tradition (above all Augustine, Thomas Aquinas, Francisco Suarez, Francisco de la Vitoria, Alfons Liguori), and magisterial documents (Vatican Council II, encyclicals as *Humanae Vitae*, *Veritatis Splendor*, *Donum Vitae*). Philosophical sources are predominantly Aristotle and Kant, then representatives of personalism and phenomenology, and, recently, Jürgen Habermas. Utilitarianism is normally seen as in conflict with core assumptions and values of Catholic ethics with its strong deontological tradition. Particular natural sciences and humanities are indispensable interlocutors to the moral theology but never as immediate source for normative claims.

Future Challenges

For a long time, post-Vatican Catholic moral theology in Europe has concentrated on metaethical questions and on the field of applied ethics has

been involved in discussions of bioethical problems (e.g., status of the human embryo, stem cell research, end-of-life decisions). Ecumenical efforts mainly involved the protestant churches. In the future, moral theology will have to deal more with questions of the good life and with virtue ethics. It will have to strengthen its biblical and genuine theological profile in the context of a secular and multicultural society, also in critical dialogue with other religious traditions. On the other hand, moral theology will have to defend certain universalistic moral claims, based on human dignity and human rights, with a special sensibility for of all kinds of vulnerable groups within modern society.

Cross-References

- [Bioethics in Christianity](#)
- [Christian Ethics](#)
- [Deontology](#)
- [Humanities](#)
- [Personalism](#)
- [Phenomenology](#)
- [Philosophical Anthropology](#)
- [Utilitarianism](#)
- [Virtue Ethics](#)

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Ethnography

► [Ethnology](#)

Ethnology

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Related Terms

[Anthropology](#); [Cultural Studies](#); [Ethnography](#);
[Ethnology of Religion](#); [Folklife Research](#); [Folkloristics](#); [Sociology](#)

Description

Ethnology is the study of humans as cultural beings. It explores how cultural patterns are constructed, preserved, and changed in various times, places, and social contexts. Peoples' cultural behaviors and expressions are examined through both contemporary analysis and historical reconstruction. Qualitative methods dominate and the empirical material is derived from various sources, such as archives, interviews, observations, questionnaires, artifacts, print and nonprint media, or the Internet.

The term "ethnology" derives from the Greek *ἔθνος* (*ethnos*) meaning people. As defined in various ways, the subject has developed along separate paths of inquiry and pedagogical principles (i.e., social and cultural anthropology and folkloristics). Ethnology (or folklife research) has been considered an academic field since the late eighteenth century, with professorships established mainly during the first half of the twentieth century. Being a child of its time, ethnology was then part of the construction of "folk" or "national" cultures. Ethnologists in their respective national

settings were engaged in preserving and presenting their unique heritage. Still there were incitements for international perspectives and cooperations. The overall methodological approach was comparative with close links to general anthropological theories of evolution and diffusion.

More or less explicit uses of ethnology/anthropology by Nazism, Fascism, Stalinism, and colonial expansionism have subjected the discipline to external and internal criticism (Craith et al. 2008). One significant consequence of the postwar critique is the strengthening of the particular characteristic of ethnology as "history from below," i.e., with focus on overlooked categories of people and cultural expressions (see section "[Characteristics](#)"). Another result is the move away from essentialist, homogenizing and deterministic understandings of culture. Scholars such as Arjun Appadurai, Fredrik Barth, and Ulf Hannerz (Hannerz 1992) have called attention to globalization, to ethnicity as social construct and culture as flow. Social constructivism is a common theoretical basis, generating studies on images, categories, norms, and values of people as individuals and/or as members of social groups (Berger and Luckmann 1967). In combination with structuralism, interactionism, and phenomenology, social constructivism has made scholars like Pierre Bourdieu and Erving Goffman particularly influential in the field. Researchers associated with structuralism, with major importance for the study of cultural and religious myths and rituals, are Claude Lévi-Strauss, Mary Douglas, and Victor Turner. Engagement in the work of Michel Foucault, and other leading names of the "linguistic/narrative turn," has led to a boost for discourse analysis and the focus on culture as representation. Further, the complex relation between the researcher and the researched has been discussed in what has been labeled as the "reflexive turn" (Marcus and Fischer 1986). This is both epistemological and political, and does not only concern the concrete meetings between the researcher and the researched, but also their dynamic interplay with structures and conditions of life. In the wake of the latest decades'

minority struggles (i.e., indigenous and colonized people, people of color, women, and nonheterosexuals) ethnologists add self-reflexive knowledge about the maintenance of asymmetrical power relations. Ethnology is a science which contributes to society's reflection over itself. This ambition is indicated in the review of study programs in ethnology published by the Swedish National Agency for Higher Education in 2008. Here the reviewers encapsulate the ethnologist's special competence to:

- concretely illustrate everyday processes from the perspective of different groups;
- let the mundane and the seemingly normal appear less self-evident;
- examine prejudices and stereotypes critically;
- make the strange and the unfamiliar more comprehensible;
- understand why misunderstandings and conflicts appear between people, and how to counteract and avoid such tensions;
- analyze how technology and media shape people's daily life;
- study how old traditions, rituals, and perceptions linger in modern life – and how new ones are created;
- reflect on present times from a historical perspective, through the investigation of how dreams about the future or the longing for the past constitute the present.

Self-identification

Science

Ethnology identifies itself as a subject within the humanities. It draws on empirical studies, with predominantly qualitative methods. Although being a subject within the humanities, it is still closely linked to social sciences, its sister-discipline anthropology among others, which is generally categorized as a social science.

There is an increased call for ethnologists to participate in interdisciplinary studies of science, i.e., natural science, technology, medicine, and environmental research. Here the objective of the ethnologist's involvement is twofold: On

the one side it adds knowledge about individuals' and groups' perceptions, practices, and needs in relation to those domains; on the other, it scrutinizes science as a cultural product in itself. Ethnologists have developed productive tools for the study of the dynamic interplay between culture, society, and science, with particular focus on the construction, dissemination, maintenance, and change of meaning, knowledge, and truth (Reid and Trawick 2000). Cutting edge research is often coming from feminist theoreticians, such as Emily Martin and Donna Haraway (Haraway 1997), well aware of gendered postulations and division of scientific labor. Critical studies on processes of "naturalization" of beliefs and practices are mixing with the growing interest for biology and brain research.

Religion

Ethnology does not identify itself as a religion. It embraces the study of popular religious beliefs and practices. As concisely phrased by professor of ethnology Gábor Barna:

The subject of the research carried out in different countries under various names (religiöse Volkskunde, Volksfrömmigkeitsforschung, ethnology of religion, anthropology of religion, etc.) is essentially the same: so-called folk religiosity or popular religion supplementing the practice of dogmatic religions, the everyday practice of religion and, in general, an ethnological/anthropological approach to the study of religious life. (Barna 2004)

Ethnologists aim at understanding the ideas and experiences of the people they study. Their intention is to attain both the "emic" (insider) and "etic" (outsider) perspectives. The people studied are increasingly regarded as "subjects," i.e., "participant observers" as well as the researcher, who acquire knowledge about the social world in the course of participating in it. Thus, the participants' accounts can be analyzed "in terms of the perspectives they imply, the discursive strategies they employ, and even the psychosocial dynamics they suggest" (Hammersley and Atkinson 2007). This means that the ethnologist's analysis does not simply attempt to replace peoples' religious beliefs with

cultural or sociological explanations. There is indeed space for the study of experiential aspects of religion, cultural phenomenology, and embodiment (Csordas 2002). Religion in relation to medicine and health is constantly an important ethnological field. Today much interest is oriented toward the role of religion and the changes in the (late/post) modern society. Secularization, migration, identity, gender, and youth are frequent themes.

Characteristics

Ethnology is a cultural science within the humanities, closely related to social and cultural anthropology and folkloristics. In Sweden, folkloristics has merged with ethnology, while in countries such as Finland and the USA, it is organized as an independent discipline. Tradition has it that anthropologists focus on non-Western cultures and ethnologists on culture “at home.” In the wake of globalization and transnational migration, the distinction between the disciplines is increasingly blurred. Despite common roots, ethnology and anthropology are being categorized and positioned differently within various national academic organizations. From a Swedish horizon, the following features contribute to make this discipline distinctive over time and in relation to other (sub)disciplines: the ethnographic method; the combination of synchronic and diachronic perspectives; the eclectic approach in theory, methodology, and empirical material. Last but not least is the firm focus on everyday life:

In the academic division of labour, ethnology emerged as the discipline of the overlooked or ignored, the seemingly trivial – all that the historians found too mundane, the aesthetic expressions art historians defined as too popular, the narratives that did not qualify as literature and the everyday routines that did not interest the sociologists. (Löfgren 2008)

Relevance to Science and Religion

Ethnologists have developed productive tools for the study of the dynamic interplay between

culture, society, and science as well as between culture, society, and religion. Although little attention has been paid by ethnologists to the emerging field of “science and religion,” such a fusion might be viable and rewarding.

Sources of Authority

The ethnologist’s sources are not given a priori, but need to be “created” by the researcher through the collection of various empirical data (i.e., interviews, observations, artifacts, print and nonprint media). Worth mentioning are also the large national archives and collections accessible especially in the Nordic and Baltic regions, including material on faith and religious customs. The work does not aim at natural scientific evidence, but at analysis and compelling argumentation along with authoritative management of all steps in the research process from experience to text. The overall purpose is to present various and substantial perspectives on given cultural and societal phenomena. Ethnology is known for being eclectic in both methodological and theoretical approaches. The basic attitude is often that of cultural relativism, with less of an obsession with canons, and more preoccupation with critical self-reflections over how such standards are used as means to produce and reproduce hierarchies and precedence of interpretation. Contemporary ethnologists gain authority through peer review procedures, but also through high quality semipopular scientific publication/interaction.

Ethical Principles

Like any other scientists, ethnologists are guided by correctness, sincerity, and responsibility. The particular ethical dilemmas intrinsic to ethnological research are dealt with in various codes of ethics, for example, the American Anthropological Association’s statements on ethics (<http://www.aaanet.org/stmts/ethstmnt.htm>) and UNESCO’s code of conduct for social science research (http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SHS/pdf/Soc_Sci_Code.pdf).

Key Values

A key ambition is to give people tools to better understand themselves and the world.

Relevant Themes

Some ethnologists are involved in interdisciplinary studies of science, and many in the research on the interaction of culture and religion, with specific focus on popular religious beliefs and praxis. So far, however, ethnology has not directly dealt with the emerging field of “science and religion.”

Cross-References

- [Critical and Cultural Theory](#)
- [Cultural Studies](#)
- [Humanities](#)
- [Knowledge, Sociology of](#)
- [Religion, History of](#)
- [Religion, Sociology of](#)
- [Social Constructivism](#)

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Ethnology of Religion

- [Ethnology](#)

Ethnomathematics

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The term “ethnomathematics” was first used by Ubiratan D’Ambrosio, a Brazilian mathematician, in the 1960s to describe the relationship between mathematical practices and different cultural groups as national-tribal societies, labor groups, children of a certain age bracket, or professional classes. Ethnomathematics is a discipline that attempts to improve mathematical education.

Ethnology of Humans and Biological Anthropology

- [Biological Anthropology and Human Ethnology](#)

Eudemonia

- [Happiness](#)

European Medical Genetics

► Medical Genetics

European Studies

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Related Terms

Cultural turn

By European Studies we mean, on the one hand, the investigation and analysis of the complex relationships between history, culture, economics, law, and the social structure of Europe and, on the other hand, interdisciplinary courses of study, which in the last year have been introduced at numerous European universities. These courses of study both address and develop further certain questions and topic areas, which since the nineteenth century have constituted a significant portion of the European cultural sciences. The reasons for the introduction of these courses of study in Europe as well as on other continents are multifaceted.

As a result of the “cultural turn” in the humanities since the 1980s, the concept of culture increasingly has replaced the concept of society as the leading theme in the human and social sciences. Reflected in this trend is the recognition that religious cultures under modern conditions have not lost their capacity to leave their mark. Another important motive for the establishment of European Studies lies in the broadening of the European Union. The debate over admission of new member states into the European Union since 1989/1990 from the beginning was obviously as well about Europe as a cultural,

economic, and political unity. The newly admitted states are not only characterized by different religious traditions, but also by the degree of modernization unfolding in these countries based on different political, economic, and religious factors with varying development dynamics.

In addition, since the Second World War, there have been various waves of economic migration, so that the different European societies have become immigrant societies. As a consequence, European religious cultures have also become pluralistic. At present Islam in its different forms is the demographically largest non-Christian religion in Europe. These developments make it increasingly clear that Europe has no fixed essence, but is a rarefied cultural construct in which geopolitical, economic, legal, and religious elements are superimposed over it. The subject areas of European Studies are with regard to the indicated complex character of Europe exceedingly heterogeneous and many-sided. They encompass history, law, economics, politics, sociology, cultural studies, literary studies, linguistics, theology, and religious studies. In the current debates about Europe and European integration, the cultural influence of the different religions is given enhanced attention.

Religious characteristics do not function merely as markers of identity, but serve as cognitive maps of the world for people. Exclusion and inclusion are instrumental in the definition of religious membership, even if the traditional “inner-outer” boundaries of Europe’s dominant Christian creedalism have dissolved. In European religio-political discourse, there is currently heated and occasionally emotion-laden discussion about the integration of Islam into European society as well as the controversial admission of Turkey into the EU. In contrast with earlier debates, the discussion about ethnicity has been replaced with the invention of Islam as an identity marker or a political category (the Muslim Council of Britain, the Islamic Conference in Germany, etc.). Because of the many-layered topic and focus areas of European Studies, these discussions can only be conducted at an interdisciplinary level.

Finally, strengthened culturally oriented studies cannot help but join together different methodological approaches. The analytical interpretation of modern religious cultures demands the close engagement of cultural and religious theory as well as social scientific, legal, and political methodologies, in order to succeed and trace appropriately the transformation of religion and society in modern Europe.

Cross-References

- [Imagination](#)
- [Islam: An Overview](#)
- [Landscape](#)
- [Pluralism \(Religious\)](#)
- [Religion, History of](#)
- [Religion, Sociology of](#)
- [Religious Studies](#)

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Evil, Problem of

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Related Terms

[Moral evil](#); [Natural evil](#); [Theodicy problem](#)

Introduction

The problem of evil, also known as the theodicy problem (from *theos*, Greek for God, and *dike*, justice), is a conundrum, or rather a set of interrelated problems, with ancient roots. A very early, but still valid, wording is Lactantius' (c. A.D. 260 to c. A.D. 340) rendering of the formulation claimed to be by Epicurus (342–270 B.C.):

God either wishes to take away evils, and is unable; or He is neither willing nor able; or He is both willing and able. If He is willing and unable, He is feeble, which is not in accordance with the character of God; if He is able and unwilling He is malicious which is equally at variance with God; if He is neither willing nor able, He is both malicious and feeble and therefore not God; if He is both willing and able, which is alone suitable to God, from what source then are evils? or why does He not remove them? (Quoted from Ahern 1971)

However, the set of problems is somewhat wider than implied by this. Broadly, it consists of two separate but interrelated questions: (I) *the question of natural evil*, namely, why is there suffering in a world supposedly governed by a good and powerful god? and (II) *the question of moral evil*, namely, what is the justification, if any, of malice, greed, and cruelty in a world ruled by a benevolent Creator and superhuman Master?

The problem of evil has attracted massive attention during the centuries and is generally thought to be the most important objection to the credibility of theism, although there is no lack of answers brought forward by believers.

Evil

- [Sin \(Vice, Human Limits, Negativity\)](#)

History and Some Preliminaries

The problem of suffering appears in different guises in most religions. In Hinduism, suffering is seen as “the essence of the universe” (Bowker 1970), partly understood as a result of a power struggle among the deities. In Buddhism, too, suffering is thought to invade almost every aspect of human life. In both religions, the way to handle evil is primarily by efforts to become detached from ordinary ambitions and strivings. Accusations against heavenly powers are less frequent.

In Judaism, however, such accusations appear quite early, e.g., in Job’s book, although here, it is not the *fact* of suffering that is questioned but its *distribution*. God is believed to participate in history, and, consequently, it is natural to ask why God does not intervene more often, not least in order to alleviate the suffering of His people. In Christianity, the questions of suffering are not so much part of the sacred scriptures as of the theological discussion from Origen onward. Famous participants in the discussion are St. Augustine and Thomas Aquinas. With growing impact, well-known philosophers such as Spinoza, Hume, and Kant have written about it. The term “theodicy” (“*théodicée*”) was probably first used by Gottfried Wilhelm von Leibniz in 1697.

Concerning (I), the problem of natural evil, there are at least two questions brought up for scrutiny. (i) Why is there suffering at all? Why must human beings, or sentient beings, endure pain of the flesh as well as of the soul? (ii) Why is there no obvious proportion when it comes to which persons are stricken by these afflictions? Some individuals seem to encounter more pain than others, both short term and in the long run. This is not fair in itself, and when moral considerations are added, this injustice is apparently augmented. Some people who are morally good seem to suffer a lot, whereas others, who are less good, enjoy a prosperous life.

When the unfairness of this is brought up in the context of monistic religions such as Judaism, Christianity, and Islam, we have an example of the problem of *moral* evil. In monistic religions,

God is not only thought of as the Creator of the world but also as a supernatural person with qualities found in human beings, although elevated to perfection, and moral evil is not part of a set of properties that one expects to find in a perfect being. Human beings are created in the likeness of God (► *Imago Dei*), but they have deficiencies in knowledge and power that God does not have, and these weaknesses may be held to (at least partly) explain human moral ineptitude. These shortcomings are not found in God, and the question as to why God inflicts suffering on sentient beings, or at least abstains from removing this suffering, lays the ground for the theodicy problem.

The Theodicy Problem Posed

The problem itself can be simply formulated as follows:

- A. God is powerful to an immensely high degree (sometimes expressed more unguardedly as “almighty” or “omnipotent”).
- B. God is benevolent to an immensely high degree (sometimes expressed as “supremely benevolent”).
- C. God knows everything that is going on in the world (sometimes expressed as “omniscient,” which by implication also includes that He knows what is going to happen, at least in the near future).

If this is how God is supposed to be, then it seems to follow that:

- (a) If God is thus powerful, then He could abolish evil if he wants to do so.
- (b) If God is this benevolent, then if He would want to abolish evil, He could do so.

However, (D) there is evil in the world.

Hence, the Being presented in (A)–(C) cannot exist.

Therefore, God must be made up of other properties.

But a god that is weak is not how God is supposed to be; likewise, a being that is lacking in moral goodness is not God nor is a being that does not know what is going on in the world.

It follows that in the face of evil, there cannot be a god as generally conceived.

Due to the force of this line of reasoning, many claim they cannot believe in God. This, in turn, may be interpreted to the effect that the objector finds God lacking in moral aspects, which is a hindrance to worship Him. Alternatively, it may be interpreted to mean that God cannot exist at all and so should be wiped out of the set of valid beliefs.

Some Preliminary Responses

Nevertheless, as it stands, this formulation has shortcomings that can be pointed out by the theist (i.e., for thinkers that are concerned with doctrines seen from within a religious tradition). Some have tried to solve the problem by retaining the sum of God's properties (i.e., A–C) while rejecting the existence of evil, i.e., premise (D). This may easily be rebutted, for example, by pinching the objector and asking if the treatment should be prolonged or not. It may then turn out that what the objector claims is really that natural evil serves some further good, an argument that belongs elsewhere and will be discussed in section "[Responses Concerning the Omnipotence of God](#)".

Another possible reply concerns modifications of premise (C), God's alleged omniscience. One way to justify God is to ascribe God two different roles, i.e., the role of Creator and the role of Sustainer of the world. Some, like Voltaire, held the view that the creation was good although God later turned His back to it all. This, however, is a less promising route of defense since God in this fashion seems to have acted callously or nonchalantly when faced with the suffering of His creatures. The alternative view that God was later introduced to a world that already included suffering may, although it lacks scriptural support, seem more attractive, although it then becomes cloudy *how* strong God really is. Is God able to hear our prayers and put everything right in the end? Questions such as these are relevant also when one is confronted with the Manichean view of a competition concerning the power over the world between good and evil powers.

However, these lines of defense are not very promising and are also uncommon in the theodicy debate. Henceforth, the discussion will mainly deal with premises (A) and (B).

Responses Concerning the Omnipotence of God

Although the theist Richard Swinburne claims that "no writer who could plausibly be called a Christian has denied the omnipotence of God until this century," the omnipotence of God is far from clearly stated in the Scriptures and may even be incomprehensible as it stands. The Greek word "pantokrator" is sometimes understood to mean "all-powerful"; nevertheless, this seems to have been exaggerated in the translations into Latin. It may also be held that the concept cannot be understood in a literal fashion. For example, God cannot be expected to do what is logically impossible, like undoing what He is at the same time doing.

However, there are two common lines of defense whereby God's omnipotence is restricted. According to the first, it may be held that although God is certainly omnipotent, this only holds good for His part of the world. There is also an evil power, Satan, competing for world-wide power. This paves the way for an answer to the problem of evil, certainly the most common in popular discussions. The presence of this evil spirit has scriptural support and is the basis of the most common answer to the theodicy problem. If all evil is attributed to the presence of Satan, then God may be seen as wholly good, although not wholly powerful. This also makes place for the actions of human beings in the soul-making process. We are, so to say, asked to participate on God's side in the universal combat between good and evil.

Attractive as this line of defense may seem, there are some serious drawbacks to take into account. To begin with, we are faced with uncertainties concerning *how* strong this evil power might be. If strong enough, he may have won the game already, and this universe may be his playground. Or he may prove to be the winner in

the end, and therefore, we would do wisely by taking sides with him. Furthermore, and more seriously, this line of defense evades the original problem by creating a new one. If God is the original Creator of the world, then it seems that Satan could only be introduced into the world through immoral negligence by God or through evil intent by God. Either way, God is responsible for the evil brought by through Satan in the same way an instigator of a crime is held responsible for the deeds physically performed by those paid by him. So the Satan hypothesis eventually fails as a solution to the problem of evil.

The second restriction relating to the almightiness of God concerns the power given to man to act freely. If God has all power in His hands, then there seems to be no room for blaming His creatures for the evil acts they perform. They cannot be blamed more for what is going on than puppets that skip and jump with every tug of the strings held by the puppeteer. In accordance with this, premise (A) cannot be construed in a way that gives room for independent actions of man. However, the reasonable way to interpret (A) is that God has the (dispositional) power to do anything, although He does not necessarily have to act thus in every single instance, should He choose to avoid doing so. In this way, people may be held responsible for at least some of the evil in the world, as is claimed in some of the arguments that follow.

Although over the years, it has become more common to stress the goodness of God, some apologists (i.e., theists or lay people defending a certain creed) have claimed that it is far more important that God is almighty than that He is wholly benevolent, the reason being that we can only trust in God if He has the power to enforce His will. (This is the view of C. S. Lewis and P. T. Geach.) Others have objected to this on the ground that it is morally offensive to worship a being about whom one has serious moral objections. As put by H. J. McCloskey, "To worship, revere, adore, and to yield our wills to a being who may do evil or permit evil which we ourselves should feel morally obliged to prevent if we could, is to act in a morally irresponsible way, it is to abandon our moral autonomy in favour of a being we know to be capable of immoral acts."

This suggests that we would do better to examine the second premise and see if it is possible to modify it in a way that is consistent with moral and theistic beliefs.

Responses Concerning the Benevolence of God

To begin with, we may ask if it is necessary to think of God as wholly benevolent. What does it mean to claim that God is good? Since God is totally different from all that is known of earthly beings, what can be meant by addressing Him as good? Is not His goodness completely different from ours?

The argument implied by these questions, however, should not be stressed too hard as it could prove to be counterproductive for the theist. If God's goodness is *completely* different than ours, it may be objected that it may not be goodness at all. A skeptic (i.e., an interlocutor interested in questioning parts of some creed or other) may even add that, from what can be deduced from the world, it would be more feasible to claim that the Upholder of it all has a more relaxed moral standard than the one expected from God. If the apologist would claim that this judgment is dubious due to our shortcomings as moral beings, then it could be objected that moral judgments always stem from *our* moral beliefs, however defective these might be. We blame those who hold much power, e.g., presidents and dictators, not according to *their* standards but according to ours; and these are the same standards we use when blaming celestial beings. If we are asked to use a completely different moral standard when praising or blaming God, then we may rightfully ask if this is a moral standard at all. Furthermore, if we cannot understand the standard involved when it comes to God, this may also pose a problem since what we are examining is the moral goodness of God; in order to do so, we simply have to rely on our own standards, however imperfect these may be.

There is a better solution to take into account. God may, as claimed by Leibniz, actually have created the best world possible. Hence, He should

not be blamed but praised. There are several ways this argument could be developed. The first line of defense concerns the natural evils. Those who deny that natural evils are really evil, since their occurrence serves a greater good, usually claim that natural evil is part of a whole that is better than a whole without it. Therefore, suffering is not “really” an evil; it should rather be considered as a necessary means for a good end.

One way to do so would be to put it into a Darwinian frame. According to some ethologists, e.g., M. S. Dawkins, pain is the most expedient way to warn sentient beings from behavior that may prove dangerous for individuals as well as for species; hence, it can be shown to have evolutionary value. Therefore, pain can be explained as a necessary means for a world containing more evolved animals, and this is the kind of universe that God is expected to create.

Still, this does not wholly save the Creator from the accusation that the proceedings of the world are, at least in some instances, needlessly dependent on evil. There seems no good explanation to why toothaches should be so immoderately painful. Further, as claimed by the ethologist Richard Dawkins, the way that some animals are construed to interact in biotopes, for example, certain species of antelopes and some types of predators, seems to make the concept of a wholly good creator questionable. Surely, a wholly good and powerful being could have created a better system than this, e.g., by substituting pain with the diminution of pleasure, as suggested by David Hume. As it is, the idea that God should have created a system with animals designed to avoid the claws and teeth of others seems to make the premise (B) questionable.

Still, the debate could continue on this line. It could be claimed that natural evil is a necessary means, not only in order to make a first-order good (survival) necessary but also in order for making a secondary good (e.g., empathy) possible. It could be claimed that natural evil is a necessary means for making sympathy and other morally useful properties possible. Without pain, no empathy; and since a world where people act from empathy is better than a world totally

devoid of such moral properties, God would be expected to create such a world.

The skeptic may reply by pointing to the enormous amount of suffering in the world and ask if all this is necessary for bringing about these allegedly good properties. Surely, this is a clear case of overkill. And, further, he may add that the result of first-order evil is not only second-order good; we also get second-order evil, i.e., moral evil. Some people even seem to enjoy the atrocities that afflict others. There certainly is no lack of moral evil such as malevolence, cynicism, and cruelty in this world. Surely, this needs to be explained.

The apologist can retort that natural evil and moral evil serve a further cause. Without evil, how would one *know* that what is good is really good? This, the theist would claim, is no more possible than that a man who had never seen a shadow could really know what light is. However, the skeptic can respond that it is possible to *experience* good without any suffering even if suffering is necessary in order to *know* that one is experiencing good. Hence, moral evil still needs to be explained. One theistic way to do so is to claim that knowledge of the dichotomy between good and bad is needed, not only in order to really comprehend what is good but also for the gratitude that God expects from his followers. To this, the skeptic might retort that it is cynical to create this amount of suffering in order to get subservient beings to bow their heads to their Maker.

A second line of defense is to stress that the choice between moral good and evil serves a good cause, i.e., the soul-making process that makes human beings autonomous individuals who are responsible for their deeds and freely turn to God and as a result are rewarded with His friendship in the eternal afterlife. This is the famous *free-will defense*. The upshot of this is that there are some evils that may be engulfed by greater goods; some bad things may be seen as necessary means for a better general state of affairs than otherwise would be possible. For example, it may be held that a world containing pain is better than a world without it since pain makes compassion possible, and a world

containing compassion is better than a world without it. Further, a world containing certain types of moral evil, for example, malice, is claimed to be better than a world without it due to the fact that this makes possible the choice between good and bad acts; hence, in such a world, human beings cannot only feel compassion but also act morally. This capacity is not possible without free will. The utilizing of free will, however, often results in suffering as a bad but necessary consequence of the larger good consisting of this very capacity. Therefore, God is not only morally permitted to allow suffering and malice in the world, He is even morally *required* to do so since the good things that are added through this process makes the world better than it would otherwise have been. No less would be expected by a wholly benevolent being.

This is a strong line of defense, but far from conclusive. To begin with, it may be objected that the presence of moral goodness and the addition of free will in some agents hardly make up for the enormous amounts of suffering in nature. One may be forgiven to ask how antelopes and sheep are compensated for the suffering they endure by the addition of free will in one species that made its entry into the world very late in the evolutionary process. Secondly, the free-will defense is not wholly convincing even on its own terms. As the philosopher Anthony Flew once put it (in the atheist phase of his career), it is certainly possible for an almighty being to create a world where people freely choose only among good things. That is, God could have chosen to create beings “who would act freely but always do right” (Mackie). This is not, as some apologists have claimed, to use people as puppets and predetermine their behavior; as pointed out by Flew, “there is no contradiction involved in saying that a particular action or choice was: *both* free, and could have been helped, and so on; *and* predictable, or even foreknown, and explicable in terms of caused causes.” Everyone can act in a good way now and then; some do it most of the time, and a few do it consistently. These agents act according to their character and so are determined by that, which, of course, does not make them less free than agents who act morally wrong

most of the time. For God to prevent immoral people to be born is simply to use the divine powers of choice in reproductive matters so that only beings that consistently would choose to act benevolently were allowed to see the light of day. Obviously, an omnipotent Being can do this (and this is in fact what He is held to have created with Paradise). Since God has not chosen this alternative, He cannot evade responsibility for the evil acts committed by men. Hence, according to the skeptic, He is not wholly good.

Still, there is a line of defense left for the theist, what could be called *The Actual Person Argument for the Existence of God*. The theist may claim that for all the skeptical acumen shown by the skeptic, what he asks of God is a world that not only excludes skeptics (as well as theists, of course); it is also a world in which human beings as they are now would not exist. Not even the most convinced atheist would prefer a world where evil is totally absent. If placed in such a world, not only would the atheist be bored, he would also be stripped of the moral properties which make him the person he is. In a world completely devoid of evil, there would be no crooks but also no heroes, no moral goals to fight for, and no Dostoevsky novels. Certainly, it could be claimed, this is a worse condition than the present one. Therefore, God is not only permitted to create the world as it is, He should also be praised for it.

This may appeal to some atheists, but it is nevertheless not totally convincing. To begin with, it may be said on behalf of those more primitive creatures that suffer attacks by sharp-clawed animals, that the costs of this alleviation of human boredom are too high. And secondly, it can hardly be denied that the amount of suffering in the world outweighs the benefits in this process. Those billions and billions of animals that have suffered before human beings appeared on Earth seem, in this light, to have suffered in vain.

Further Lines of Defense

When presented with arguments like these, some theists take refuge in the inscrutability of

God. Some add that it is even sacrilege to present arguments like these, that it is wrong to question the supreme wisdom of a Being immensely more developed than we are. This, though it may perhaps dampen the questioning spirit of some believers, is of little help to the agnostic and will not silence the skeptic. To begin with, it could be claimed that we have to act on the rational and moral capabilities we are endowed with. Although limited, we cannot just hand over to authorities the problems that we must confront as moral beings, no less in a case like this than when we choose allegiance to political leaders. It could even be said that this is a further ramification to the theodicy complex. Why could not God have made us less susceptible to temptation, less inclined to doubts, especially when the price we have to pay is so high – eternal damnation, or at least exclusion from Paradise?

John Hick presents an answer to this problem. He claims that life on Earth, with all its suffering and insecurity, is a “soul-making process” whereby human beings mature to be friends of God. As in all close relationships, loyalty is tested, and as a result of faithfulness, the relationship is strengthened. Those who cling to faith even when much tells against it prove themselves especially worthy to be inhabitants of the reign of God. In order to make this soul-making process possible, it is necessary that the earthly surroundings contain so many occurrences that speak against the existence of a good Creator that it poses a challenge even to the most devout. Hence, the enormous amount of unexplained evil found in the history of mankind and other animals is necessary; it serves the purpose of confronting human beings with an objection that really works as a test of their faith.

How do we know if this answer is feasible? This, according to Hick, we will come to know when we knock on Heaven’s door. Viewed as a life strategy, this is judged differently by the believer and the skeptic (partly as a result of different conceptions of belief). For the believer, this can be held as a declaration of the hope inherent in belief. For the skeptic, whose conceptions are usually determined by scientific

demands of justification (rules of probability, etc.), it would be viewed as a kind of “intellectual Russian roulette,” similar to Pascal’s wager or the route to faith presented by William James in his essay “The Will to Believe.” Nevertheless, it is consistent with Christian teachings and may constitute an answer that works for the believer, although it does very little for the searching agnostic. As is the case with Dostoevsky’s *The Brothers Karamazov*, where Ivan’s skeptic objections are met by a kiss from his deeply religious brother Alyosha, the most powerful answer from the believer lies in the continuation of belief in the face of such strong arguments and so many daily examples of human cruelty and stupidity. The skeptic may conclude that he has shown not only that God is not worthy of worship, or even that there *cannot be* a God in the way the theist defines God (since at least one of the defining characteristics will have to go), but also that it may prove morally pernicious to worship a Being with so many ethical shortcomings. He may even hold, like Christopher Hitchens and other skeptics, that the belief in God has brought much evil to the world, e.g., the Crusades and the Inquisition. Still, the believer may hold that without a God, the world would be a much worse place, with no hope for those who are placed in the worst conditions and little consolation to all who are deprived of a close relative or of a sustainable life goal.

Cross-References

- [Free Will](#)
- [Hope \(Life after Death\)](#)
- [Pain \(Suffering\)](#)
- [Rationality \(philosophical\)](#)
- [Theism, Classical](#)

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Evoked and Event-Related Potentials

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Related Terms

[Averaged evoked potentials](#); [Electrical potentials](#); [Electrophysiological responses](#); [Evoked responses of the brain](#); [Scalp-recorded potentials](#); [Sensory evoked potentials](#)

Description

Evoked potentials (EPs) are small voltage fluctuations in the ongoing ► [electroencephalogram](#) (EEG) elicited by, and time-locked to, repeated occurrences of specific sensory, motor, or cognitive stimulus events. To extract average waveforms (also known as average “evoked potentials” of the brain) from the ► [EEG](#), it is necessary to sum and average the results of multiple trials. EP morphology varies as a function of the sensory modality (which are a type of nerves and centers that carry stimuli from sense organs (or receptors) to the central nervous

system and analyze their meaning. Different sensory modalities exist: visual, auditory, somatosensory, olfactory, etc.) of a physical stimulus; visual EPs (VEPs) are quite different from auditory (AEPs) and somatosensory (SEPs) EPs. In addition, amplitude (magnitude of the evoked potential, usually recorded in micro V or mV (one millionth of a Volt), with respect to a baseline computed on the basis of EEG signal amplitude over a time span of choice, usually 100 milliseconds, or ms, preceding stimulus event presentation), and latency (for example, the time between a flash of light and the major positive response in the occipital EEG, namely, P1), vary with the intensity and subjective relevance of events. EPs have been extensively used in human studies and have made important contributions to our understanding of neural systems that respond selectively to different types of stimuli in different sensory modalities and in the mapping of cortical and subcortical regions of the brain (Regan 1989; Barber et al. 1999). To date, these studies have successfully identified a set of robust potentials, named ► [event-related potentials](#), associated with several motor-cognitive-affective functions. The intracerebral sources of these potentials are also known to some degree (Donchin 1984; Zani and Proverbio 2003). Event-related potentials are a set of standard and robust electrophysiological potentials, abbreviated as ERPs, reflecting “higher-order” brain processing invoked in relation to mentations such as memory, expectation, attention, or changes in the mental state, rather than simply evoked by the physical impingement of external stimuli.

Self-Identification

Science

Since it was first introduced by GD Dawson (1951), the study of EPs has been pursued extensively and systematically, and much effort has been devoted to it by scientists from different fields including physics, electrophysiology, neuroscience, psychology, etc. EPs have always been regarded as valuable indices of brain sensory and

cognitive-affective functions. Historically, when there was an almost complete lack of noninvasive and harmless neurophysiological techniques for human research, EPs were considered the technique of choice for such studies. Since EPs consist of peaks and troughs, the polarity of which is indicated by the letters *P* and *N*, respectively, followed by numbers that denote their chronological order (e.g., P1, N1, P2), they provide millisecond-by-millisecond high-temporal resolution of neural processing (i.e., a measure of the ability to distinguish between two temporally close but not identical samples of the property being measured; it is expressed as the difference in values of a property necessary to make such a distinction, also called resolving power. EPs and EFs have a resolving power in the order of 1 ms or less). Earlier latency (<150 ms) peaks and troughs mostly reflect the activity of brain sensory areas (visual-occipital, auditory-temporal, etc.). Later-latency potentials, termed ► [event-related potentials](#) or ERPs, mostly reflect higher-order mind processes such as, for instance, attention, memory, and language. This is highly relevant to the unveiling of “online” sequential and parallel activation of different areas and systems of the brain during mental functions. Unlike any other modern ► [neuroimaging technologies](#), EPs/EFs are uniquely endowed with this valuable high-temporal advantage (Donchin 1984; Zani and Proverbio 2003). They have nevertheless suffered the limitation of a raw spatial resolution, a measure of the ability to distinguish between two spatially close but not identical samples of the property being measured, arising from the so-called inverse problem, namely, the problem of determining which sets of generators inside the head might have produced the EPs recorded from outside the head (Scherg 1992; Zani and Proverbio 2003). The devising of source analysis algorithms has allowed this limitation to be circumvented. Indeed, these algorithms, for example, BESA (Scherg 1992) and/or LORETA (Pascual-Marqui et al. 1994), make it possible to determine the intracranial generators of these scalp-recorded potentials (wave or voltage), in humans, without the need for parallel surface

(whether from the cortex or the scalp) and deep intracerebral recordings, as were usually obtained from nonhuman animals before ethical rules were established to prevent them. BESA or Brain Electrical Source Analysis; is a computerized algorithm for source imaging and electromagnetic dipole localization for EP and EF in research and clinical settings. Loreta is the acronym of low resolution brain electromagnetic tomography. Given measurements of scalp electric potentials and/or magnetic fields, this algorithm computes the exact 3D intracranial location (s) of maximal activity with a minimum degree of “blurring.”

Characteristics

Unlike other modern ► [neuroimaging technologies](#) for investigating human mind and brain functions, only EPs/ERPs and their magnetic counterparts (evoked fields, or EFs/ERFs), can, at present, contribute to elucidating the millisecond-based temporal progression of neural processing observed in the brain, thus increasing our knowledge of the dynamic functional interconnectivity across brain systems (Lehmann and Callaway 1979; Donchin 1984; Regan 1989; Barber et al. 1999; Zani and Proverbio 2003).

Relevance to Science and Religion

The major temporal advantage of EPs makes this subdiscipline/technique aware of its value in adding precise timing to the activation of brain regions identified by techniques with high spatial resolution but poor temporal resolution, such as PET and ► [fMRI](#). Currently, this makes the combined recording of electrical and hemodynamic signals in the same session the most advanced procedure in neuroscience for thoroughly enhancing our knowledge of where in brain space, and when in time, specific regions are active during a function, as in memory and attention processing (Donchin 1984; Zani and Proverbio 2003).

Sources of Authority

There are innumerable sources of authority for this subdiscipline/technique. These are not only eminent scientists from a range of domains from neuroscience to physics, including, mathematics and electronic engineering, but also milestone papers, books, and dedicated journals. These sources are authoritative because they have devised new theoretical viewpoints or introduced new methods of analysis, as well as identified previously undetected potentials associated with individual sensory and cognitive processes, thus boosting the power of EPs/ERPs to address hard questions such as “What do these potentials indicate?” during brain processing, or, from a more general view, “Where do they come from in the brain?”, as well as “How do the brain and mind work?” Overall, then, the strength of the linkage of these potentials to cognitive neuroscience undertakings has been increased. A great deal of time and space would be required to review all these sources; in view of the limitations, only a very few selected ones will be considered here.

In 1964, Kornhuber and Deeke found a scalp-recorded electrical reflection of motor cortex activity leading to voluntary muscle movement, which they called *Bereitschaftspotential* or BP and was later known as readiness potential because of its relationship to the pre-motor planning of volitional movement (Kornhuber and Deecke 1980). In two related studies in 1965, Salomon Sutton and colleagues found an enhanced positivity with a latency apparently ranging from 200 to 300 ms related to “stimulus uncertainty,” while in 1968 and 1969, Walter Ritter and Vaughan found a similar positivity in conditions related to “stimulus novelty,” later known as the *P300*. Thereafter, Emmanuel Donchin and his students (Donchin and Lindley 1969; Donchin 1984) at the University of Illinois brought the study and interpretation of the functional significance of the *P300* potential for evaluating cognitive information to unprecedentedly high levels. During the 1970s, Risto Näätänen and his group (Näätänen et al. 1987) at Helsinki

University recorded a so-called mismatch negativity, or MMN, 150–200 ms after occasional physically deviant auditory stimuli in a stream of otherwise identical stimuli. This MMN is elicited by deviations in any auditory feature and increases as the feature becomes more deviant. In 1980, Marta Kutas and Steven Hillyard at U.C. San Diego pioneered studies of the response of language areas to semantic stimuli, recording a so-called N400 after presenting an incongruous word in sentences such as “I like pizza with mozzarella cheese and *nails*.” Overall, these potentials, or components, have provided a specific taxonomy of EPs/ERPs that has subsequently been widely used in numerous research and clinical settings (Kutas and Hillyard 1980). The untimely death of Russel M. Harter in 1990 should not go unnoticed; he was at the peak of his career, after having contributed much during the 1970s and 1980s at the University of North Carolina at Greensboro to identifying the neural substrates of human visual perceptual development, pioneering the recording of infant VEPs. Last but not least, we must recognize the outstanding work of Terence W. Picton (Picton et al. 2000), Michael Scherg (1992), Paul L. Nunez, F.H. Lopes da Silva, H. Spekreijse, Roberto D. Pascual-Marqui (Pascual-Marqui et al. 1994), D. Lehmann (Lehmann and Callaway 1979), D. Regan (1989), and many other leading scientists not mentioned here for space reasons who made important contributions to establishing methods for locating the sources within the brain of potentials recorded from the surface of the scalp. Since 1949, the “Electroencephalography and Clinical Neurophysiology” Journal, also known as EEG Journal, comprising the “Electromyography and Motor Control” and “Evoked Potentials” subsections, has also been of great importance for fostering research and disseminating information in this field. This journal has always been, and remains, the official organ of the International Federation of Societies for EEG and Clinical Neurophysiology. For this reason, its name was changed to “Clinical Neurophysiology” in 1999.

Ethical Principles

In line with the Declaration of Helsinki in 1971, clinical, diagnostic, and research activities performed in the context of this subdiscipline/practice are guided by sound ethical principles of patient/subject care and interpersonal and communication skills, as well as by standard guidelines for psychophysiological research, compiled by a panel of outstanding scientists in this field (Picton et al. 2000).

Key Values

The key values of this subdiscipline/practice are to use information technology to appraise and assimilate evidence from scientific studies to enhance patient care outcomes in clinical settings, and to enhance our knowledge of the functional activity of brain sensory, cognitive, and affective systems.

Conceptualization

Nature/World

Nature, in the sense of the natural or physical world, is seen to represent all the physical stimuli eliciting a functional or dysfunctional bioelectrical response in the brain, no matter whether or not the latter is consciously aware of them.

Human Being

The human is seen as a complex biological system in which both lower-order sensory and higher-order cognitive brain processes may be studied, the latter seen in nonhuman animals to a much lower degree.

Life and Death

Life is defined as a state of brain responsiveness to the external world as indicated by the presence of EPs, no matter whether individuals are aware of and consciously report the events that elicit them. EPs are therefore objective signs of life in individuals in a coma, where there is still some sparing of cortically based cognitive brain

functions besides subcortically regulated visceral ones such as the cardiac cycle and respiration. Conversely, death is usually considered as the absence of such brain potentials due to the irreversible cessation of all the forebrain and brainstem functions, even in conditions in which the heart and lungs are still working, thanks to the action of ER equipment (Lehmann and Callaway 1979; Donchin 1984; Regan 1989; Zani and Proverbio 2003).

Reality

Reality is a contentious term that, in its widest sense, might include everything, that is, whether or not it is observable or comprehensible. In a most general way, EPs reflect brain processing related to everything, that is, mostly at the physical sensory level, independent of awareness, which is related to higher-order processing or cognitive levels in the brain and thus to the activity of the so-called association cortices. To some degree, this higher-order activity is reflected in the ERPs (Donchin 1984; Zani and Proverbio 2003).

Knowledge

Knowledge is rationalized in terms of neural processes that link stimuli to successful behavior in complex and challenging environments. These processes are referred to as the way humans and nonhuman animals acquire, manipulate, and use information in the context of mental functions. EPs have contributed successfully in reflecting the neural mechanisms underlying all these functions by means of appropriate experimental setups, in which the patient/participant performs tasks, and stimuli differing in meaningfulness are administered to “probe” the underlying neural electrical activity thus elicited.

Truth

EPs may serve as “clues,” on the one hand, to the impingement of events in the external and internal physical world on brain systems, irrespective of their conscious experience, and on the other, to their mental representations, irrespective of their “true” presence. Indeed, robust evidence has been obtained of EPs/ERPs recorded in conditions in

which no stimuli were actually presented because they were “omitted” in a sequence, elicited simply by strong subjective expectations (Donchin 1984; Zani and Proverbio 2003).

Perception

Perception is thought of as an active construction process, and a form of conscious awareness of the objects of the external world that transcends the simple sensory processing carried out by the primary and secondary cortices, notwithstanding the importance of this basic processing for analyzing the features of physical stimuli and objects. EPs have provided meaningful knowledge of the sensory and perceptual processes of the brain for the major sensory modalities (Donchin 1984; Regan 1989; Zani and Proverbio 2003). For instance, a relatively early latency P100, or P1, recorded from the occipital scalp, changes in amplitude as a function of check size to produce an inverted U function, the low amplitude values of which are associated with both lower and higher check sizes, and the highest amplitudes with medium sizes of 10–15 min of arc. However, for active perception, active involvement of the frontal and parietal association cortices is also thought to be mandatory. As a proof, neurological patients with a lesion in the right inferior parietal lobe (causing a hemispatial neglect syndrome), but intact occipital lobes, show a normal P100 at the right occipital scalp in response to patterned visual stimulation from the left visual field, contralateral to the side of the lesion, but do not consciously perceive these stimuli. Conversely, patients with a lesion in the visual occipital cortex (blindsight patients) cannot see stimuli from the external world and show no P100 at the scalp over the occipital cortex. Overall, these EP findings reflect normal visual sensory processing, but impaired perceptual conscious processing, in the neglect patients, and impairment of both sensory and perceptual processes in blindsight patients.

Time

Time has a very special meaning for EPs. Unlike other timescales, in the order of nanoseconds, seconds, minutes, or hours/days, proper to

subcellular, cellular, and whole-system structural and functional brain functions, the millisecond-based scale used to measure the time of appearance, or latency, of the various peaks and troughs in the EPs/ERPs, indicates the stages of neural processing that an external or internal event undergoes in the brain, closely paralleling “online” the actual timing of mental and behavioral functions (Donchin 1984; Regan 1989; Zani and Proverbio 2003).

Consciousness

Consciousness is a complex concept that includes neural processes relative to the state of wakefulness, awareness of the world and the self as an actor in the world. Most of these neural processes occur at an unconscious or automatic level. The relationships of EPs and ► EEG signals to consciousness differ markedly. Indeed, EEG simply provides a generic index of individuals’ wakefulness, or arousal, ranging from coma to alert wakefulness. Conversely, EPs can provide a measure of the time-locked and selective responsiveness of the brain to sensory and cognitive events as a function of the subjective relevance of events. To some degree, this makes them possible signs of some of the neural processes strictly related to, or preceding, the conscious mental processes elicited by these events (Donchin 1984; Zani and Proverbio 2003), some in particular; for instance, the so-called N400, a wave recorded about 400 ms after the occurrence of a linguistic stimulus, such as the word “sock” presented at the end of a sentence such as “I like my roll with mustard and sock.” This wave, then, seems to reflect brain processes related to the subjective realization that this word is semantically odd with respect to subjective expectation – for instance, “a hot dog” – and/or to the successive conscious mentations elicited by this realization (Kutas and Hillyard 1980).

Rationality/Reason

Traditionally, rationality has been regarded as that which is rational and capable of sound and goal-directed reasoning for problem solving and decision making, following given rules or otherwise, as opposed to being irrational or incapable

of reasoning. There is considerable evidence that psychiatric populations with altered reasoning ability and mental faculties show alterations in both EPs/EFs and event-related potential morphology (Regan 1989; Barber et al. 1999; Zani and Proverbio 2003).

Mystery

EPs may provide insight into the mystery of brain functioning in terms of time-based parallel and sequential functional inter-activations of its manifold ► [functional systems](#).

Relevant Themes

Some additional issues are especially relevant to this subdiscipline/technique, as to any other life science disciplines, from the “Science and Religion” viewpoint, issues that have been considered by many thinkers throughout human history. If, from a religious point of view, the mind stemming from the brain is to be strictly considered as arising from a spiritual soul, should the absence of brain responsiveness – as reflected by the absence, after death, of any evoked potentials – be taken to indicate that this spiritual entity has been separated from its material “reservoirs,” the brain and body, now incapable of any response per se? If so, a “dualistic” view of soul/mind and body, or, in more up-to-date terms, mind and brain interrelationships, should be maintained. However, many accomplishments of neuroscience currently support a “monistic” view of mind and brain, as dependent on biological processes and independent of the spiritual soul. This has made, and will continue to make, these issues the subject of intense argument (Donchin 1984; Zani and Proverbio 2003).

Cross-References

- [Clinical Neurophysiology](#)
- [Cognitive Neuroscience](#)
- [Cognitive Science Psychology](#)
- [Magnetoencephalography \(MEG\)](#)

- [Neglect](#)
- [Neuroimaging](#)
- [Neurophysiology](#)
- [Neuropsychology](#)
- [Perception](#)

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Evoked Responses of the Brain

► Evoked and Event-Related Potentials

Evolution

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Related Terms

Darwinism

In a general sense, evolution is one of two different kinds of change, the other being development. Based on the usages in biology, where both kinds of change are studied, development can be defined as “predictable directional change,” and would be a constitutive aspect of any dynamical system, as seen, for example, in the developmental stages of an embryo, which go through a predictable sequence. At a simpler level, tornadoes also go through predictable stages of development. Evolution, on the other hand, would be the “irreversible accumulation of modifications and marks” resulting from encounters with other systems or forces. It produces individuation. Such marks can form a record of historical changes. A simple example would be the craters on the moon. A more interesting example would be changes that occur as a result of mutations in the DNA information storage in the cells of organisms. Such mutations are known to mark some of the changes that have occurred during biological evolution. All natural systems both develop and evolve (individuate). They develop insofar as they are members of a class of dynamic things, and their characteristic changes are constitutive of their being in time. They also evolve/individuate because they inevitably get modified when they interact with other things and systems.

In its most general sense in science, “evolution” means progressive change. That is how physicists, chemists, astrophysicists, and sociologists use it. In these fields, it is usually taken to be predictable (hence “progressive”), as in the changes producing the main sequence of stars, or in the “evolution” of alcohol during fermentation. Biological evolution has been taken to be not predictable, largely because neo-Darwinian theory is based completely on chance occurrences, as explained below, and as emphasized so strenuously by Stephen Jay Gould, who wanted to rule out all notions of progress from biological evolution.

Science has for the most part been involved only with development, leaving evolutionary changes as the province of history. Philosopher of science Karl Popper spoke of “the poverty of historicism,” referring to the fact that it is difficult to use history for pragmatic purposes. Only predictable changes can be modeled. There have been exceptions in science, such as historical geology and evolutionary biology. The technique of historical geology has been to take several different kinds of evidence from any given sequence in the geological record. Each kind of evidence can be used to corroborate (or not) what was found with other kinds of evidence taken from the same record. In this way, a geological time period can be “run through” over and over again, building up a coherent picture from different lines of evidence. This is analogous to checking to see if some developmental event in an embryo is repeated in other embryos, where other embryos are used to supply evidence for each kind of experimental probe. So history can be studied by science if preserved traces can be studied by many different techniques, as can be done with the fossil record. Based on studies by paleontologists of fossils and the strata they are preserved in, biological evolution has been constructed as an inferred process of replacement of kinds of living systems with others over long periods of time on the earth. The fossils have been located in time by historical geologists using physical techniques for dating the enveloping rock strata.

This record gives us an idea of the sequence of living beings that inhabited the earth.

The idea of biological evolution is founded upon the inference that earlier living forms gave rise to later ones in a kinship relationship based on reproduction. Indirect methods of finding relationships between living beings are comparative anatomy, which Darwin and his forerunners used to imagine biological evolution in the first place, and comparative genomics, which is now the major tool for establishing kinship relationships between kinds of living things. The conceptual model used in these studies is what Darwin called “descent with modification.” Here, greater similarity is taken to reflect closer kinship, and processes of change are held to result in accumulating differences as time passes from generation to generation. So the model is one of ever-increasing difference from original ancestral forms as generations succeed each other over time. During this process, driven by reproduction, new species occasionally come into being if the accrued changes prevent interbreeding with populations of the older kinds. This process of descent can be modeled overall as a tree, with the oldest ancestor in the trunk, and with new branches marking the origin of new species. One result of this process would be to increase the number of different kinds of living things, as well as the number of different kinds of environments they live in as they migrate to unoccupied regions. One would also expect an increase in the number of resulting ecological relationships among the different kinds. So this model of “descent” explains the variety and disparity of living things.

Concurrently, we have also found in the evolutionary record a process of increasing complexity in the newer kinds of living beings appearing later in the record of evolutionary change. The earliest living things were simple masses of single cells, each reproducing separately. To these were added multicellular kinds of different sorts on different branches of the “tree” of life (e.g., sponges, plants, animals), and to these were added kinds that live in social systems, as well as kinds that engage in building things. As a result, we find that our descriptions of living beings

need to get increasingly more complicated as we describe kinds appearing more and more recently in the record. This pattern of change is not implied by the “descent with modification model,” which only predicts the generation of increasing numbers of kinds of living things. Since it is common for developmental processes to show an increase in complexity of a developing system (as in the egg to chicken sequence), it has been suggested that biological evolution might also be a predictable process for any planet with moderate enough conditions that could support life. That is, there is some evidence that biological evolution can be considered to be an aspect of a large-scale developmental process of the surface of any earth-like planets. Any developmental process always involves individuation of the developing system as well, because historical accidents are always occurring in any material system. Therefore, development is always evolutionary in part. Biological evolution, then, would be “evolutionary” in its creation of many new kinds, and may also show a developmental tendency in its creation of increasingly complex kinds of living beings as it continues over time.

The above statements make up what can be called the facts of biological evolution – dated fossils and graded series of increasingly dissimilar anatomical resemblances accompanied by increasing degrees of genetic difference. Some religiously motivated persons may refer to this body of information as “the theory of evolution,” which might better be stated as “the theory that evolution has occurred.” However, what is described above is not taken to be a theory in the usual sense (involving causes) at all, but a logical inference based upon facts from several sciences, ranging from physics, through chemistry and biology, to anthropology.

There actually is a theory of evolution that informs the thinking of evolutionary biologists, and this is the “neo-Darwinian theory” – the theory that evolution is mediated by natural selection. This theory, along with several others as well, was sketched out by Darwin, and has been developed by subsequent evolutionary biologists as a largely mathematical theory of

population genetics. It concerns how some genetic predispositions can replace others over several generations in a lineage of populations. It is a theory of competition between genotypes (which code for phenotypes like the brown eyes/blue eyes alternatives in people) for relative representation in the next generation. Genotypes that reproduce most successfully would gradually replace competing types, and are then said to be the more “fit.” It is assumed that this differential reproduction (with the best said to have higher fitness) is usually a sign of better adaptedness to existing environmental conditions. Fitness involves two components – viability and fertility – which make up the phenotype of a kind of organism. Viability refers to the ability to make a living and to survive the various hazards facing living things, while fertility refers to the ability to attract mates and successfully produce and (in some cases) raise offspring. A genotype’s fitness is measured as the number of surviving offspring of that type in the next generation relative to most successfully reproducing genotype.

The neo-Darwinian theory has built into it an important provision that relates closely to the controversy between religion and biology. This provision is now coming to be increasingly criticized within evolutionary biology itself as not only not being required, but as not being even a plausible restriction. This important provision is that *new forms and behaviors can appear in organisms only by way of random mutations of genetic predispositions*. “Random” here means “random with respect to the needs of the organisms.” This provision forestalls the possibility that there might be some agency, like a deity or other as-yet-undefined factors, influencing evolution, since the changes that might increase fitness are held to necessarily occur prior to the possibility of their becoming useful. This basic assumption is a purely ideological constraint on the neo-Darwinian theory, and restriction to it has no basis in observation. Some evolutionary biologists are now interested in the idea that organisms themselves might influence new forms by way of changing behavioral patterns or by changing the hormonal environment of their cells, which is where the deployment of genetic information

takes place. It is now clear that regulation of genetic information is more important than changes in that information in generating new phenotypes, and such regulation could plausibly be influenced by the biological system itself.

Possible influences by a living system itself on what new phenotypes may appear during evolution are coming to be assimilated under the label “self-organization.” This change in perspective allows organisms themselves to have a role in upcoming evolutionary changes. In the neo-Darwinian theory, there can be no effect of organismic intentionality upon evolution; they (and we) are viewed as mere hapless pawns in the competition between genotypes in a population. Some neo-Darwinians have even proposed that genes are the agents in evolution, with organisms being relegated to being mere “gene machines,” or “vehicles” for the promotion of genetic varieties. So the enforced randomness of gene mutation, installed in the neo-Darwinian theory in order to eliminate the possibility of *external influence* upon evolution, is being challenged instead by the possibility of *internal agentive action* by living beings themselves, as suggested by some studies in the field “Evo-Devo” (Evolutionary Developmental biology). This invokes unease among many scientists because Western science has been wedded to the idea that all of Nature works mechanically, with no influence of desire. This is why Francis Bacon excluded Aristotle’s final cause from consideration in science. Natural selection only eliminates the relatively unfit, and creates nothing new. It is strictly a negative “weeding out” process, revealing success in reproduction subsequent to changes being made by self-organization. It can now be said that *natural selection (selection by consequences) only disposes what self-organization proposes*.

The neo-Darwinian population genetics theory has been embedded in a larger, more encompassing theoretical nexus, called the Synthetic Theory of Evolution. This was a hoped-for union of population genetics, natural history, paleontology, comparative anatomy, developmental biology, and animal behavior. It is interesting to note how fully the randomness idea has suffused this entire theoretical orientation

in biology. (1) The supposed randomness of mutation as a source of the new has already been noted. (2) The willy-nilly wanderings of animals, spores, and seeds has been cited as important in the establishment of new species because new populations might come by chance to be established far enough away from the source populations so as to interrupt interbreeding. A long period of evolutionary changes in separated populations after this would be enough to establish a new species after the accumulated genetic differences became great enough to have rendered the genomes incompatible in a hybrid. This “allopatric model” of speciation has been the dominant one in the Synthetic Theory. (3) In the population genetic theory, evolution is always characterized as being kicked off by environmental changes occurring without respect to the needs of the organisms in a population – that is, occurring at “random.” (4) Since biological populations of larger organisms are often rather small, there is commonly a statistical sampling error determining which genes might get passed on to the next generation, called “genetic drift.” This means that varieties that get subjected to selective culling are often chosen in advance by accidental events. (5) At a larger scale, unforeseeable “pre-adaptation” is supposed to have been a major mediation of new ways of life. For example, the fish-like ancestors of the first vertebrates to leave water for dry land appear to have already been walking in the shallow waters where they lived, and they were already breathing air in those stagnant tropical waters. We might note that some modern fishes do both. It needs always to be the case that, in order to get going in a new way of life, there must be some way of gaining a foothold – once again, the only alternative seems to be chance.

It is interesting to note that logically, there is no way to tell the difference between a chance event and an arbitrary action. Chance events are characterized when data about collections of some kind of event fall into frequency distributions that can be fit to some probability density function. But when a collection of instances of a type of deliberate, agentive action is subjected to statistical analysis, it too can be found to be “random.”

For example, the frequency of pairs of moves in master chess games, and of pairs of notes in a classical music score, can be shown to fit a Poisson distribution, even though they were obviously not made “by chance.” This makes an ironic footnote to the Synthetic Theory’s focus upon randomness. This bias would seem to be a veritable invitation for those who wish to imagine a supernatural hand in evolution to assert that all the seemingly random events were actually directed from outside by a deity. There can be no logical objection to that assertion, and so the difference of interpretation becomes merely an assertion of wills. For this reason alone, atheists will be inclined to accept the ideological change privileging self-organization instead of randomness in the generation of new departures in evolution.

We can explore further the relationship between natural selection and the evolution of changes in organisms over time, a process that has been labeled “macroevolution.” This label is poised in distinction to “microevolution,” which refers to the changes in gene frequencies from one generation to the next as resulting from natural selection. It was long assumed that microevolution repeated over thousands of generations would gradually add up to macroevolution. That was Darwin’s own view, and this “gradualism” was taken to be the norm for biological evolution until recently, when it was shown that phenotypic evolution often goes by spurts and jumps, sometimes in response to dramatic environmental change. Genetic change by way of selection over the generations would logically be gradualistic, but we see that organismic changes need not be. A further point is that any feature or function of an organism is influenced by many genes. The neo-Darwinian theory does encompass the evolution of many genes simultaneously (as modeled in the computation technique, “genetic algorithms”). Most biological functions involve more than one trait, and the simultaneous evolution of many such traits, insofar as they affect one function, can be dealt with successfully by neo-Darwinian theory. There remains, however, a conceptual problem with the simultaneous evolution of many independent functions, yet to be solved within selection theory.

Macroevolution can be explored further with a famous example used by religious objectors to evolution – the evolution of the eye. They point out that since an eye would not function unless all its features were in place, it seems impossible to imagine all of these getting gradually improved simultaneously because in the selection model, there needs to be functional superiority in each generation in order to propagate some variety of a feature. An “unfinished eye” could not have any selective advantage in respect to vision. As well, since each feature needs the others to collaborate together in order to produce vision, they could not evolve in tandem either. This example poses problems for the selection model; natural selection, selecting by consequences, cannot foresee future benefits. In the selection model, one is required to imagine improvement of all the future parts of the eye as occurring because each step was adaptively superior to other, competing forms, long before they came to function together as features of the eye. That is, each future feature of the eye must be viewed as having been involved in other functions that were selectively favored. There could have been no selection pressure favoring vision until just before the advent of the eye. For example, the pigment cells in the retina could have had light-sensitive ancestral cells that functioned merely as detectors of light and dark, without any image forming ability. Only in later generations of succeeding populations in descendent species would they get co-opted into the focusing eye, a process labeled “exaptation.” This is the formal Darwinian answer, but whether there is in fact a sequence of ancestral populations with adaptive pre-eye components actually known from the fossil record is questionable. Lacking such a record, evolutionary biologists can only believe that such a sequence must have occurred. The belief rests on plausibility. That is, as is frequently the case in science, there can be a logical in-principle solution to a problem before that solution can be demonstrated empirically.

Another important aspect of macroevolution that is problematic for neo-Darwinians – *convergent evolution* – is explored in a separate entry in this encyclopedia.

Concerning the ideological aspects of evolutionary biology, we might consider how a process that supposedly produced us could not have ideological implications. Science is not free from ideology, as Marxist scientists were insisting back in the 1880s of the nineteenth century. Long before that, the connection of Darwinism to Capitalist ideology was being formed, given the influence on Darwin’s thinking by texts like those of Malthus. Capitalism values the growth of competing firms, while Darwinism values the relative growths of different genotypes in a population. It was said that Darwin imported Capitalism into Nature when he formulated competition between different types in a population for reproductive hegemony as the basis of evolutionary change. Subsequently Social Darwinists justified their particularly brutal view of the human economic situation by appealing to its naturalness – Nature red in tooth and claw! More recently those neo-Darwinians known as Sociobiologists promoted similar views, which an even more recent group known as Evolutionary Psychologists have tried to ameliorate. They, however, still use the basic mechanism of reproductive competition between various types in a population as the motor of evolution, producing natural selection. And so, we who are here today would be seen to be the offspring of a series of ancestors who outcompeted (by successfully outreproducing) the ancestors of other possible folks who are not here instead! Competition is therefore the source of all good, based on a random – that is, pointless – production of competing genotypes. Insofar as it is insisted that nothing is directing the evolutionary process, and that it is not developing in any particular direction, it is without any intrinsic meaning. Gould was fond of noting that it was just pure accident that our lineage did not go extinct long ago, as most kinds of animals have.

It needs to be noted that there are today at least four groups that have an interest in shaping our culture’s creation myth (using “myth” in its ethnographic sense of an account of what we are, where we came from, and what we should be doing to reflect those origins.) There are, most prominently, the neo-Darwinian evolutionary

biologists, who feel that they, as scientists, ought to have exclusive rights to interpret organic evolution. There are, actively contesting them, religiously based Creationists (fundamentalists in all three of the Abrahamic Faith Religions would presumably have a stake in the Genesis story). Then there are, somewhat less prominent now, the Marxists, who object to the notion of genetic determinism that almost automatically follows from the neo-Darwinian idea that only genetic information can be passed on from one generation to the next, reflecting the properties of the winning genotypes in the reproductive competition. They promote instead the idea that Man can be molded by social arrangements regardless of inherited predispositions. Finally, there are the ideological Capitalists, for whom the valorizing of competitive production in our basic myth can only be a good thing.

So, we see that the large changes in phenotype over time that we call biological evolution, or macroevolution, has been established as an almost inescapable fact. At the same time, the dominant – indeed, the only current – theory of biological evolution, the still unfinished theory of natural selection, or microevolution, deals only with changes in the proportions of genetic varieties in a population over a few generations. It is a theory that depends upon accidental occurrences at all levels involved in evolution, from cells and organisms to populations and biological lineages.

Cross-References

- [Altruism](#)
- [Attachment: Theory and Patterns](#)
- [Biology](#)
- [Biology, Theoretical](#)
- [Creationism](#)
- [Cultural Studies](#)
- [Eastern Orthodox Christianity and the Sciences](#)
- [Ecological Psychology](#)
- [Evolution, Convergent](#)
- [Free Will](#)
- [History of Ideas \(Intellectual History\)](#)

- [Metaphysics, Darwinian](#)
- [Natural Selection](#)
- [Philosophy of Science](#)
- [Worldview](#)

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Evolution, Convergent

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Related Terms

[Biological evolution](#); [Evolution](#); [Organic evolution](#)

Ever since Darwin, and implicitly even before his work, the pattern of biological evolution has been viewed as one of “descent with modification” (Darwin 1859). That is, since biological evolution is mediated by changes occurring during the development of individuals and the reproduction of populations, there could be many different changes made to the common phenotype in a population in different instances and at different times. This will sometimes give rise to descendent lineages deriving from the original population as a result of animals, seeds, spores, or other propagules spreading out into new locales. Since the same principle would apply to all the newly

formed populations as well, we would have a resulting pattern of increasing numbers of biological lineages descending from an original population. This pattern can be visualized as a tree evolving from a common ancestral population represented in the trunk and with an increasing diversity of living things represented in the branch tips. Comparative genomic studies have corroborated this model by showing that genetic difference increases along with phenotypic (anatomical and behavioral) difference. That is, if we arrange living things on a conceptual tree, with increasingly different forms spread out into the branch tips, we find that genetic difference generally follows the same pattern.

So, given the fact that the genetic information, which informs the construction of the phenotype, parallels the apparent pattern of increasing diversity of living things during evolution, the principle of “descent” appears to be a sound model for evolution. Given this picture, it is natural to expect that the disparity among living things would be continually increasing during evolution as well, resulting in such different beings as, for example, sponges, butterflies, and fishes. If we look over all living things, this expectation does seem to be corroborated in general. However, upon closer examination we find more than a few puzzling cases where, even though the genetic difference might be great, phenotypic similarity is much greater than would be expected given that fact (Willey 1911; Conway Morris 2003; McGhee 2011). In taxonomy these cases of similarities between evidently distantly related kinds is called “homoplasy.”

Now, in some cases homoplasy is easy to understand as a result of the requirements of adaptation to a given environment. For example, fishes, porpoises, sharks, and fossil ichthyosaur reptiles all have very similar streamlined bodies that allow them to swim rapidly in the dense medium of water. General shapes like these can be coded for by at least partly different genetic information, allowing for many ways to solve an adaptive problem, mediated by natural selection. As well, it is easy enough to understand how closely related species might give rise to descendants that take up the same way of living

separately. This, called “parallel evolution,” can be seen to result from similar genetic and organizational predispositions and body forms being subjected to similar environmental selection pressures. An example is found in the several frog families that have independently given rise to species that lay their eggs on land instead of in water, or which come to brood their eggs inside the body of a parent. Certain possibilities would naturally be inherent in a given phenotypic organization informed by similar genetic predispositions. So, some cases of homoplasy are easily explained within the general Darwinian viewpoint, especially if they are similar only in a general sort of way rather than in detail.

However, there are many cases of homoplasy that cannot be readily understood using the Darwinian “descent with modification” perspective. In these examples, kinship relations are quite to very distant, and the similarities are surprisingly alike. These cannot be understood using the “descent” principle alone. Here are some examples:

1. Jellyfish, squids, and vertebrates have focusing eyes on the same plan. It is known that the clear protein that makes up the lens is coded for by different genes in these cases. The genes are different, but the form and function are the same. Amazingly, the same form is found as well in the eyespot of single-cell dinoflagellates.
2. Both old man’s beard (a lichen) and Spanish moss (a flowering plant) live as finely dissected grayish masses draped over the branches of trees in misty coastal environments, the first in northeastern North America, the second in southern coastal regions. They are organized so as to capture water from mist, and minerals from dust.
3. Both the very primitive hagfish in the oceans and an Amazonian catfish live by burrowing into large rotting corpses that have drifted into deep waters. Their bodies have converged upon a muscular eel shape covered in slime, which can tie itself into knots.
4. The primitive freshwater fish *Polyodon* and the basking shark have evolved the same body form, mouth structure, and behavior

for feeding upon microscopic plankton. It should be noted in this case that there are other kinds of body designs for this same economic activity, notably in the whale shark and among whalebone whales. That is, we cannot explain these similarities by claiming that there is only one possible way to achieve this particular way of life, in which case natural selection would have been sufficient to explain the similarities.

5. The New World vultures have evolved from storks, while Old World vultures evolved from hawks.
6. Hummingbirds and hummingbird moths have evolved the same body form, general size, and hovering behavior that allows them to feed upon nectar in flowers. Other birds and butterflies have achieved this economic activity in quite different ways.
7. Large complicated underground nests with tall chimneys for air conditioning have evolved both in some tropical ants, related to wasps, and in some tropical termites, related to cockroaches.
8. A stunning larger scale example is found in comparing the many body shapes and lifeways of marsupial (pouched) mammals with those of eutherian mammals (like us). The faunas of each, which evolved independently on separate continents, duplicate the same major forms and lifeways, like those of wolves, mice, and badgers – even saber tooth tigers. We do find a few very specialized kinds in each group that were not duplicated in the other fauna, like the eutherian bats. Also, while the lifeways of kangaroos compare closely with those of antelopes and deer, their body forms and progression are different, and so not all the ecological duplicates in this general example are as closely similar as most of them are.
9. An even larger scale example is found in the fossil record, when early paleoniscoid fishes were replaced, after a mass extinction, by holostean fishes, and when these were replaced after another large-scale extinction by modern teleost fishes. All of these faunas evolved the same panoply of body

forms – minnows, pikes, eels, flatfish, panfish, and so on. This pattern of replacement has been called “iterative evolution.” Again, there are some unique forms, like teleostean seahorses, not found in the earlier faunas.

10. Agriculture was evolved separately by humans, ants, termites, and bark beetles.
11. Another large-scale example is the evolution of similar vegetations in different regions, while the species are all different. A well-known example is the Mediterranean vegetation profile found also in the Andes Mountains, South Africa, California, and in Australia. In this case, the similarity clearly involves factors larger in scale than organisms.

We find an interesting example in comparing seahorses with chameleons. Both of these are slow moving, camouflaged stealth hunters using a very rapid strike at their prey. They move about using prehensile tails to grasp the vegetation they climb about in. Both have independently moving eyes. Seahorses have live birth, as do some chameleons. The extreme difference in habitat in this example, as well as the significant distance in kinship, magnifies the importance of these similarities. Note that the actual mechanism of prey capture in each case is quite different, with seahorses using a sucking action and chameleons using a long sticky tongue. This shows that, whatever the forces eliciting convergent similarities here, they cannot transcend historical differences that have accrued in the two lineages separately. This should serve to remind us that in evolutionary convergence similar forms evolve from very different ancestors.

This brings us to the question of what might be causing this widespread limitation in evolutionary possibilities, which, on the Darwinian “descent” model should be unlimited and should produce similarities only very rarely, by chance. Darwinians invoke chance, conditioned by similar selection pressures. The only other conceptual possibility raised so far that might work is the structural attractor idea from the field of dynamical systems. Structuralism has been an approach used in linguistics and in cultural anthropology, where again interesting similarities and

limitations are found. The idea generally is that there are structural attractors, or “deep structures” in nature that exert a pull upon phenomena resulting in their being reflected in many similar “surface structures.” In the case of biological evolution, there are as yet no candidates for “deep structures.” A far-fetched non-structuralist possibility from genetics might be imagined by way of the lateral transfer of genes carried by viral infection. It is also known that many genes are conserved during evolutionary changes, and so the same genetic information might be lying dormant in many lineages. But this would not explain why these genes would be brought into play in cases like the seahorse and chameleon. Possibly more interesting, it is known that gene regulation can manipulate the same genetic information to get different results, so why not imagine the possibility that gene regulation could turn different information to producing the same results? But, again, given that adaptation by natural selection can produce a variety of adaptations, why should it produce duplications? Somehow, these genetic possibilities do not seem very convincing as an explanation of evolutionary convergence, especially considering that convergence is found even at the ecological level, as in the Mediterranean vegetation patterns. In this case, fire has been at work, but why is there only one kind of response to fire? We know there is not just one response because in Australia there are other, non-Mediterranean-type fire disclimax biomes.

It might be noted that our logics make it very easy for us to see how differences can accrue in changing systems, but very difficult to imagine how similarities between different systems might arise. Any unplanned change is more likely to create a difference from what was present before the change. But it requires elaborate technologies in order to generate similar forms, as in a factory, or during organism reproduction, which is guided by the genetic system. Evolutionary biologists have simply put this problem aside, sometimes by suggesting that on the genetic level there is only parallel evolution (Gould 2002), if indeed, they acknowledge it at all (Pigliucci and Kaplan 2006).

Description

Evolutionary biology is a subdiscipline of biology, and of historical geology and physical anthropology. Recent advances have been in using DNA comparisons to determine the degrees of relatedness of various lineages of living systems, and in bringing in ontogeny (development, in the subdiscipline Evo-Devo) in the role of describing how new forms are created.

Self-identification

Science

This is a science in the sense of making systematic observations in comparative studies, and in generating mathematical models in the population genetics subdiscipline.

Characteristics

Evolutionary biology is a distinctive scientific discipline in that it is concerned with historical subject matter.

Relevance to Science and Religion

Evolutionary biology is related to “Science and Religion” because it has implications for, and discusses, the origin and evolved nature of human beings. As well, it is a science that establishes beliefs about past events, and all beliefs have numinous functions.

Sources of Authority

The sources of authority in evolutionary biology, as in any science, are important published works and the authors who wrote them. These persons move to positions of power in regard to controlling publication and resource allocations. As well, they determine the direction that investigations will move in.

Ethical Principles

Ethical principles guiding this discipline, as in any science, have to do with abhorring plagiarism and in maintaining focus (excluding overly creative approaches and new departures). At the same time, competition is extolled.

Key Values

The overriding key value in this discipline is competition. This is central to the dominant (neo-Darwinian) theory of evolution, as competition between genotypes for representation in future populations.

Conceptualization

Nature/World

“Nature/world” does not function prominently in evolutionary biology inasmuch as it excludes the origin of life from its studies.

Human Being

“Human being” is important inasmuch as it studies the origin of humanity.

Life and Death

“Life (and origins of) death” are important in that the neo-Darwinian theory has a theory of why senescence occurs, and that leads to death.

Reality

“Reality” is not, as such, important in evolutionary biology.

Knowledge

“Knowledge” has some importance inasmuch as the “meme” analog of the gene is held to spread through populations by way of competition between ideas.

Truth

“Truth” has no role in this, or any, scientific discipline. All observations and theories are

implicitly held to be faulty in some way, and may be jettisoned or improved at any time.

Perception

“Perception” is the subject of some studies in the ethology subdiscipline of evolutionary biology. For example, while we have three color receptors in our eyes, birds have four.

Time

“Time” is important in evolutionary studies inasmuch as biological evolution has taken place over long periods of time, while studies that can be done covering many generations are restricted to microorganisms in experimental setups, or to computer simulations.

Consciousness

“Consciousness” has no presence in evolutionary biology.

Rationality/Reason

“Rationality or reason” is studied in regard to its functions in the “evolutionary psychology” subdiscipline of evolutionary biology.

Mystery

‘Mystery’ has no presence in evolutionary biology.

Relevant Themes

Additional themes, issues, and concepts in evolutionary biology of relevance to “Science and Religion” concern (a) mass extinctions that have periodically decimated life on Earth, and could happen again, (b) widespread extinctions currently being caused by human economic activities, and (c) human predispositions that appear under crowded conditions.

Cross-References

- [Bioinformatics, Computational](#)
- [Biology](#)
- [Evolution](#)

- [Natural Selection](#)
- [Philosophy of Science](#)

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Evolutionary History

- [Biology of Religion](#)

Evolutionary Prototyping

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Evolutionary prototyping is a software development method where the developer or development team first constructs a prototype. After receiving initial feedback from the customer, subsequent prototypes are produced, each with additional functionality or improvements, until the final product emerges.

This prototyping scheme differs from the rapid or throwaway prototyping, in that the developer begins with the best understood requirements; whereas in rapid prototyping, the developer implements the least understood requirements. Furthermore, the first prototype need not be built quickly.

Note that evolutionary prototyping is similar to incremental development in that parts of the system may be inspected or delivered to the customer throughout the software life cycle model.

Evolutionary Psychology

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Related Terms

[Adaptation, behavioral](#); [Adaptiveness](#); [Behavioral adaptiveness](#); [Behavioral selection](#); [Cultural adaptiveness/adaptation](#); [Cultural evolution](#); [Natural selection of behavior](#); [Social evolution](#)

Description

Evolutionary psychology (EP) is a general theoretical approach to psychology. It is the application of Darwinian principles to the understanding of human nature. Simply put, EP claims that we humans think and behave as we do because evolutionary pressures molded and adapted us to be that way. EP is an approach to psychology that seeks to provide a comprehensive, unifying framework for understanding human behavior and mental processes.

EP sees itself as grounded in the most successful unifying framework of the life sciences: neo-Darwinism. Neo-Darwinism has been used as the theoretical structure uniting all of biology, and its effects are being felt in areas as diverse as anthropology, economics, and even cosmology. As the organizing framework for biology, neo-Darwinism applies to all living organisms on Earth. The assumption that humans fall outside of this framework is, for EP and its adherents, special pleading in the extreme. To further bolster their position, evolutionary-minded psychologists (here on EPers) can point to an impressive body of

empirical support that has accrued over the past few decades. This empirical support has cut across all subdisciplines of psychology. From the earliest work in mate selection and attraction, the evolutionary approach has been successfully applied to questions in developmental psychology (e.g., why do girls mature more quickly than boys?), social psychology (e.g., why do we so easily form in-groups and out-groups?), cognitive psychology (e.g., why is calculus so much more difficult to learn than language?), biological psychology (e.g., why is the frontal lobe so much bigger than the occipital lobe?), and even abnormal psychology (e.g., why are we more likely to have phobias to snakes and spiders rather than cars and guns?).

Most recently, the evolutionary approach has been delving into our most human of characteristics: morality, religion, and consciousness. Though some have argued that these topics are “beyond” scientific explanation, recent work has given EP a solid foothold in each. For example, morality is a natural part of our social nature. Those of our ancestors who simply couldn’t figure out that repaying debts made others angry or being obviously selfish made one a poor mating prospect, suffered social isolation and reduced fitness. Similarly, religion may have been important for bolstering group-based moral standards making one group more cohesive and therefore more successful compared to another. How far EP can successfully be pushed is still an open question. No doubt it will eventually run into limitations of one sort or another. But as for now, EPers see their approach as the most exciting theoretical advancement yet in psychology.

Self-identification

Without question, EP sees itself as science. This is so because it generates hypotheses that can be empirically tested.

Characteristics

What makes EP distinctive is its promise. From the EP perspective, psychology has stumbled

around for decades as a loose collection of subdisciplines with only a minimal amount of constructive interaction among themselves. EP holds a promise of providing a common theoretical framework for uniting all of psychology. For the first time in history, psychologists might have a common language that they can use to relate to one another. Furthermore, EP strengthens the connections between psychology and other related disciplines such as biology, anthropology, primatology, and even archeology. A common theoretical framework and a common language can help specialists from different disciplines and subdisciplines work together rather than in suspicious isolation from each other, thus facilitating progress.

Relevance to Science and Religion

There are a number of reasons why the science/religion dialogue is of interest to evolutionary psychologists. First, religion is a nearly universal characteristic of human societies. As such, it affects the thinking and behaving of the vast majority of humanity. Ignoring religion leaves psychology as an incomplete science. Put another way, to fully understand humans, psychology must investigate religion. The fruits of this investigation will very likely play an important role in shaping the issues relevant to the science/religion dialogue. For example, the empirical studies showing positive physical and mental health benefits associated with religious practice can inform discussions of both the functional significance of religion in peoples’ lives and the potential evolutionary origins of religion.

Second, religion did not just appear fully formed – it evolved. The same is true for the mental faculties that allow humans to think religiously. The question of how humans became religious creatures is inherently a question of evolutionary psychology. Exploring the ► [selection pressures](#) that molded us into creatures capable of religious imagination informs us about our evolutionary past and helps us to better understand the role that religion plays in today’s world. Finally, exploring the evolution of religion can

provide a scaffold for constructive interaction among many different scholars both religious and nonreligious. For believers and theologians, it may provide an opportunity to better understand how religion (presumably guided by divine providence) emerged, or was revealed, among our ancestors. For scientific skeptics, it may offer an opportunity to better understand the natural basis of religion and the seemingly mysterious human need for it. Both groups, however, can be united in these efforts by using agreed upon scientific methods for addressing questions about why and how humans evolved as religious creatures.

Sources of Authority

Being grounded in neo-Darwinism, the writings of Darwin (*Origin of Species*, *Descent of Man*) provide the foundational texts. William James was one of the few early psychologists to take evolution seriously as an important mechanism molding human nature. His writings – *Principles of Psychology*, *Varieties of Religious Experience* – form another layer of the early important works. In more recent times, E. O. Wilson's *Sociobiology* and Richard Dawkins' *The Selfish Gene* lay-out some of the important principles of neo-Darwinism and its application to human behavior. William Hamilton's work on inclusive fitness and Robert Trivers' work on parental investment and reciprocal altruism have provided important contributions in understanding how a "selfish" evolutionary process can create "selfless" behavior. Barkow, Cosmides, and Tooby's edited volume *The Adapted Mind* provides a good overview of evolutionary psychology for the professional audience. While a very recent handbook (2005), edited by David Buss called *The Handbook of Evolutionary Psychology*, provides a state of the field report in just about every subdiscipline of psychology.

Ethical Principles

The ethical principles guiding EP are no different from those guiding any other scientific discipline.

Practitioners in EP are expected to conduct research with competency and integrity. Because EP deals directly with human nature, those involved in EP research bear an especially heavy burden in being honest, cautious, and thorough in their data collection and interpretation. It is not uncommon for EP research to have sensitive social and political implications. It is all too easy for the general public and/or the popular press to sensationalize, misunderstand, or exaggerate EP studies in an attempt to sell a product or push an agenda. For example, studies indicating that by virtue of our evolutionary design males are naturally aggressive or females are naturally deceptive are sometimes carelessly transformed from studies trying to explain why certain behavioral propensities exist into ones offering a justification for some of our less socially desirable tendencies. EP researchers must take great care in delimiting the scope of generalizability of their work, and they must be constantly sensitive to the wide individual differences typically present in humans. The need for replication of findings, restraint in interpretation, and strict discipline in distinguishing natural tendencies from moral prescriptions are essential in EP.

Key Values

The key values would be curiosity and honesty. Psychologists who adopt an evolutionary approach must be curious about human nature, and this curiosity must drive them to seek the best explanations possible for why humans are the way we are. Furthermore, EPers must be honest about human nature. Humans have a naturally evolved collection of both admirable and ignoble traits. This is reflective of the fact that evolution is an adaptive process, not a moral one. At the same time, EPers must be careful not to confuse "how we naturally are" with what we potentially can be. For example, though we have natural tendencies toward selfishness, vindictiveness, and prejudice, we also have natural tendencies toward compassion, forgiveness, and justice. By studying moral exemplars such as Gandhi, Mother Theresa, and Nelson Mandela, EP can

provide important data on how it is that humans can enlarge the more admirable of our qualities while restraining our more vile ones. What we are naturally neither determines the ultimate manner of our being nor justifies our more shameful tendencies.

Conceptualization

Nature/World

There are a number of ways in which the EP perspective on these terms is somewhat different from how they are commonly used. First, in one sense, nature and world are to EPers pretty much the same as they are to anyone else. Nature is the natural stuff out there: forests, streams, birds, and mountains – all the stuff you want to “get back to” when you go camping. World is often taken as being broader, encompassing both our human-made urban environments (“man’s world”) and the “natural” world. However, in another sense, EP offers a slightly different perspective on both these terms. Since from an EP standpoint, humans are not radically set apart from other species, our habitat is also not radically set apart from “nature.” In other words, all habitats are natural. The entire world from an 80-story office tower in Chicago to a tangled jungle canopy in the Congo is natural. Habitats may vary in terms of how much a species has manipulated the environment to suit its own needs (humans and beavers tend to manipulate their environments more than dragonflies and coyotes). Manipulation, however, is not the same as making something unnatural. As an environment is manipulated, the kind of selection pressures it brings to bear on various species changes. Generally speaking, the species doing the manipulating does so to make the environment more suitable for itself, and often this will make the environment less suitable for other species. So as beavers reduce river flow, species that depend on the river flow may suffer. As humans build 80-story office towers, species that formerly used the trees or open space on which the building now sits suffer.

Furthermore, EP often makes a distinction between the world humans now inhabit and the

world to which we were originally adapted. *Homo sapiens* emerged some 200,000–150,000 years ago. It has only been in about the last 8,000 years or so that settled agriculture emerged. Thus, for over 99 % of our evolutionary history, humans lived in hunter-gatherer bands – and it was this world, called the ► [environment of evolutionary adaptedness](#) or the EEA, to which we were adapted. This ancestral environment is the one which is “natural” to us in the sense that our mental and behavioral tendencies are designed to fit with it and not necessarily with the modern urban world.

Human Being

As with nature/world, there is a sense in which the term human being is the same for EPers as it is for anyone else. Human being refers to us, members of our species. However, there is another sense in which human being is a much more technical and nuanced term for EPers than for most others. Human beings are members of the species *Homo sapiens sapiens*. This species arose about 200,000–150,000 years ago and differed only very modestly in morphology (body form) from other ► [hominin](#) species also present at that time (e.g., *Homo erectus*, *Homo helmei*, and *Homo neanderthalensis*; collectively these species are often referred to as the archaic *Homo sapiens*). The diverse array of hominin species present both prior to and concomitant with the emergence of *Homo sapiens sapiens* debunks any notion of human evolution as a progressive march from less intelligent and sophisticated species to increasingly more intelligence and sophisticated ones. Indeed, upon their initial emergence, *Homo sapiens sapiens* did not differ at all in terms of stone tools, artifacts, hunting strategies, or other archeological indices of cognitive capacity relative to other contemporaneous hominins.

Thus, a major question in EP, and human evolution in general, is what variable(s) account(s) for our unique human intellectual capabilities. When and why did we become human, and what exactly does that mean? By the time of the ► [Upper Paleolithic](#) (about 35,000 years ago), symbolic artifacts and stunning cave art reveal a mind that is undeniably human – the same as ours now.

But why did it take so long and what prompted its emergence then and not sooner or later?

Life and Death

While the origin of life is a fascinating and important topic, it is not directly relevant to EP. All evolutionary processes pertain to the diversification of life forms; thus, life – understood as a self-sustaining system capable of reproduction or replication – is a necessary prerequisite for evolution. Death or the loss of a system's self-sustaining and reproductive ability is also an essential aspect of evolution. Less adapted creatures tend to die out with relatively less reproductive success compared to more adapted creatures. Thus, the traits associated with the less adapted creatures are less likely to be passed on to future generations.

Reality, Knowledge, Truth, and Perception

These four terms are interrelated in EP. Evolution designs creatures to be adapted to their environments. This typically means that to one degree or another, creatures have to take in information from the environment and respond to that information in ways that enhance their fitness or reproductive success. Perception refers to all the processes that go on in an organism directed to the purpose of taking in and making sense out of external stimulation. Knowledge refers to the interpretation that organisms give to that external stimulation based both on the sensory inputs and the stored results of past interactions with the environment. This knowledge frames the reality within which the organism functions. For example, a rabbit may perceive through both visual and auditory signals the presence of a large four-legged furry creature in its immediate vicinity. Based on this input coupled with information retrieved from memory about past encounters of a similar nature, it may construct knowledge about the presence of a predator (it knows a fox is about). This knowledge provides the basis for its current reality – it is in trouble and needs to react quickly. For the rabbit, the danger is real and so it runs away. It is at this point that evolution, in a sense, stops.

The question of “was the danger really real?” or, put another way, was the rabbit's reality true is

not terribly relevant for evolutionary purposes. The only thing that is relevant, from an evolutionary standpoint, is whether the reaction (running away) based on the assumed reality (danger present) is more adaptive than a different reaction based on different assumed reality. In this sense, it can be said that evolution is more “concerned” with pragmatic truth (what works in terms of promoting fitness) rather than metaphysical truth (what is absolutely true).

As an example, suppose another rabbit was a “tough guy” rabbit who would only run away if there was thoroughly convincing evidence of a fox (as opposed to an opossum or raccoon) about. This might have the advantage of conserving energy for only those times when one is really in danger. However, since the margin of error on this strategy is far thinner (a single mistake could be fatal), the chances of this rabbit's alternative strategy for interpreting reality getting passed along to future generations are less than its more paranoid comrade.

Thus, we are led to a conclusion about evolutionary processes: they hone an organism's mental/perceptual processes such that they are adaptive, not necessarily so they discern the “truth.” Often a fairly accurate (or truthful) assessment of the environment is more adaptive than an inaccurate (or nontruthful) one (avoiding falling off a cliff that is really there is quite adaptive). However, this need not always be true. Most EPers see very little convincing evidence that any creatures, other than humans (and maybe elephants), know they are going to die, even though this is undeniably true. Knowing that truth would probably not be adaptive – the worry would sap energy needed for more immediate tasks. Thus, truth and adaptiveness are not the same, and so just because a certain interpretation of reality is adaptive, there is no guarantee that it is the truth. This discussion becomes very relevant when we consider issues of God, religion, the soul, etc. Believing that these concepts are true might be adaptive, but that doesn't necessarily mean that they are really true. It doesn't necessarily mean that they are false either; it just means that we can't use adaptive as convincing evidence for truth.

Time

For EP, time is often considered on a much deeper scale than is commonly done. Humans as a species have been around for about 200,000 years. However, placed against the time scale of life on Earth (about 3.5 billion years), it is a miniscule proportion. Furthermore, since settled agriculture only emerged about 8,000 years ago, then the kind of lifestyle that we are currently engaged in makes up only a tiny portion of the total time that humans have been around. Thus, human civilization, which we typically think of as being very old, is, in fact, only a tiny blip in relation to the deep time of Earth's total history.

Consciousness

From the perspective of EP, consciousness is something of a mystery. Psychological studies show that many processes can be carried out quite effectively unconsciously. Furthermore, some of the most abundant and well-adapted creatures (bacteria, beetles, and cockroaches) have little, if any, consciousness. So why be conscious? The importance that consciousness has for humans (one might easily argue that it is the central human trait) suggests that it must serve some adaptive function. But isolating exactly what that function is has not been easy. Some studies suggest that consciousness is necessary when acquiring new, complex skills. This, however, is not a guarantee that consciousness arose for that purpose or that it arose for any purpose at all.

Rationality/Reason

EP considers reason to be an adaptive trait that allowed humans to better interact with their environments. Furthermore, studies suggest that it was the social environment that was key in selecting for human rational functioning. Reasoning problems that are framed in terms of social obligations (if he or she is a teenager, then he or she must not be drinking beer) are usually more easily solved than the ones framed more abstractly (if the card has a vowel on one side, then it must have an even number on the other). This suggests that our reasoning ability

evolved to help us solve social problems and to ensure that we were not getting cheated by others. This may help to explain why it seems so effortless (and even fun) to gossip and speculate (reason) about why others did what they did (Fred must have thought that Jenny cheated on him when he saw her at the party with Ted). Yet at the same time, reasoning about why the sum of x must equal the square root of y on the other side of the equation is often arduous.

Mystery

In EP, mysteries usually surround particular human traits such as consciousness, language, morality, religious tendencies, etc. Why and how did these particularly human characteristics arise? Complete explanations may never be found. Yet it is precisely the mystery surrounding these issues that makes them especially interesting for EPers to pursue. Mystery in the largest sense involves the very origin of the evolutionary process itself. Why have such a process and from where did it originate? Is there any purpose to evolution or is it just an aimless, futile march of adaptation, diversification, and extinction? These are the deepest mysteries and ones where science (and certainly EP) is hard pressed to provide any answers.

Relevant Themes

There is considerable discussion concerning the evolutionary origin of religion. Some have argued that religion may have provided an adaptive advantage in terms of group cohesion and solidarity. If so, then this suggests that religion was itself an adaptation. Furthermore, it suggests that some form of group level selection may have been operating in our ancestral past. This would cut against the dominant orthodoxy of individual selection being the proper level of analysis for understanding evolutionary processes.

Others have contended that religion represents not an adaptation but an exaptation or spandrel. ► **Exaptation** refers to a trait that emerged for one adaptive purpose being co-opted later for

a different purpose. So, for example, the bones of our middle ear originally emerged as part of the hinge system for reptilian jaws. Later, this set of bones served nicely as a mechanism for conducting sound vibrations (although that is not what it was originally designed to do). A ► [spandrel](#) is similar except that its origin need not have involved any adaptive purpose. Today, we can find all kinds of uses for our belly buttons (paint them, put rings and diamonds in them, etc.), and social trends being what they are, belly buttons might become identified with sexual appeal such that those with better buttons might even have higher rates of ► [reproductive success](#). None of these functions, however, explain why belly buttons originally arose. As best as we can tell, they are just accidental by-products of our anatomy without any direct adaptive purpose.

From EP's perspective, religion may be something like this. Humans may first have evolved the mental capacity for ► [agency detection](#) (ascribing behavior to an internal mental state such as a desire or belief) for the purpose of understanding and predicting the behavior of other animals (including fellow humans). Later, this capacity may have been extended to include environmental events such as the wind, rain, or ocean currents. Thus, the wind was assumed to have a desire to punish humans for sin or reward them for virtue. From this beginning, more complex ideas about spiritual forces and deities could emerge. Debates over the origin of religion reflect its complexity as well as the complexities of the evolutionary process itself.

Cross-References

- [Biological Psychology](#)
- [Biology of Religion](#)
- [Cognitive Science of Religion](#)
- [Cognitive Science Psychology](#)
- [Evolution](#)
- [Evolutionary Theology](#)
- [Philosophy of Mind](#)
- [Psychology of Religion](#)
- [Theory of Mind](#)

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Evolutionary Theism

- [Evolutionary Theology](#)

Evolutionary Theology

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Related Terms

[Darwinian theology](#); [Evolutionary theism](#)

Introduction

Evolutionary Theology (ET) refers to forms of religious self-reflection that are significantly shaped by the resources of evolutionary biology. While some evolutionary theologies build on assumptions of non-Darwinian forms of evolution such as orthogenesis and spiritual

goal-directedness, most contemporary proponents of ET give preference to standard neo-Darwinian models of evolution with its focus on natural selection, the statistics of variations of environments and genomes, and the malleability of species over time. However, since evolutionary theory itself is under constant development, and also find various interpretations within contemporary philosophy of biology, proponents of ET also refer to aspects of biological evolution that go beyond neo-Darwinism, such as the importance of biochemical constraints, self-organization, and the much debated question of trends toward complexity in evolution. Also, more often than not, theological proposals refer to central aspects of cultural evolution, such as the emergence of symbolic language, morality, aesthetics, and religion.

In order to constitute a theology in the proper sense of the word (involving concepts of the God or the divine) ET inevitably draws on other sources than evolutionary theory, such as religious experiences, scriptures, and traditions. ET is nevertheless distinct from forms of theology that are either indifferent to the findings of evolutionary biology (such as existentialist theology), or anti-Darwinian in nature (such as Intelligent Design theory). Even though the latter may be said to be shaped by Darwinism, evolutionary biology is here not used as a positive resource for theology.

Early Evolutionary Theology

The first examples of ET can be found in the earliest responses to Darwin's theory of evolution. Darwin sent a draft of the *Origin of Species* (published November 24, 1859) to Charles Kingsley, a close friend from Darwin's days as student of theology. From his parsonage, Kingsley wrote a congratulating letter to Darwin: "I have gradually learnt to see that it is just as noble a conception of Deity, to believe that he created primal forms capable of self-development into all forms needful *pro tempore* and *pro loco*, as to believe he required a fresh act of intervention to supply the *lacunas* which he

himself had made. I question whether the former be not the loftier thought" (November 18, 1859). God the creator "makes things make themselves," as Kingsley later argued. Already in the second edition of the *Origin of Species* (January 7, 1860), Darwin appropriated Kingsley's words when referring to "a celebrated author and divine" who had written that "it is just as noble a conception of the Deity to believe that He created a few original forms capable of self-development, as to believe that He required a fresh act of creation to supply the voids caused by the actions of his laws" (Darwin 1860: 481). In the concluding paragraph, Darwin also inserted a new reference to God: "There is grandeur in this view of life, with its several powers, having been originally breathed *by the Creator* into a few forms or into one and that, whilst this planet has gone circling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved" (Darwin's insertion italicized). It has been discussed whether these theological reflections are to be seen merely as strategic compromises. But in his posthumous *Autobiography* Darwin stated that at the time he was writing the *Origin*, "I deserve to be called a Theist," while adding that his religious conviction later "has very gradually with many fluctuations become weaker" (Darwin 1958: 93). He ended up in agnosticism: "The mystery of the beginning of all things is insoluble by us and I for one must be content to remain an agnostic" (1958: 94).

Darwin's impetus for religious reflections mostly came up in relation to the laws of physics, and to the beauties of nature such as the Brazilian rain forest. He thus shared the expectation of a harmonious world order with contemporary Victorianism. On this background, the miseries of pain, and their inevitability given natural selection, were to be seen as counter-indications of a moral divine design. Whereas Darwin's strongest proponent in America, the Harvard Professor Asa Gray, argued for a divine direction of evolution, Darwin himself eschewed the idea of a divine twinkling of the processes of natural selection. His correspondence with Gray gives

ample evidence of Darwin's concession that his own theology was "in an utterly hopeless muddle. I cannot think that the world, as we see it, is the result of chance and yet I cannot look at each separate thing as the result of Design" (Letter to Asa Gray November 26, 1860). Simultaneously, Darwin gave up the idea of a divine revelation in Christianity. His distaste for revivalism was outspoken and uncompromising, in particular the "damnable doctrine" of damnation (1958: 87).

Ever since Darwin pointed to natural selection and variation as the prime engines of biological evolution, a variety of themes came up as potential falsifiers or validations of religion in general, and of Christianity in particular. In what follows, the different challenges and responses are discussed one by one.

The Interpretation of Scripture

Darwin and his followers were by no means the first to question a literal reading of the creation story in Genesis 1–3. The so-called higher criticism in Germany had done so since the end of the eighteenth century, and in England Robert Chambers' *Vestiges of the Natural History of Creation* (1844) had argued that since God works through laws of nature no one should understand the 6-days account of Genesis literally. Darwin's revolutionary theory of evolution was launched in the midst of an age of evangelical revivalism, however, and the interpretation of scripture was heavily debated in the early decades of ET. Even though Darwin did not pretend to solve the riddle of the emergence of life, his mechanisms of evolution required a long history of species formation, including a geological period of minimally 200 million years. Initially, the Darwinians had a time problem that was only solved conclusively much later with the Big Bang theory. But the defenders of a literal reading of Genesis (an individual creation of each species during 6 days, and a time horizon of maximally 10,000 years) soon had to fight against the common views of physicists, geologists, and evolutionary biologists. Catastrophists argued that the laws of nature had been different before and

after the deluge; some argued more defensively that the 6 days might refer to long ages before the creation of humankind (the Hebrew *yom* could mean both days or ages); others straightforwardly believed that God made the world look older in order to test his believers.

It goes without saying that evolutionary theologians found these maneuvers utterly futile. They interpreted the Bible as a foundational myth about the perennial conditions of humanity in relation to God rather than as a textbook of epochs in early natural history. Proponents of ET here usually followed a combination of historical criticism and liberal Protestant theology (Barton and Wilkinson 2009). Today, ET follows a standard distinction between the "common creation story" provided by the sciences, and the "metanarratives" of religion, the latter focusing on the meaning of the cosmos, life, and human existence. Ancient precursors exist for such distinction. The Jewish-Platonic philosopher Philo of Alexandria (c. 20 B.C.E. to 50 C.E.) read Genesis as a description of God's instantaneous creation of a spiritual world that was only later to be manifested in time and space. Church Fathers such as Gregory of Nyssa (c. 331–395) and Augustine (354–430) followed this method of interpretation, assuming that God created an intelligible world (Genesis 1) prior to the creation of the material world (Genesis 2 onward). Symbolic and literal readings were thus often intertwined in Patristic and Medieval exegesis. Against this background, Eastern-Orthodox and Roman-Catholic theology have come to accept the gradual evolution of species, even though the human soul is claimed to be uniquely created simultaneously with each fertilized egg. A literalist reading of Genesis is only widespread among Protestant fundamentalists. Conservative Jewish communities usually accept long-term gradual evolution, while Muslim communities are divided on the issue. Since the Quran only offers vague descriptions of cosmological beginnings, the age of the Earth does not feature centrally in Muslim circles. Islam does host varieties of ET, but according to polls, the majority of Muslim communities are still against evolutionary theory, particularly concerning human descent.

The Common Descent of Humanity

While Darwin left the origins of humanity out of account in *On the Origin of Species*, he addressed the issue at great length in *The Descent of Man* (1871) as well as in the *Expression of the Emotions in Men and Animals* (1872). Darwin here analyzed many structural homologies between humans and other species, while also pointing to behavioral similarities regarding sexual selection, emotions, and instinctive reactions. Darwin found that even religious sentiments are similar to the reactions of dogs coping with sudden changes in their environments. To many of his contemporaries, Darwinism was simply identical with the “ape-theory.”

Proponents of ET have developed several arguments against the view that Darwinism implies a humiliation of the human race. The most principled argument (developed already by nineteenth century Kantians) has been to apply the *fact/value distinction*: The dignity of humanity does not depend on its historical origins but stands and falls with the intrinsic value (or disvalue) of humanity as it is today; just as a daughter of Stalin should not be valued or disvalued by the undertakings of her father, so the value of humanity does not depend on its origins. Even though this argument is valid, the repetitive use of it tends to bolster the dualistic view that what is valuable about humanity is simply that which dissociates us from other animals.

Others have followed an even more straightforward *argument from progress*: Rather than being a story of the descent of man, evolution is a story of the “Ascent of Man” (so the title of Henry Drummond’s Lowell Lectures 1904, also used for a famous BBC series by Jacob Bronowski 1973). Yet also this argument backfires. It could well be, as already assumed by Darwin himself (1958: 92), that the human race is only one station in an evolutionary trajectory that inevitably leads beyond the human race. A similar argument is made today by the transhumanist movement.

The most widespread strategy among evolutionary theists has been to develop a comparative

perspective that is able to value the *continuity* between humans and other higher animals, and to point to marks of *human distinctiveness*. Central aspects of human cognition find precursors and analogies in other species, such as locomotion (including bipedal walk) and the development of sentience (from light-sensitive cells to compound eyes and lens-based eyes). Likewise, in social insects, we find clear systems of division of work with procedures for “punishment” of free-riders among higher apes, and we find forms of behavior that may be termed moral or proto-moral. The comparative perspective even involves cases in which animal development far exceeds that of humanity, for example, in terms of physical strength, the olfactory senses of dogs, and the evolution of forms of awareness unknown to humans (such as echolocation in bats and dolphins). Without humiliating the human species, such evolutionary features may elicit a sense of humility on the part of humanity. Many proponents of ET thus see humanity as being a peer with its co-creatures, and influential theologians such as Jürgen Moltmann have argued that both evolutionary and biblical perspectives require us to understand humanity as carved out of the web of nature (*imago mundi*) before it makes sense to speak of humanity as created in the image of God (*imago Dei*).

What then about human distinctiveness, if not uniqueness? Evolutionary theory does not support an essentialist concept of species. Yet most evolutionary biologists are prepared to admit that *Homo sapiens*, due to historical happenstance, has developed quite unique characteristics that we do not find in other species. “We are built as gene machines and cultured as meme machines,” as Richard Dawkins argued in *The Selfish Gene* (1976), and similar views are held by George C. Simpson, E.O Wilson, and other strict evolutionists. Theologians often argue on similar tracks. Wolfhart Pannenberg points to the human openness to new and fresh experiences within a horizon of possibilities which liberates humans from a bondage to the concrete environments and the instinctual reactions typical for other species. This sense of infinite horizons may also explain the emergence of religion, including ideas about

God. Likewise, Karl Rahner points to the peculiar capacity of human beings to transcend themselves through their latent or “unthematic” awareness of God. This “supernatural existential” serves as a precondition for the specific human capacity for freedom, self-reflection, and universal concepts of truth and morality.

Within current science-religion discussions, the search for human distinctiveness has been elaborated partly in discussion with paleoanthropology, and partly in the context of research programs such as evolutionary psychology and cognitive theories of religion (van Huyssteen 2006). Paleoanthropological records suggest that *Homo sapiens* emerged from a common evolutionary lineage with the *homo habilis* and *homo erectus* (c. 2–1.8 myr) around 400 kyr ago, and was, according to known records, not developed into anatomically modern *homo sapiens sapiens* until around 100 kyr ago. Our species has thus lived together with the *homo neandertalis* (c. 170–30 kyr), who had slightly bigger brains than we. Yet, apparently, a cultural explosion took place only within our species between 60 and 30 kyr ago. Paleoanthropologists argue that cultures constitute systems of nongenetic information transfer, manifested in discrete forms of tool making and art, and in systems of morality and belief that differ from population to population (van Huyssteen 2006: 222). Moreover, cultural information is not only dependent on the brains of individuals, but is stockpiled into forms of cultural memory, supported by social media such as art and architecture, symbolic language, rituals, and signs with socially shared meanings.

While evolutionary psychologists agree that there is a naturalness for developing religious imagination within the human species, they find the explanation for this fact in the “Hyperactive Agency Detection Device” (HADD): Particular brain modules work spontaneously leading to an over-ascription of agency and mind to, for example, stones, trees, clouds, or dreams as revealing “supernatural agents.” Some evolutionary theologians find this explanation plausible and argue for its in-principle compatibility with a notion of a God, who wants to be known to human beings.

Others (probably the majority) find the psychological explanation of the emergence of religion both speculative and wanting in detail, and argue that religion more probably came up in the creative gene-culture interaction, where the immediate pressures of natural selection are relaxed (Rolston 1999: 141). With its laryngeal tract *Homo sapiens* affords a particular capacity for nuanced speech, and the acquisition of a symbolic language during cultural evolution facilitated an awareness of open-ended meanings, including references to principles and universals such as the divine, mathematics, ideas of the common good, and the search for truths that transcend the perspective of the individual persons and particular groups. The emergence of religion (as evidenced in burial practices) and moral sociality (as evidenced in rituals and community building) feeds into this picture. As in natural selection, not everything goes in cultural evolution. Religion and morality have thus been pruned and universalized in the course of cultural evolution, so that only relatively few ideas of the divine have been able to survive the test of time and experience. Also, religious wisdom traditions provide large-scale orientational schemes which enable humans to cope with everlasting dilemmas of the human condition, and to pick out information about what is of enduring value in contrast to what is only of ephemeral importance.

Design, Chance and Natural Selection

The issue of design versus natural selection plus variation has remained a contested area in ET. Both believers and nonbelievers have thus argued that if Darwinism is correct, divine purpose and care are removed from the world of living organisms to be replaced by purposeless chance and pitiless selection. The picture is oversimplified, however. For even though Darwin’s mechanism of natural selection superseded divine design as the basic framework for explaining the fertility, growth, and order in the world of biology, Darwin himself spoke of a design in the general setup of the universe. Since the late 1950s, physicists have

unexpectedly reinvigorated discussions of design by pointing to the so-called *cosmic fine-tuning* of laws and physical constants, which provide the proper physical and chemical conditions for the emergence of life and consciousness. Moreover, mathematical models have been developed in order to explain recurrent features of self-organization and *trends toward increased complexity* during evolution (Gregersen 2003). The so-called anthropic principle points to the concerted fitfulness of the basic laws of nature (gravity and nuclear forces) and of the constants of nature (mass-energy) for the biological habitability of the universe. Whereas the biological community earlier tended to think that life and human existence emerged as an unlikely result of chance, the majority of scientists today believe that we live in a biofriendly universe, so that life emerges inevitably given the physicochemical conditions. Rather than seeing humanity as a tragic gypsy fighting against all odds with the conditions of the universe (so Jacques Monod), it is nowadays more often assumed that we are at home in the universe (Stuart Kauffman), and that the emergence of life is almost inevitable (Christian de Duve). Obviously, this view is open to naturalist as well as to theistic interpretations.

The anthropic principle can be reformulated as a research program asking, How much could the constants and laws of nature be changed, and we would still have life and consciousness? The answer of physics is: very little indeed. Based on the fact of the concerted laws, a new argument for design has been developed: (1) The more improbable the specific laws of nature are (in relation to other mathematically possible laws), and (2) the more these very particular laws are actually fine-tuned for life (toward the inevitability of life and consciousness), the stronger is the argument for an inference to design. No inference, however, offers a proof. Thus, it could be that the laws of nature are as they are by sheer chance (the Lady Luck Hypothesis) or it could be that our universe is only the lucky winner among endless other universes that we do not, and probably never will, know about (the multiverse theory). Anthropic design is thus only one of several explanatory hypotheses, and

considerations of plausibility and economy will depend on worldview assumptions that exceed the scope of empirical science.

The idea of *self-organization* is often presented as the antidote to the idea of design. This is correct as long as one by design understands a controlling preordering of things. Yet, any self-organizational processes takes off from conditions that are difficult to understand to be results of preceding self-organizations, conditions such as the mathematical envelope of possibilities, the physical constants and the laws of nature as we know them. Even if physicists should find a grand unified theory for gravity and quantum laws, which could also explain the amount of matter in the universe, such imaginable “law of everything” would be as it is, and has always been. Yet, even if self-organization can hardly explain all of physics, computer models of self-organization have succeeded to explain quite a few robust features of biological evolution. Evolutionary novelty thus tends to come up in semi-stable and codependent systems poised between evolutionary stable strategies (ESS) and purely chaotic systems.

The new sciences of computational complexity have thus given hope to explain the fact that evolution eventually evidences an overall *complexification* over time, measured by parameters such as size of organisms, morphological complexity, kinetic complexity, complexity of nervous systems and sensitivity, social complexity, and the intensity of interconnectedness between different biological organisms. On the whole, the history of evolution offers both cases of resilience and self-repetition and of novelty and exploration of new adaptive spaces. As evidenced in cases of *convergent evolution*, not everything is up for grabs in evolution. Natural selection is always constrained by what is physically and chemically possible. Some biochemical structures thus show a remarkable self-identity across phyla (such as the *hox*-gene responsible for the building of body structures), while other biological functions have developed independently in different genetic lineages (such as the construction of lens-based eyes in octopus and mammals). Even if the ecological niches

differ markedly, similar adaptive spaces are explored by genetically distant biological classes.

ET stands and falls with its assumption that the interplay between *natural selection and chance* plays a central role in God's manner of letting the world of biology flourish. This core assumption can take several forms. In its strongest form, it is argued that natural selection plus chance by themselves provide the divine ruling of the biological world by *guaranteeing a progress* and proliferation of the biological potencies of the material world. Around the turn of the nineteenth century, this combination of natural selection and a progressivist teleology (often based on Herbert Spencer's interpretation of Darwin) was widespread among liberal theologians (e.g., the aforementioned Henry Drummond).

The medium-strong version is that natural selection plus chance involve a *statistical tendency* to provide some sort of overall *directionality* during evolution, even though one should expect many cases of downfalls, as it is evidenced in the big periods of extinction during evolution (99% of known species are extinct). Observe that directionality is more than equiprobability but less than progress. Many contemporary proponents of ET follow this line. Arthur Peacocke, for example, has persistently argued that the biological notion of chance refers to genetic mutations as well as to the variations facilitated by circumstances and ecological niches. Chance, in this sense, has nothing to do with existential feelings of estrangement and purposelessness, as presupposed by atheists such as Bertrand Russell or Jacques Monod (Peacocke 2004: 50–65). On the contrary, only the principle of chance and variation can open up the full gamut of evolutionary possibilities by generating new organismic constellations which then are subsequently tested in the competitive game of natural selection.

The weak or minimalist version of the core ET assumption is that natural selection and chance are *compatible* with theism. Natural selection and chance are here seen as the *de facto* methods that God has chosen in evolution, this method being coherent with the religious affirmation of divine purpose concerning the outcomes of evolution.

The “how” of the evolutionary mechanisms and principles as described by the sciences are thus complemented with a theological interpretation of the “why” of evolution. The religious question of purpose thus depends on the qualitative or “poetic” outcomes of the evolutionary processes rather than on its quantitative or “prosaic” methods. This path is taken by those who follow Stephen J. Gould and others who argue that the Modern Synthesis of Darwinian macroevolution and genetic micro-evolution is not complete, though not incorrect. The history of evolution is a “drama” (Celia Deane-Drummond) with endless many mutations (at micro-level) and historical “saltations” (at macro-level). On this view, the religious interpretation should acknowledge the tensions, paradoxes, and back-falls of evolution rather than construct a smooth and optimistic trajectory of evolution.

The way ET copes with natural selection and chance can be seen as a theological redescription of an evolutionary process already described and (partially) explained by the sciences. So far, theological hermeneutics stands in the foreground. Yet this hermeneutical approach can be complemented by theories of divine agency during evolution. Robert John Russell et al. (2008) argue that since many mutations occur due to quantum mechanical processes, mutations and variations should be explained at deeper explanatory levels than those offered by the biological sciences. Moreover, since quantum events are the basic constituents of nature, there is at quantum level eventually no difference between the primary and secondary causality (i.e., between the divine creativity, and the actual quantum events). Finally, since quantum events are statistical in nature (even if they all fall within the spectrum of the Schrödinger equation), one cannot ever, according to the Copenhagen interpretation, gain a complete deterministic theory of quantum events. By implication, one can never have full biological explanation of mutations. According to Russell and colleagues, quantum mechanics thus makes a substantive divine agency conceivable also in the biological realms of chance and mutations, a possibility opened up by the Copenhagen interpretation. It is

noteworthy that also some Islamic scholars put emphasis on mutations rather than on natural selection (Guessoum 2011: 290). Although the Quran gives preference to ideas of cosmic balances, mutations are seen as indicators of a sovereign divine agency, which works, as a hidden variable, alongside the standard operations of the laws of nature.

Natural Selection and Natural Evil

Any theory of particular divine agency in evolution inevitably raises the stakes for an evolutionary theodicy. For how can a benevolent creator promote a biological world, in which pain and suffering is part of its working method? Since Darwin himself shared the harmonious expectations of a Victorian natural theology, he was lifelong affected by this theodicy problem. Also today evolutionary biologists argue that the existence of widespread and systematic pain in the universe is what one should expect, if there is *no God* of the universe (Richard Dawkins).

Several evolutionary theodicies have been proposed. One way is to give up the moral expectation to God shared by morally concerned atheists and believers when posing the theodicy question. If God is being-itself, God is both the ground and the abyss of any particular being. This *ground of being-theology* either argues that talk of divine love is symbolic (Paul Tillich), or that moral characteristics of God are altogether misplaced. God is amoral rather than unmoral. This theological position finds some support in the Bible (Isa 45:8: “I make weal and create woe”) and thus also Martin Luther and John Calvin referred to the “hidden God.” These Reformation theologians, however, made a distinction between the hidden and the revealed God, and the task of faith was to believe in God’s revealed love while accepting the tension between experience and faith.

Another path consists of distinguishing between *evil* and *hardship*. On this view, the fact of natural suffering does not suggest that God has evil intentions, or even finds pleasure in designing miseries. Rather, natural evils are

unavoidable by-products of evolution. Just as one cannot create morally free creatures without also risking their immoral deeds, so God cannot create a world endowed with freedom and autonomy without facing natural evils. This *free process defense* involves that pain and pleasure come and go together, part of the package deal of creation. God is neither immoral nor amoral, but values the world as a whole as “very good” (Gen 1:31). This position then finds two different interpretations. One is to endorse the cruciform character of creation, and argue that the pain of the prey is redeemed by the pleasure of the predator within the evolutionary process; a world of sweat and blood is better than a bloodless world (Holmes Rolston). Another option is to see God’s compassion and co-suffering as the divine response to natural evils. A Christian ET may thus say that in Jesus, the Son of God, God is co-carrying the costs of evolution while taking side with the losers of the game of biological and social completion. Similarly, non-Christian philosophers of biology have observed the common emphasis on the centrality of suffering in Darwinism and in Christianity (Ruse 2001: 134).

On Christian premises, it is even possible to elaborate a Trinitarian theodicy in three steps. In the beginning God said, “Let it Be”: Let the world develop and flourish (the free process view of creation). For the benefit of the evolving creation, however, God goes into the depths of evolutionary existence through his own Son, thus sharing the “groanings” and birthing woes of creation (Rom 8:22–23) while also absorbing and transcending the pains in God’s internal experience (cross and resurrection of Christ). Finally, God will send his life-giving Spirit to create a new world under new cosmological conditions while retaining the experiences of lived life, with both scars and joys (the new creation) (Southgate 2008).

Unsolved Metaphysical Questions

As we have seen, proponents of ET follow a variety of strategies by which they appropriate central tenets of evolutionary theory within

distinctive theologies. Accordingly, the term “evolutionary theism” is only to be used as a shorthand for quite different ways of using evolutionary biology as a resource for religious self-reflection. In fact, none of the described positions use evolutionary biology as their only source for theological reflection a commitment to Darwinian evolution as the best available scientific theory does not imply the view that evolutionary theory is the solution to all sorts of questions. Not only does physics and chemistry precede and undergird all forms of life through cultural formations but human beings have developed forms of life and experience that cannot be sufficiently tackled by evolutionary biology. If there is a common core to ET, it is the assumption that evolutionary theory needs to be seen in a wider metaphysical perspective, involving other natural sciences, the manifold perspectives of the human sciences, and the religious experiences of humanity. Here one needs to dig “deeper than Darwin” (John Haught).

ET also shares an ontological commitment with nontheistic spiritual traditions such as Buddhism. For biology consciousness is a secondary issue that only develops as a sub-form of life in specific lineages, humans in particular. Yet, both the idea of God in the theistic traditions and the idea of the primordial mind in Buddhism presupposes aspects of ultimate reality which are prior to what emerges and come to flourish in very late stages of cosmic evolution. There must be something significantly prior in order for something significant to evolve.

Cross-References

- [Biology of Religion](#)
- [Divine action](#)
- [Evolution](#)
- [Evolution, Convergent](#)
- [Evolutionary Psychology](#)
- [Hermeneutics, Theological](#)
- [Imago Dei](#)
- [Metaphysics, Darwinian](#)
- [Systematic Theology](#)
- [Theistic Naturalism](#)

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Exaptation

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Refers to a trait that emerged for one adaptive purpose being co-opted later for a different purpose. For example, the bones of our middle ear did not arise specifically to conduct sound pressure waves. Instead, they were originally part of the reptilian jaw bones designed for chewing. The hinged arrangement, however, proved useful much later for sound propagation and was “re-tooled” by natural selection for that purpose.

Existentialism

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Related Terms

[Philosophy of existence](#)

Description

Existentialism, as a philosophy of life, has its idea-historical sources in German idealistic philosophy. Kant, Fichte, Schelling, and Hegel gave the decisive impulses for the birth of existentialism. Kant (1724–1804) moved away from what was understood as medieval metaphysical ontology, ungrounded speculations about the nature of the beyond, and he turned to the analysis of perception and grounds of knowledge, this being the subjectivist turn in him. Heidegger (1889–1976) classifies Kant as an adherent of the philosophy of consciousness, and given the subjectivist turn this seems plausible. In Kant, possibilities and limits of *human experience* and of *perception* are in focus. He asked how the mind “in advance,” *a priori*, structures the perception of the world; his aim was both to show *how* the mind works and how the factory of mind looks like prior to actual perception (Kant 1982). Existentialism draws attention to the preceding domain as well, but it adds *existentialia*, which are beyond the categorical frames. *Existentialia* are like categories, Heidegger wrote, they are transcendental in relation to everyday experience and awareness, but in Heidegger’s view they were more fundamental for human self-understanding than categories. Categories are subjectively in the mind; *existentialia* structure the self/world interaction or human existence in its entirety, and they give access to being. By focusing on *existentialia*, Heidegger considered that he had moved beyond the philosophy of consciousness: in

understanding human existence (*dasein*) in terms of *existentialia*, a clearing of being comes to pass, which does not happen in the philosophy of consciousness! Existentialism, as Heidegger interprets it, is an existential/ontological analysis of being; existentialism is not subjectivism (Heidegger 1985).

To Kant’s subjectivist turn, existentialism adds the existential turn: the analysis is directed to human existence, not only to the mind. Schelling (1775–1854) had claimed that being could be known in existence through experience; there is an *a posteriori* philosophy of “higher empiricism” (Schelling 2007). Experience is not only a passive receiving according to Schelling, but an active *deed of self-determination*. Both Kierkegaard’s and Sartre’s existentialism has radical *a posteriori* character. Claiming that existence precedes essence, Sartre seems to agree with Schelling: human essence is realized through deed, action, and choice only; choice gives human nature its “whatness” or being; existence precedes essence (Sartre 1946). Heidegger on his side claimed that the distinction between essence and existence has haunted Western thought from its beginning. If essence is understood as a pre-given “entity” or abstraction, as a “what” and as a thing, then essentialism is unavoidable according to Heidegger. If we on the other hand understand essence from the perspective of time, then the existential clearing of the essence of humanity and of being is possible according to Heidegger, and such clearing have happened, happens, and will happen in philosophy (Heidegger 1993). That the humanity of humans is dependent on their choices, on their ability to self-determination, is a central theme in existentialism.

Schelling initiated the historicity of philosophy: the place of thinking is in time and space. Existence could be known only in and through existence itself, not through reason alone; existence is to be known in the *phenomenon of existence*. The Greek word for “phenomenon,” φαινόμενον, is translated as “that what shows itself.” Existentialism is closely related to phenomenology and hermeneutics; today, it is more in agreement with post-phenomenology

(Deleuze, Guattari, and Levinas) than with Husserl's phenomenology. Existentialism is thinking in time and place; it tries to express the basic phenomena of human life; it explicates that what show itself in human existence, including being. Existentialism in Heidegger's interpretation is an existential ontology.

For Feuerbach (1804–1872) and Kierkegaard (1813–1855), Schelling's existential turn became crucial. Human beings are in time and space: we think, feel, and will as concrete *bodily beings* in the concrete physical reality; to exist is to *apprehend*, to sense the concrete physical being; human nature (*wesen*) “dwells” in the concrete physical being. Existentialism focuses on the analysis of human nature, subjectivity, existence, and human finitude in time and space. The analysis of finitude shows that there are different ways of relating to the world, to others, and to God. Human life, existentialists conclude, is *relational* and individuals might be aware of different ways of relating. They do not understand with “relationality” personal relations only, but constitutive relations, which give human beings their identity. It is the capability of relating that differentiates human beings from mere things. Things and objects lack this ability according to existentialists. Things are “givens”; human life is an open possibility, not a fixed thing. Existentialism has several “subgroups” like atheist existentialism, Christian existentialism, and feminist existentialism. Atheist existentialists claim that the clearing of existence/being does not open for God relationship. Christian existentialists like Søren Kierkegaard, Karl Jaspers, Gabriel Marcel, Rudolph Bultmann, Paul Tillich, and Mary Daly claim that God relationship is constitutive for human self-understanding. Feminist existentialists claim that Man has taken the place left by the exit of Father God; the next step in history is to dismantle and to deconstruct the structure that make the master Man possible: the hierarchical ontology with God or Man at the top. The radical vein is an essential part of existentialism.

Existentialists describe and explicate human relationality. They claim that preceding the objectifying relation to things there is the bodily

lifeworld, which we come to know through moods (*stimmung*), passions, choices, actions, and deeds. Existence in time and space is both for Feuerbach and for Merleau-Ponty (1908–1961) bodily existence in the concrete physical universe. According to Heidegger, *existentialia* like care, death, and freedom belong to human lifeworld. The facing of finitude gives birth to anxiety; it shows the presence of anxiety or nothing in human life; in anxiety, the nothingness of human existence shows itself. Anxiety is an expression of the finitude of human existence; as such, it belongs to all *aware* life according to existentialists. In anxiety, the finitude of human existence shows itself, truly to exist is to *ex-ist*. Existence for existentialists is to step out of the nothingness of existence, as it shows itself in anxiety, and it is to give life content, meaning, and direction through choice, decision, and deed (the Latin *ex-ist* means “to step out”). The analysis of finitude does not only show the negativity of existence, but it also shows the possibility of self-transcendence and of living for others: the ethical striving. Early existentialism and recent existentialism express the ethical striving.

Schelling had coined “the horizon of freedom” as a basic feature of human existence: self-determination, that is, choices and deeds through which humans realize their potentials and their belongingness to being, happens in the horizon of freedom, which by definition is in time. The horizon of freedom is the relationship between the now and the future; only the future is the open possibility. Nietzsche (1844–1900) radicalized the time relationship: it is the future that determines the now; the future is the becoming of the now, also expressing the ethical striving. The horizon of freedom is direction to future: human existence is future-oriented and future-directed. In Heidegger, and in later hermeneutics, especially in Dilthey and in Gadamer, horizon becomes crucial as the *horizon of understanding*: human life, and even life in general, is to be understood in the light of the future possibilities and potentials, not only in the light of its past events and happenings. The individual is in time and space; she or he

constantly projects her or his nature onto unknown future, this being the stage of care (*Sorge*); in the situation of projection, the individual is to decide and to choose what she or he is to become through the leap of choice or of faith (Kierkegaard). Choice, through which humans realize and come to consciousness of their selves, happens only in the horizon of freedom according to existentialists. Both in Kierkegaard and in Sartre, freedom is self-communicative, that is, freedom in one person affects and “starts” freedom in the Other; the individual is a part of the human race or human species. Freedom is not “my freedom,” freedom belongs to all; “it” determines the individual and the species. The relationship between the individual and humanity at large or the human species is a central theme in existentialism. In Sartre’s view, there cannot be any realized good or realized and materialized human nature that is not good for all; the individual good enriching the humanity of humans is the only good according to him (Sartre 1946).

Getting inspiration from Heidegger’s analysis of thinghood and of technology, recent existentialism analyses the human predicament in the era of technology and globalization. It warns us of objectifying and rectifying human life; a danger in the present situation is that we understand ourselves as things among things. When the horizon of understanding is determined by the ontology of thinghood, we tend to understand ourselves as things among things; we do not see ourselves as time beings with the continuity between the past, the now, and future. Things, understood in terms of thinghood, have no time relationship. As we understand ourselves as things among things, we have fallen away from our humanity into a nonpersonal “they”; a kind of “thrownness” characterizes the everyday life according to Heidegger. “Thrownness,” “herd” (Nietzsche), “inauthentic living” and “bad faith” (Sartre), and “dreaming innocence” (Kierkegaard) are existentialists’ coinages for living at the mercy of other people. The existential turn at this level is that the individual makes the turning around and starts to look for some more authentic ways of living than just following the stream.

Recent day existentialists claim that the modern scientific perspective, building on the subject/object distinction between the individual and the observed world, gives one perspective on things. Existentialists adhere to perspectivism, Nietzsche being a portal figure in modern, or rather, in postmodern perspectivism. The objectifying relation presupposes that the individual posits her or him as an observer in relation to the world, creating the subject/object structure between the individual and the world. Thinkers profoundly influenced by existentialism, like Martin Buber (1878–1965) and Paul Tillich (1886–1965), consider that the subject/object structure lays the ground of the cognitive relation in modern natural science. In claiming this, they were inspired by Heidegger, Kierkegaard, and Feuerbach. Behind these three, there lies the influence of Fichte (1762–1814). Fichte had opened for human self-determination, and self-determination is a central theme in existentialism. Feuerbach analyzed the possibilities of self-determination and concluded that the subject/object relation between the individual and the observed world or nature is a result of the act of positing. Given the relationality of human existence, this act of self-determination is in Feuerbach’s view a secondary act. Prior to the subject/object relation, there is the I and Thou relation: before the individuals posit themselves as autonomous thinking selves, they are in the world as concrete bodily beings in the company of fellow men and women (Feuerbach 1957). Feuerbach is the initiator both of the I and Thou philosophy and of the existential/phenomenological analysis of bodily/physical being. He was an inspirational source for Nietzsche, and he should be seen as one of the foundational figures of existentialism. Martin Buber developed the I and Thou philosophy and conceptualized the objectifying relation as the I-it relation, setting it apart from the more primordial and original relation of I and Thou. According to Buber, science and scientific knowledge are congruent with the I-it relation; human active self-determination is in the I and Thou relation. It is in relation to the Other that the positing of subjectivity or self-determination

comes to pass according to Buber: only in relation to another Thou the individual finds her or his true “deeper” self. Maurice Merleau-Ponty also held the view that the individual self-determination happens only in relation to the Other: the individual understands who and what she/he is only in the company of other human beings. Christian existentialists emphasize the central role of God relationship in the act of self-determination.

Simone de Beauvoir (1908–1986), living side by side with Jean-Paul Sartre (1905–1980) and also working with him, analyzed the gaze or the look of the Other. Historically, women have been submitted to the look of the Other, which for Beauvoir is the look of man. Under the look of man, or of men, women understand themselves as passive objects instead of taking hold of their innermost capabilities to action and self-determination; authentic living between men and women is to go beyond the objectifying look and the bad faith; it is to understand oneself as an active agent of self-activity and self-determination. In bad faith, coined by Sartre, the human self-understanding is not determined by the individual’s own self-determination and own choice, but by that what the individual believes *others think* of her/him. In the state of bad faith, the individual’s possibilities and potentials have not shown themselves yet, that is, the individual has not come to consciousness. Recent existential theologians, like Mary Daly, emphasize the interactional nature of consciousness: both women and men are in the power of bad faith. If one pole of the interactional setting changes, in Daly’s view women’s consciousness, then the change of the other pole, of men’s consciousness, will follow. Recent day existentialism is moving away from the individualistic interpretations to communal, societal, and interactional interpretations of human being there, seeing individuals as performative agents in interaction and inter-dependence with each other.

Existentialism considers itself as humanism. Sartre had written *Existentialism Is a Humanism* in 1946, Heidegger answered Sartre (who had referred to Heidegger an existentialist, which Heidegger was unwilling to accept) by

composing *Letter on Humanism* in 1947. Sartre had claimed that existence precedes essence: a human being is thrown into existence; she or he has to accept the finitude and anxiety of existence and to understand that it is through her or his choices that she or he makes her or his life and fills existence with content, direction, and meaning. Heidegger’s point in *Letter on Humanism* is that the humanity of humans has been discussed under the domination of old metaphysics and recently under the domination of technology and the ontology of thinghood. Due to those misconceptions, the humanity of humans has not been reached yet, but someday in the future the possibility of human essence will perhaps show itself. Humanism as we know it today is opposed, Heidegger wrote, “because it does not set the *humanitas* of man high enough” (Heidegger 1993).

Existentialism had its heyday in Germany in the beginning of twentieth century, in France, during 1940s and 1950s, in the USA between 1940s and 1970s, in Russia through Dostoevsky, Shestov, and Berdiaev in the end of nineteenth and in the beginning of twentieth century. *The Great Soviet Encyclopedia* from 1979 characterized existentialism as “an irrationalist current in contemporary bourgeois philosophy” (<http://encyclopedia2.thefreedictionary.com/existentialism>, 2012-05-11). Existentialism has been influential in philosophy, in literature, in art, especially painting, in expressionism, and in constructivism. The existentialist turn grounded both phenomenology and hermeneutics. The themes picked up by existentialism has been developed further by feminist thought, cultural analysis, post-structuralism, post-phenomenology, constructivism, and, recently, by epistemological discussions in reflexive or differential monism.

Self-identification

The early existentialists like Schelling, Feuerbach, Kierkegaard, and Nietzsche considered that they were doing science. These philosophers did not deny the objectivity of thought, as we today understand it as representations of the

world out there (correspondence theory of truth), but they claimed that there must be other kinds of truths as well. They were not relativists, but they considered that representations give only surface knowledge of things and humans. It is not representational truths or representational objectivity that we find in existentialism, but *expressive truths* (existential/ontological truth-claims) about the self-to-self and of the mind-reality relation.

Characteristics

The emphasis is on the individual and the description of human finitude with its limits and possibilities are the characteristic features of existentialism. Even if existentialism emphasizes the individual, it also draws attention to the interaction between individuals and between individuals and humanity at large. Further, the action-character of human life is in focus: through action and choice the individuals realize their nature and that realization has impact on other human beings, changing the human nature, and even God's being. Some existentialists like Schelling, Kierkegaard, and Tillich emphasize the change in God: human beings are active agents in an unfinished universe and their actions affect the universe and even enrich God.

Relevance to Science and Religion

Existentialism has drawn attention to the presuppositions and conditions of natural and humanistic sciences: science and scientific truths are of human making and existentialism studies the process of the production of knowledge, the function of knowledge and science in modern society, the value judgments associated with science, representations and "techniques of power" (Foucault) in history and in the contemporary world, the role of prejudices and fore-understandings in human self-understanding. Existentialism has made contribution to the discussion of what science is and what the role of science in the contemporary society is. In existentialism, there has been keen

interest in religion as anthropological, social, and cultural phenomenon. Feuerbach, Kierkegaard, Nietzsche, Dostoevsky, and Berdayev, with Marcel, Jaspers, and Merleau-Ponty, have analyzed religion as a psychological, social, and cultural phenomenon. Nietzsche's cultural philosophy sets many of the main themes of today's cultural analysis.

Sources of Authority

In existentialism, there is skepticism considering authoritative sources; still, the great names of existentialism are considered as authorities. Like empiricism, existentialism listens to the senses, like rationalism existentialism uses reason in the analysis of human existence. But existentialism goes beyond plain empiricism as it claims that an aware mind is more differentiated and alert to life experience than common sense empiricism with its passive camera-view of the mind allows for. Existentialism even goes beyond rationalism in taking hold of the human potential and in claiming that the realization of that potential, the genuine human nature, is the matter of choice and decision, not of rational calculation.

Ethical Principles

Existentialism emphasizes ethical principles like responsibility, reciprocity, action, self-activity, and spiritual development. Existentialism "demands" a respond to human situation subjectively, socially, and culturally. As it sees individuals in interaction with their surroundings, it also presupposes that the individual becomes aware of that how environment and social milieu affect the individual, and how he or she is affecting the surroundings. Reciprocity is that an individual's self-realization happens in relation to other people; reciprocity in the individual-society interaction is to understand the way models of interpretation and patterns of understanding affect the individual, and in what way the individuals contributes to the legitimacy of the

cultural patterns. In existentialism, human nature, that what we are able to become, is dependent on action or choice. Choice, then, is first and foremost an inner act through which the individual strives to become that what he or she is able to become: a self-active, aware, differentiated, and integral self, and this self being a goal of the spiritual development. In Kierkegaard's view, spiritual development gives echo in eternity.

Key Values

The key values of existentialism are affirmation, self-realization, and love. Humans should not shy away from existence, but they should meet existence with open eyes. They should not only affirm themselves as rational beings, but as life-experiencing beings. Life experience is antithetical: there are rational and irrational, good and bad, constructive and negative elements in human existence. The more of the negative one is able to take in and to affirm, the higher the possibility of spiritual development, or the spiritual synthesis of personality. It is love that makes the affirmation possible. Existentialism does not see love as individual property or quality, but love is an existential/ontological matter: individuals partake in love that is in and above them. There is a widespread interest in Spinoza, who also had a participatory view of love. There are existentialists, like Kierkegaard, who identify love and being with each other.

Conceptualization

Nature/World

Nature or world is not only an object of analysis as is the case in natural sciences. Existentialism gives a relational interpretation of the world and or nature: the individual is already in the world, in culture, and in nature. Nature is the sensed, apprehended world.

Human Being

To say what human nature is or to claim that we know what a human being is impossible

according to existentialism. Humans are potential beings: their life is characterized by openness toward future, vulnerability, and unfinished states of affairs (in economy and in personal life). Only future will show what it will become of man. The nonobjectivity of human nature has ethical consequences according to Levinas: to claim that one knows the Other or to claim that we know the human nature is to do violence to the Other. To respect the Other is to let the Other express herself or himself. In these expressions, we only see the exterior of personality, never the core of personality or the seat of underlying motives.

Life and Death

Even if death plays such a central role in existential self-understanding, it shows the finiteness of life to us; existentialism is a philosophy of life. Existentialism puts things in relation to life experience. Death has a this-worldly meaning: it forces us to summon our life and to accept death as a limit of life. Faced with the possibility of death, we are confronting two possibilities: either to escape from death (and from life) or to accept death as a springboard of spiritual growth. It is useless to speculate about life hereafter or about the origins of life, as the origins and the ultimate outcome of life are beyond the reach of human knowledge.

Reality

The complete knowledge of reality is not accessible to human beings. There are perspectives on reality: perspectives in natural sciences give some view on reality; the ethical perspective shows the relationality of life; the perspective of faith gives an understanding of reality. Existentialism affirms that there is a reality independent of human beings, but all knowable reality is in relation to human beings. Human beings express their understanding of reality in art, in science, in philosophy, and in religion. Giving emphasis to action, existentialism pleads for the openness of reality, claiming that the ultimate outcome of reality, whatever that is, is also dependent on human action and choice, not only on the anonymous forces of universe.

Knowledge

There are several kinds of knowledge. The representational knowledge of modern science is one kind of knowledge. Existentialism claims that the representational knowledge or objective knowledge touches only the outer relations of things and humans. The participatory knowledge, on the other hand, is an existential/intuitive form of knowledge. To differentiate between different forms of knowledge is essential to existentialism. Existentialists are attracted by Aristotle's doctrine of informed matter, as Aristotle's differential or reflexive monism comes close to existentialists' understanding of the nature of knowledge, some even claim that Aristotle was an existentialist!

Truth

Most of the existentialists agree with Kierkegaard that subjectivity is the truth: only the personally tested truth-claims have validity, and such truth-claims are approximations to reality. Existentialists think that truth-claims in natural science are also approximations and they consider that scientific truth-claims are dependent on the underlying plane, which has been drawn or projected "in advance." Scientific truth-claims are not final truths as they change over time and have hypothetical character as models. Truth, for an existentialist, is that what gives direction, content, and meaning to one's life; truth and commitment belong together. One "existential" insight into the nature of truth is that error and truth are related, and that there always is the possibility of correcting one's truth-claims.

Perception

It is not the scientific study of perception under the laboratory conditions that is the primary interest of existentialists, but the study of the categories and presets determining perception. The presets are also socially and culturally determined patterns of perception; shortly, the mind is infiltrated by prejudices, evaluations, subjective preferences, and power structures; it is framed by fore-understanding. Existentialists consider that the patterns are historical. Nietzsche's cultural philosophy is the analysis

of the patterns of understanding and of perception: we should be aware of the influence of the patterns of understanding (criticism), but we are also able to introduce new models and new patterns of understanding (construction). With the change in the presets, changed of perception and changed understanding will come; the world is perceived in a new way.

Time

Time is a central category in existentialism. Humans and other living and nonliving things are in time and space. Thinking, feeling, and willing are in time; thinking above time moves in the sphere of abstraction. The existential turn is to turn from abstraction to existence in time and space. Thinking is a matter of coordination of the mind/body totality. The coordination is like navigating the sea, with the difference that the "marks of navigation" mark identity, relationality, and the goal of life. Kierkegaard did the coordination in terms of time. To awaken to consciousness is to become aware of one's past. By telling one's life story consciousness dawns, and one's past becomes a part of the now; one gets an aware relation to one's past, this being an essential part of one's identity. In that very moment, the possibility of future or the futurity of human *dasein* opens itself up as well according to Kierkegaard. Life is continuity between the past, the now, and the future; in repetition the existence that has been becomes in the now (Kierkegaard 1964).

Consciousness

Existentialism gives a relational view of consciousness. Consciousness is not a thing; consciousness is awareness. Consciousness by existentialists is interpreted in several ways. For Sartre (and for Hegel), subjectivity or consciousness is the "I to I": the individual relates to her or him; she or he turns inward and becomes self-conscious. For Kierkegaard, consciousness is a relation to reality outside of the mind. When consciousness or the self comes into being, the "relation relates," he wrote, that is, the aware mind (the "I to I") relates "a third" outside

the mind. The second relation gives the measure of the self, not the “I to I” relation. Only that what is different from the self gives true qualitative difference! Qualitative difference is a sensed difference, and only sensed difference gives consciousness.

Rationality/Reason

Existentialists are not against reason. They are against the exclusive identification of reason with *ratio*. Existentialists do not dismiss reason or rationality, but they are critical of identifying reason or rationality with a second-order phenomena. The second-order phenomena are representations and abstractions and in existentialists view modernity has made a fatal identification between rationality and reason. Reason should be given a much wider definition than *ratio* allows for. Reason might have several interpretations; modernity’s interpretation of reason as procedural reason (Charles Taylor) or as technical reason (Paul Tillich) is a limitation and reduction of reason. The argumentative approach takes arguments as arguments, but arguments are abstractions and as such they are above life, and so is the procedural or technical reason above life as well. For example, in Feuerbach, reason is in life.

Mystery

Some atheist existentialists are open to the mystery of being. Human nature is an enigma; nature and being are groundless; the ground of human life and of knowledge rests on the bottomless abyss. In general, the negative and nothingness are seen as elements of life by existentialists. For Christian existentialists, all created life is finite, and the Christian existentialists look for points of meditation between the finite and the infinite. Like Descartes, some existentialists consider that the relation between the infinite and the finite is internal to the mind; consciousness of finite as finite presupposes the infinite.

Relevant Themes

Existentialism is action oriented. It is in the praxis of life that existential truths are to be

tested. Feminist thought and feminist theology put emphasis on the action and change: through analysis and construction, language, consciousness, and societal structures are changed for a more equal society to take place. Today’s world is characterized by the economization: through globalization all people are affected by economics and macro-political decisions. Existentialism analysis the role of religion, science, and economy in the era of globalization, and it aims to offer constructive alternatives to prevailing economical and political ideologies, emphasizing the local and the initiatives from the below in constructing the condition of livelihood for the individual and for the community. The individual orientation is tuned down in modern existentialism and the interaction between the individual and society, and individual and culture are brought to the foreground.

Cross-References

- [Freedom](#)
- [Hermeneutics](#)
- [Ontology](#)
- [Phenomenology](#)
- [Pluralism \(Religious\)](#)
- [Posthuman Condition](#)
- [Process Theology](#)

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Exo-system

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Interpersonal and institutional processes that have an indirect effect on an individual's well-being even though he/she is not a participant in them; rather, their effects are mediated through interpersonal domains in which the individual does participate. For example, although a child does not participate in the parent's sphere of work or in the meetings of the school board, activities in both of those domains can have consequences in the life of the child. A concept in Bronfenbrenner's ecology of human development.

Expansion of the Universe

► [Space](#)

Experience

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History

Our access to reality as living organisms is through experience: through our senses, we receive information, and comparing this with what we know, we change our knowledge structure. Aristotle put it this way: *ek tes mnemes empeiria* – out of memory, experience grows. By that, he meant that experience is always a connection of our

sense impressions with already extant knowledge, or in other words, an abstraction from what we perceive into a theoretical structure. During antique times, experience was mainly related to technical knowledge of the artisan and craftsman, like farmers, carpenters, and doctors, who try this and that and finally acquire knowledge about his/her field. Real knowledge, however, was thought to come from reasoning and insight. Aristotle gave a place to empirical knowledge through experience, in his manifold writings about the natural world. In his theory of science, the *Organon*, he acknowledged the role of sense experience in that it fosters the material out of which knowledge is generated. This sense experience which covers singular events, though, has to be brought into relationship with other events and underlying structures, such as causation or correlations have to be abstracted, and this is done by the mind. Finally, these pieces of information have to be put together into a model of what this experience tells us about reality. This is done by what Aristotle calls *anchinoia*, the deep insight of reason, which then uncovers the deep structure of how single events are related. We see smoke. We know that smoke is normally produced by fires. We reason that there must be a fire. In that, we build on our experience around fire: that it is hot, that it burns, and that burning produces smoke. Thus, sense experience and cognitive structures, such as memories and knowledge, are always intertwined.

Middle Ages

During later antique times and the scholastic period of the middle ages, the term used for experience was the Latin verb *experiri* – to make an experience, which is related to traveling. Robert Grosseteste (1168–1253) was the first to use the term systematically to describe his optical experiments. It was more systematically used by Roger Bacon (1218/1219–1292), one of his students. Bacon was the first to postulate a *scientia experimentalis*, an experimental science or a science of experience, which should be the basis for *all* knowledge, even for theology and

philosophy. Since he had no chance to elaborate fully on this, as he was under arrest and could not communicate, we have to glean what he meant by it from the sketches he produced. From that, the following image emerges: Bacon had a holistic view of experience. Inner or spiritual/religious experience and outer experience were two branches of one epistemological access to the world. By spiritual or religious experience, he meant an experience that came out of a contemplative access and illumination received in a kind of mystical rapture. This would give the foundation and general understanding, which could then be used to order the experiences of the outer world through senses and systematic experiments. What Bacon means by inner experiences through raptures is not so different from Aristotle's understanding of *anchinoia*, a clear, direct insight into theoretical structures that serve to connect phenomena we experience in the outer world. It gives us insight about the basic, fundamental principles which we need in order to make sense of experience. For experience itself is not useful unless we can connect it to theoretical structures. And the basic theoretical structures are derived from such insights. For Bacon, such fundamental insights came from spiritual experiences of mystical raptures. In that sense, such inner experiences were spiritual and religious at the same time, as Bacon was a Franciscan friar for whom these experiences could only be given by the God he believed in. What is interesting to see in Bacon is that in this mid-thirteenth-century view, at the cradle of the modern scientific enterprise, the two notions of inner and outer experience are still unified, two facets of one faculty that helps us understand the world. It is not clear whether Bacon had mystical experiences himself, or whether he took his ideas from the abundant Franciscan tradition of ► [spirituality](#), dating back to Saint Francis himself and his close friend Aegidius of Assisi. But he was surely involved in many scientific experiments, probably in the production of gunpowder and other chemical experiments. He advocated studies of medicinal plants, diet, and other regimes to prolong life and to study the effect of large lenses and mirrors to kindle fires, to make optical instruments like telescopes, and so forth.

After him, the scientific efforts to understand the world were gradually intensified. Francis Bacon (1561–1626), who was no relative of the earlier Bacon but used in fact a lot of his writings and took his famous theory of idols from Roger Bacon, advocated experiments to teach us about nature. His ideal was to free us from the bonds that nature, habit, political, and societal convention, as well as current understanding – the idols that bind us – bind us with. The way to do this is to put nature to the test. Here, the language of the judge starts to become pervasive that is still active today, when we speak of controlled *trials*, if we want to test the efficacy of a medical intervention. Francis Bacon saw nature as the one who needs to be tried, submitted, and overcome. He meant that we can reveal nature's secrets by way of experiments. In a parallel movement, Galileo Galilei (1564–1642) actually performed experiments to clarify many notions of mechanics, as did many other contemporary writers and followers after him. During the seventeenth century, it had finally become clear that the high road to understanding nature was to perform experiments. The natural sciences started to form themselves into special disciplines, and experimentation became their way of finding out about the natural world. The outer experience of Roger Bacon had become a methodological stance through the advocacy of Francis Bacon and the example of Galilei. This transformation meant that passive, receptive experience or experience that was the consequence of a journey into unknown lands, literally, had become an active interference with nature. Not only innocent observation, but manipulating nature and not only receptive perception, but interactive experience that resulted from introducing changes into a natural system and observing the result was now the hallmark of scientific experience.

Scientific Experience

Ever since, scientific experience has become a systematic effort of interfering with nature, changing conditions, and observing the effect. A scientific experiment is a precise question put

to nature. The result of the experiment is an answer in the form of a minute piece of experience. It is produced by controlling conditions, where possible, and introducing one changed condition, or sometimes a series of them, to observe the difference. Sometimes, scientific experience is also just about observation, where conditions cannot be manipulated, such as in astronomy. Here, the experiment is the whole cosmos, and scientists use their knowledge to create situations or questions that are similar to real experiments. Sometimes, the experiments are performed by nature herself, such as in biological species that led Darwin to his ► [theory of evolution](#), or in serendipitous observations, as in Jenner's observation that dairymaids who had had cowpox did not contract real pox, or in Fleming's observation that moldy bread could cure some diseases, thereby discovering penicillin. Always, it is the same structure: a defined change is introduced by the scientist into a clearly describable and comparatively controllable system, and the result is observed vis-à-vis an unchanged control condition. Normally, quantitative analysis is used to support the soundness of the conclusions or scrutinize them, although this is not always necessary and rarely is in the large breakthroughs. Thus, experience as a receptive interaction with nature has become a highly structured and highly manipulative interaction.

The original limitation of all our senses has been overcome through the invention of new instruments and methods that extend our senses and aid them into the realms of the infinitely small, the infinitely large, and the infinitely complex. This development had started with the invention of the telescope and the microscope in the sixteenth/seventeenth century, which was already foreshadowed by Roger Bacon's discussions about the power of lenses and reflecting mirrors in the thirteenth century. And it is carrying on today with the construction of huge hadron colliders that allow physicists to peep into the minute constituents of matter and the interface between energy and matter, as well as with the construction of enormous telescopes that allow us to expand our knowledge of the universe. The same is true for instruments such as the electron

microscope or nuclear magnetic resonance spectroscopy that allow us to probe the constituents of more complex structures such as complex biological material up to brain activity.

All these instruments are nothing else but aids for human sense perception which, together with a clever experimental setup, put a question to nature and find the answer. Again, we see the general structure already laid out by Aristotle: sense experience, in the modern case – data, together with memory, in the modern case – theoretical structures, comprises experience.

The Role of Theoretical Structures and Presuppositions

Natural scientists, empiricist philosophers, naïve realists, and positivists often forget about the second part in this equation, the theoretical structures that are necessary to make sense out of the data of sense perception. Nearly everybody in science agrees that data without a theory are useless. The theory, really, has several layers of theoretical structures. The surface structures are normally comparatively innocent, and consensus on them is not difficult to reach. These are current theories that predict certain phenomena that can be empirically tested. Although also here a lot of theory competition prevails, the answers can normally be found empirically and, once found, settle the debate about appropriate theories. For instance, in physics, it was a century-long debate whether light was a particle, as already supposed by Grosseteste, or whether it had to be conceived as a wave. Modern experiments showed that light is both, depending on the setup of the experiment. And a new theoretical structure, quantum mechanics, could also make sense of this double nature. On this level of discourse, science is normally comparatively peaceful and consensus driven, even though the consensus is often only reached through manifold structures of social interactions that are not always rational.

Now, a deeper layer of theoretical structure is often neglected: the preconditions that are supposed to be true and that are needed for any science, whichever kind it is, to proceed and be

able to operate. Such basic theoretical structures are often quietly presupposed and not debated and analyzed further. Various philosophers have pointed to the fact that such preconditions are always operative by necessity. Robin Collingwood called them absolute presuppositions. Pepper called them world hypotheses. Kurt Gödel showed that even the strictest formal system possible, an algebraic formalism, has to make presuppositions that cannot be proven within the system itself; hence, it has to make an assumption. Thomas Kuhn, building on these thinkers, coined the phrase of a “scientific paradigm,” meaning thereby all the hidden, undiscussed assumptions that are taken for granted. Thomas Kuhn had also built on Ludwik Fleck, who had observed that the scientific process of coming to grips with a scientific experience is not just a straightforward matter of data deciding on theories but a highly complex social process. Hence, Fleck coined the phrase: “A scientific fact is the convention to stop thinking.”

These various and similar analyses point to a simple yet deeply unsettling and often neglected fact: all scientific reasoning makes presuppositions that are hardly openly discussed, not necessarily rational and not necessarily true, but the result of a historical process, of societal convention, or just of tradition. Such absolute presuppositions undergird the scientific process. In our modern days, we assume, for instance, that matter is primary and that everything else can be built up from it and that complex processes can be understood in terms of interactions of fundamental building blocks. Our *virtual exchange* particles are no more real or unreal than medieval *intelligences* or *angels* which were a clear consequence of the favored world model then and in the same sense necessary and consistent with the general theory as our “virtual particles” are with modern-day physical theory. The difference certainly is that our modern-day physical worldview is informed by a multitude of empirical knowledge which in turn proves itself useful through the way it is applicable. But the generic theoretical structure is the same: it has to rest on certain assumptions that are not within the scope of the system

itself. In the same sense, it can be imagined that different absolute presuppositions or paradigmatic assumptions might lead to different types of experiences. However, Kuhn and many theoreticians and historians of science have pointed out that such paradigmatic shifts only happen, once the current model has come to a dead end.

We do not discuss and reflect today on how we arrive at such paradigms, world models, or sets of absolute presuppositions that inform our theoretical models and by the same token our experimental work. The consensus opinion today seems to be that such paradigms grow out of the general culture and are historically determined which is to say there is no rational process behind it.

Inner Experience

Here, we turn back to Roger Bacon. In his model of science, the spiritual experience or insight would have provided the basic understanding or structures onto which to build the scientific-experimental enterprise. During his time, however, this strand of thinking was not really taken up. A contemporary of his, the mystical writer Hugh of Balma, a Carthusian (flourished around 1260), even had tried to implement experiential knowledge of God, i.e., spiritual experience derived from a mystical contemplative practice, as a formally accepted way of knowledge into theological learning. However, it remained, as we all know, a sidetrack. Apart from some reverberations – Thomas Aquinas acknowledged it in the final part of his *Theological Sum*, Johannes Gerson, Denys the Carthusian, and his better known friend Nicolaus Cusanus spoke favorably about it – theology remained firmly grounded on its two main pillars: revelation in the scriptures and interpretation through the church and its officials. Direct, experiential, inner experience and knowledge derived thereof did not sit well with the authorities. During the time following Bacon and Hugh of Balma, inner mystical experience became ever more suspect. The council of Vienne 1313, for instance, declared many of the lay groups that advocated such direct access as potentially heretic. The Franciscan fraction of

the spirituals who, following what they felt was Saint Francis' true legacy, also advocated such direct access to inner experience of God, was finally crashed and marginalized. Meister Eckhart (1260–1328), the last of the academic scholastics who might have been in a position to install mystical access to knowledge in an academic environment, was blackmailed and had to defend himself, appealing to the Pope, but dying on his way there. Mysticism had to turn into private piety. It was relegated to religious orders and smaller groups, but was not part of the official, academic structure of acquiring knowledge, which was mainly based on cognitive learning and not on inner experience.

Various reform movements tried to bring this element back into the church. Some were driven out, such as Luther and other figureheads of reformation. Some managed to implement it within the official church, such as Ignatius of Loyola (1491–1556). He developed his own way of inner experience, which he called “spiritual exercises.” Interestingly, directly and indirectly, he had drawn on some of the ideas proposed by Hugh of Balma in the thirteenth century. These exercises are a systematic way of fostering inner, spiritual, and religious experiences and are modeled along the lines of Ignatius' own inner path of experience, which led him through a contemplation of his own shortcomings; the life of Christ in imaginative meditations to an imageless, contemplative presence; and finally, into a deep experience of mystical union which he describes in his autobiography *The Way of the Pilgrim*. Since these exercises became the pillar of the order of Jesuits which Ignatius founded, inner or religious experience came at least indirectly back through some of the teachers who the Jesuits provided at the newly founded schools and universities across Europe and in the New World.

However, this should not disguise the fact that until now, inner, spiritual, or religious experience has not really had a systematic place within our society. And it certainly has had no systematic place in our structures of learning, in the academic world, or in schools. While our culture has invested huge efforts into developing outer

experience of the senses into the systematic tool of science to unravel the secrets of the material universe, we have seen only scattered, unsystematic, often unrelated, and mostly limited efforts at installing a corresponding epistemology of inner experience in our culture. What might such a culture of inner, spiritual, and perhaps, even religious experience look like? What preconditions would it make? What promises and what pitfalls should we be aware of?

If we turn back for a moment to the thirteenth century, when some minds were active to install such a mode of gaining knowledge, inner experience, in our academic system, we see, in a highly sketchy and abbreviated fashion, the following: the medieval psychology had one conceptual tool on offer that might lend itself to an epistemology of inner experience – an inner sense that was directed toward experiencing God directly. It was variably termed *sensus cordis* – the sense of the heart, *sensus interior* – inner sense, *affectus* – affect and its highest part, *scintilla synderesis* – the spark of the synderesis or the spark of the soul, or *apex mentis* – the summit of the mind. All those terms, though used by different writers in different contexts, meant, basically, one thing: there is an organ in the soul whose sole purpose it is to be affected by God and to touch on God. This being touched by God, which in the Christian tradition is of course only possible through grace, was termed mystical union. A case can be made that, although not fully worked out, those writers had an epistemological process in mind which was considered similar and in parallel to the experience of the outer senses: while the outer senses are directed toward the world and bring us knowledge about it in outer experience, the inner sense is directed toward God and brings us knowledge about the deep structure of the world in a kind of inner experience of rapture or enlightenment. This was what Roger Bacon had in mind when he said that such spiritual experience would be the foundation of all sciences, even theology. This was what later writers, such as Hugh of Balma or Meister Eckhart, had in mind when they thought that real wisdom, real knowledge, was derived from such inner experiential insights. As we know, this strand of tradition

was cut short. While we have a comparatively clear epistemology of outer experience in the canon of methods of science, we have practically no understanding of the epistemology of inner experience. This would be a task of the future, should one find the concept useful in the first place.

Various Eastern traditions have placed a lot of emphasis on inner experience, such as the Buddhist tradition and also the tradition of Yoga and Vedanta, the experientially oriented arm of Indian philosophy. They have also derived elaborate bodies of theory about the human mind out of such inner experience. We do not have anything comparable in the West. But we can glean from those traditions that it is possible to elaborate on an epistemology of inner experience.

Epistemology of Inner Experience

While in science proper it is difficult enough to reach consensus about facts of the outer world, which principally speaking can be observed by most people, it seems next to impossible to find consensus about the experiential realities of inner experience. While science has developed clear criteria of correspondence, of testing of truth claims, etc., nothing of the like exists in most religions and only in a few spiritual traditions. Wherever such epistemological methods exist, they are very pragmatic and are about pragmatic consequences. The test then is in the transformatory potential of an experience. In the case of Ignatius of Loyola, he was transformed from a vain knight to a very productive and extremely efficient reformer of the church, inaugurating a clerical order that helped shape the world after him, for better or worse. However, we are very far from a systematic understanding on how such tests would have to be performed and what criteria would be the right ones. Within the Christian tradition, the so-called discernment of spirits is a first step. Here, the criteria of an experience are whether it helps an individual to live his or her life better, whether it sets someone free, whether it helps him or her to be more loving and compassionate, and whether it improves

happiness of more people around the person, to name but a few prominent criteria. But apart from that, not much of a critical epistemology exists.

There is a great danger here, which is not very often recognized: one is tempted to take all content of inner experience at face value. This is also what often happens in modern revivals of spiritual experiences, such as in some strands of transpersonal psychology. How do we know that the voices which Jeanne d'Arc heard were in fact the voices of Saint Michael and Saint Catherine, among others? She was convinced, but what could convince us? There is not much by way of criteria we could use to make such a judgment. She seems to have been in contact with some reality, or her conviction was so strong that she overcame a lot of obstacles; else, she would not have succeeded to help drive back the English from France and eventually help ending the 100 years war. What if someone has an ayahuasca experience and sees the snake god of the jungle? Is this the snake god then? Or just an idle image? What if someone says he or she has seen God, or the Virgin Mary, or Shiva, or Buddha? Do they fantasize? Is it real? Who can tell us? And how do we tell? These problems are unsolved and would be part of the program of an epistemology of inner experience.

They point us to two important problems or distinctions, which we will now turn to: one is the problem of the independent causal agency of consciousness, and one is the problem of language, or the distinction between spiritual and religious experience.

The Status of Inner Experiences

Clearly, inner experience is structurally different from outer, scientific experience of the world in that in inner experience there is no real "sense organ." Rather, the organ of inner experience is consciousness itself. And contrary to outer experience, where we have a comparatively clear referent of a sense experience, say a tree, in inner experience, the referent of an experience is unclear, say the voice of Saint Michael. While science has found some ways round the

ambiguity problem of the outer referent – consensus about what we see, multiple experiments, replication of results, and coherence with other theoretical structures – no such thing exists in the realm of inner experience. If we assume, with mainstream science, that all conscious activity is just derived from and contingent on brain activity, then an inner experience that should be able to tell us something about the outer world as such does not make any conceptual sense. In such a mainstream view, any inner experience can, by definition, only be about the system itself. It can either be the result of such a complex system idling, and it has self-generated meaning and hence devoid of any reference to the outer world. In order to gain ground for inner experience as a real relationship with a reality outside ourselves, we need to presuppose as a minimum precondition that consciousness has some reality and dignity in itself apart from and over and above the fact that it is somehow correlated with brain activity. This does not mean that we are forced to commit to a dualist view. A transcendental monist view would also do. But we need to presuppose that consciousness has its own mode of existence. Then we can craft consciousness and conscious inner experience into a separate mode of access to reality, namely, from the inside. While outer experience teaches us about the world from the outside, inner experience tells us something about its deeper structure if, and only if, consciousness can have its own access to reality in such an inner or spiritual experience. For them, such an experience is really about a transcendent reality that reaches beyond the individual, as is implied by the notion of spiritual experience.

There may be several ways of cultivating such direct access to reality through inner experience – meditation, contemplation, active imagination, shamanic journeys, trance rituals, psychedelic ritual drugs, or other ways of shaping and training consciousness. But they all make the implicit assumption that for consciousness to be in touch with reality by a separate route of inner experience, it has to have its own status of reality apart from being a result of brain activity.

Interpretative Framework of Inner Experiences, Language, and the Distinction Between Spiritual and Religious Experiences

Many scholars have pointed to the fact that experience comes mostly in language structures, and some even say there is no such thing as experience outside and beyond language. This latter claim has been effectively criticized since there are a lot of phenomenological reports about contentless states of consciousness, experiences that were ineffable for a long time until language and meaning structures offered themselves to express those experiences. But by and large at some point, experiences have to be expressed in language if they are to be communicated in some way or another. Even if one only writes the experience down in one's diary for one's own sake and reflection, language has to be used. And even if an experience is painted or transformed into music, some sort of cognitive structure is being used to express the experience.

It is at this interface that spiritual experience is converted into religious experience. We can think of spirituality and religion like the content and the form of a poem. While religion provides the forms – the theological structures, rituals, and mythological narratives – to make sense of experiences, experiences provide religions with the life to carry the rituals and narratives through the ages. If an inner or spiritual experience is interpreted within the framework of a religion, it is called a religious experience. And most religions can be either traced back to deep spiritual experiences, or are direct results of experiences of the founder, such as Buddhism. Although normal religious discourse prefers the term ► [revelation](#), if probed for its real meaning, it is not very difficult to see revelation as a chiffre for the deep spiritual experience of a religion's founder(s). Arguably, this point can be made for historical figures such as Moses and the Jewish prophets, for the historical Jesus and the followers who converted this particular Jewish Rabbi's teaching into a new religion, as well as for Mohammed.

Religious experience then is a subcategory of inner or spiritual experience, namely, that kind of inner experience that fits within and is interpreted by religious language and narratives. It goes without saying that some such experiences also alter the religious narratives themselves as was the case with the experience of the historical Jesus which altered the classical Jewish narrative into what we know today as the Christian narrative. Arguably, such inner experiences can also be interpreted within several frameworks. What Ignatius of Loyola interpreted as a revelation of the Holy Trinity, a modern-day Zen teacher might equate with a Sartori or Kensho experience, saying it has the same quality.

Inner and Outer Experience: Science and Spirituality

Inner experience is the bridge between science and spirituality. We have seen that all science has to rest on theoretical structures and it has to refer back its experiential knowledge to theories that make sense of them. The theories themselves are not found in the data. They are found in and by the mind of great scientists. Normally, this creative process that is at the root of scientific theories is completely neglected. But it is structurally very similar to inner experience: it is sudden insight into a potential theoretical structure that gives meaning. The same is true for spiritual experience: it is the sudden insight into some deep structure of reality, be it in general, or of the reality of one's own life. What is different is the consequence: while in science we then move outward, to looking for further experiential support, in spirituality and religion, these inner experiences normally have consequences for further conduct and behavior, if the experiences were profound. And similar to science, there is the need for distinguishing real experiences and true consequences from fake ones. This is nontrivial, and we have no epistemology to help us. We simply have to assert that inner experience is structurally equivalent to scientific experience,

hence, we only have to practice, meditate, replicate the experience, and that is it, then is in the same way simplistic, inadequate, and positivist as saying: simply observe, do the experiment, and you will know. You will only know what you can see within the framework of the theory you are willing to accept as true. The challenge of inner experience and of scientific creativity is to move us beyond that boundary of the known. Hence, also the framework of religion will ultimately have to be flexible to accommodate such new experience. The same is true for science: if it prohibits certain experiences and decrees certain ways of looking at the world as a priori wrong, then science is not science any longer but scientism, a religion of materialism. It then has the same structure as dogmatic religion. Hence, inner, spiritual experience, or spirituality, and good science are actually very similar. They are both about expanding the horizon of what we know and understand through experience. By the very virtue of this process, they will always modify the theoretical structures that are used to interpret these experiences, whether we call them religion, in the case of inner and spiritual experiences, or science, in the case of outer experience. Ultimately, the driver both of scientific progress and of religious fervor is the same: it is experience of our world, from the inside and the outside that gives us knowledge and insight. John Duns Scotus (1265–1308), the Franciscan scholastic writer and contemporary of Meister Eckhart, puts it in those words: *expertus infallibiliter novit* – who has had an experience has flawless knowledge.

Cross-References

- ▶ [Consciousness](#)
- ▶ [Consciousness \(Buddhist\)](#)
- ▶ [Epistemology](#)
- ▶ [Meditation](#)
- ▶ [Mysticism](#)
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- ▶ [Ritual](#)

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Experiential Philosophy

► Phenomenology

Experimental Philosophy

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Description

Experimental philosophy, or “x-phi,” applies the methods of experimental psychology to the study of intuitions. In a broad sense, experimental philosophy encompasses any work in philosophy or

other disciplines that uses experimental methods with the objective of addressing philosophical questions.

The emblem of the recent experimental philosophy movement is the armchair in flames, which symbolizes a move away from reliance on “armchair philosophy” alone. This movement, which became prominent around the turn of the twenty-first century and is becoming increasingly well established, emerged as a reaction to philosophical practice in the late twentieth century. Philosophy was perceived to have distanced itself from practical experimentation, yet philosophers were making claims thought to be empirical claims, and these were supported only by their own intuitions or those of their associates. Experimental philosophers sought to test some of these claims empirically, or in some cases to investigate questions of their own, using experimental methods rather than relying on some combination of introspection, conceptual analysis, and a priori reasoning.

The 2008 volume, *Experimental Philosophy* (Knobe & Nichols 2008), sets out an “Experimental Philosophy Manifesto,” clarifying experimental philosophy’s aims and explaining how it is a continuation of traditional philosophical practice, rather than a departure from it. Appiah makes the same point in his book, *Experimental Ethics*: “What’s novel isn’t the experimental turn; what’s novel was the turn away from it” (Appiah 2008).

Leading figures in the movement include Joshua Knobe, widely known for his groundbreaking work on intentional action; Thomas Nadelhoffer, coordinator of the *Experimental Philosophy blog* (<http://experimentalphilosophy.typepad.com>); Stephen Stich, who has used cross-cultural studies to challenge the assumptions of traditional analytic philosophy; and Shaun Nichols, coeditor, with Knobe, of *Experimental Philosophy*. Some philosophers were inspired by these researchers or others to use experimental methods; others, in various disciplines, saw a need for empirical studies to investigate philosophical questions, independently of existing work in the field, though often becoming aware of the movement subsequently. The blog

(<http://experimentalphilosophy.typepad.com>) provides details of other leading experimental philosophers, and links to experimental philosophy labs and organizations.

The movement has been viewed as controversial and faces opposition from some, but there is arguably a growing acceptance of experimental philosophy's claim that statements about philosophers' and the folk's intuitions, or about folk concepts, require empirical support, if arguments that appeal to these are to be widely accepted.

Some experimental philosophers identify with the "negative project," also called "experimental restrictivism (or restrictionism)," which seeks to demonstrate that many existing claims are based on suppositions that can be shown to be false. Others are part of the "positive project," which views experimental philosophy's scope as wider and investigates philosophical claims that are considered empirically testable, designing experiments to confirm or refute hypotheses. This distinction is not uncontroversial and is perhaps less relevant in 2011 than in the early years of experimental philosophy.

Research groups holding regular meetings include the Metro Experimental Research Group (MERG, pronounced "merge") in the USA (<http://www.yale.edu/cogsci/MERG.htm>) and the Experimental Philosophy Group UK (<http://sites.google.com/site/experimentalphilosophygroupuk>). There are a number of experimental philosophy labs, an Experimental Philosophy Society (XPS), Facebook groups, an experimental philosophy page (<http://pantheon.yale.edu/~jk762/Experimental-Philosophy.html>), providing links to a wealth of papers and other resources, and an experimental philosophy blog (<http://sites.google.com/site/experimentalphilosophygroupuk>), providing information and a forum for announcements and discussion.

Self-identification

Science

Rather than self-identifying as a science, experimental philosophy is a branch of philosophy that adopts scientific methods in the course of

investigating questions that may or may not be of scientific interest. The philosophical focus of the research carried out in this field is an essential component, so work in this area is never exclusively scientific, but the methods and statistical analysis are expected to meet the same standards as those required in the sciences. Experimental philosophers can be scientists, philosophers, or other nonscientists interested in investigating philosophical questions using experimental methods.

Characteristics

Experimental philosophy is considered a radical departure from standard philosophical methods by those who think that the practice of philosophy necessarily precludes empirical research. It is the only branch of philosophy in which empirical research is viewed as essential and philosophers are involved in investigating empirical questions, often, but not exclusively, through the use of surveys. Other methods include functional neuroimaging, behavioral experiments, and computational modeling. It differs from other contemporaneous types of philosophy in incorporating experimental work. It differs from straightforward scientific research in focusing on philosophical rather than scientific questions, and in attempting to draw philosophical conclusions from experimental results.

Relevance to Science and Religion

Experimental philosophy uses scientific methods in conjunction with the analytic skills of philosophy; it is allied with and dependent upon science, and independent of religion. It can include scientific work or support interdisciplinary work involving the sciences, especially in areas relating to concepts, moral psychology, the mind, or human behavior. It is relevant to and interested in religion only insofar as it sometimes studies attitudes to religion, the effects of religious belief, or intuitions about religious questions.

Sources of Authority

Sources of authority for this subdiscipline have emerged in various forms within the experimental philosophy community. The authority of these sources is not absolute; it derives from their widespread acceptance within the research community. Prominent sources of authority include: *Experimental Philosophy* (Knobe & Nichols 2008)

The Experimental Philosophy Page (<http://pantheon.yale.edu/~jk762/ExperimentalPhilosophy.html>)

The Experimental Philosophy Blog (<http://experimentalphilosophy.typepad.com>)

Other sources would be university research groups, courses and lectures, the experimental philosophy literature, and individual researchers in the field.

Ethical Principles

The main guiding ethical principles are those for any academic research: that work should meet certain criteria or standards, acknowledging sources and recording data accurately, for example. In experimental philosophy, there will normally be an additional requirement that experimental work comply with applicable rules and regulations concerning research on human subjects. Projects involving this kind of research will normally need to be approved by an Ethics Committee (or a representative thereof), and to meet specific criteria stipulated by the academic institution where the research is to be carried out.

Key Values

Key values are the acquisition and dissemination of knowledge, supported by empirical data; methodological rigor (both philosophical and scientific); and the development of theoretical frameworks and testable hypotheses.

Conceptualization

Nature/World

The terms are not explicitly defined within experimental philosophy, although specific conceptions of the world, such as naturalistic versus supernatural world views, are investigated in some experiments.

Human Being

The term is not explicitly defined within experimental philosophy, but a key notion that can be inferred is that of a being with intuitions about the application of concepts, about moral judgments, and about related theoretical positions, which can be investigated by the presentation of hypothetical scenarios.

Life and Death

The terms are not explicitly defined within experimental philosophy.

Reality

The term is not explicitly defined within experimental philosophy, although some thought experiments presented in vignettes may specify a particular version of reality to gauge participants' responses within that context.

Knowledge

There is no fixed definition of this term within experimental philosophy, as a subdiscipline, but folk and philosophers' intuitions about what constitutes knowledge are investigated in some experiments.

Truth

The term is not explicitly defined within experimental philosophy, but folk and philosophers' intuitions about what constitutes truth are investigated in some experiments.

Perception

The term is not explicitly defined within experimental philosophy.

Time

The term is not explicitly defined within experimental philosophy.

Consciousness

The term is not explicitly defined within experimental philosophy, although folk and philosophers' intuitions about consciousness are investigated in some experiments.

Rationality/Reason

The terms are not explicitly defined within experimental philosophy, although the rationality of behavior and folk and philosophers' intuitions about reasons and rationality are investigated in some experiments.

Mystery

The term is not explicitly defined within experimental philosophy.

Relevant Themes

Other topics that are relevant to experimental philosophy's engagement with "Science and Religion" and are critical, in that they constitute a significant proportion of the topics under investigation in the contemporary literature, include:

Intuitions

Concern about assumptions that were made in the philosophical literature about intuitions, whether of the author or attributed to the folk, was instrumental in starting up the experimental philosophy movement, and they are the focus of much of the survey-based work undertaken by experimental philosophers. Scientific work also relies at times on assumptions about what is intuitively obvious and the findings of experimental philosophy could have implications for scientific methodology.

Concepts

Concepts of various kinds have been shown by work in experimental philosophy to diverge, both

within and across different groups. Attempting to discover the nature of folk concepts by conducting surveys is one strategy used by experimental philosophers, either to seek support for positive claims or to demonstrate that certain concepts are incoherent or contingent. Concepts that are applied in some areas of scientific work may need to be revised in the light of this inconsistency.

Action

Many experiments investigate aspects of action, such as when it is conceptualized as intentional, what factors cause particular responses, or the extent to which behavior can be viewed as rational. This work can be interdisciplinary, sometimes with the objective of finding scientific explanations of action or action causation.

Free will

The folk concept of free will has been investigated in the experimental philosophy literature, along with the question of whether the concept is compatibilist or incompatibilist. Related concepts under investigation include agent-causation and moral responsibility. Work in neuroscience has also been undertaken that has implications for theories of freedom of the will.

Morality

Experimental philosophy is interested in moral judgments, how they influence thoughts and behavior, and how they are influenced by other factors. It investigates interactions between moral and other types of judgment, such as judgments about intentions, at the conceptual level, and the effects of different variables on the degree to which people behave morally.

Cross-References

- ▶ [Cross-cultural Psychology](#)
- ▶ [Experimental Psychology](#)
- ▶ [Free Will](#)
- ▶ [Game Theory](#)

- [Methodology in Psychology](#)
- [Neuroethics](#)
- [Neuroscience](#)
- [Philosophical Anthropology](#)
- [Philosophy of Mind](#)

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Experimental Psychology

- [Cognitive Science Psychology](#)

Explanation

- [Attribution/Attribution Theory](#)

Extended Cognition

- [Externalism and Internalism](#)

Externalism and Internalism

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Related Terms

[Cognitive niche](#); [Extended cognition](#); [Individualism](#); [Intentionality](#); [Interiority](#); [Mental events](#); [Mental representations](#); [Mind](#); [Relationality](#); [Self](#)

Description

Until quite recently, our conceptions of mind, self, and soul have held these to be internal to the central nervous system of our biological organism, an internal/external boundary which has its roots as far back as the early modern emergence of science. Rejecting both the individual possession and locational internalism of Descartes, there is a growing externalism within scientific and philosophical studies of mind which view it as embodied, enactive, encultured, and interwoven with a social and technical web and as a construction not limited to the boundaries of the individual organism (Wilson 2004). Originating a generation ago in the *content externalism* of Hilary Putnam and Tyler Burge (1986), that the semantic content of mental states is often dependent on factors external to the subject, the last decade has seen the emergence of a substantially stronger *process* or *vehicle externalism*, Andy Clark and David Chalmers' view that the structures or mechanisms making various mental states possible may themselves extend beyond the skin (Clark and Chalmers 1998). Many of our mental states are hybrids, spread across internal and external materials, biological or not. Vehicle externalism can also be rooted in a relational ontology of self, which has implications for a number of religious themes, from the nonduality of enlightened Buddhist views (Rockwell 2005; Thompson 2007) to the Western theological understanding of redemption, which may be better understood as originating in our relational externalities.

Externalism

Externalism is, quite simply, the view that “the mind ain’t in the head.” It is the claim that the mind is constituted by the mechanisms and resources with which we use to think. It asserts that the constitution of thoughts, beliefs, and desires often include, even require, states and processes external to our biological organism. This is not unlike the *extended phenotype* in evolutionary

biology. In the case of human beings, our cognitive niche includes many things by which we extend our minds into the environment, like imitation, symbol use, as well as external artifacts, and even social practices and structures, from which emerge the possibilities of distributing cognitive tasks across individuals or accumulating knowledge across generations. That does not mean that the mind's location is separate from heads and bodies, as these are proper parts of a mind. Mental phenomena are hybrids that couple events in the world to physical processes in the nervous system. According to Mark Rowlands (2003), this is the most important development in the philosophy of mind in the latter half of the twentieth century, rooted in the phenomenological philosophy of Husserl, the linguistic philosophy of Wittgenstein, and the existentialism of Sartre.

The *parity principle* states that “if something plays a role in cognitive activity, such that, were it internal we would have no difficulty in concluding that it was part of the mind, it should be counted as part of the mind whether it is internal or not” (Clark and Chalmers 1998). If Inga and Otto both set out for the Museum of Modern Art, Inga by recalling its location on 53rd Street and the Alzheimer-suffering Otto by consulting his notebook, there is no reason to treat their memories differently, as both are just as accessible, reliable, and transparent in use. Even paradigmatically mental events, like biologically instantiated memory, are not constantly available, not always easily accessible, and not automatically endorsed and can be implicit or procedural. It can also include the downloading to external artifacts which distributes the cognitive load of a task, from paper and pencil to the electronic prostheses of calculators or cell phones.

Parity may only be a special case of a much wider *complementarity principle* which argues, on grounds of both individual differences and historical variations, that the advantages of external resources, both physical and symbolic, might be in *not* merely duplicating internal functions but in developing capacities otherwise unavailable. Different cognitive artifacts do

actually have different effects on our brains, as brain changes in literate populations show and historical and cultural differences in the uses of such artifacts suggest. As Clark (2008) points out, the questions about the range and variety of cognitive scaffolding and the different ways they can enhance (or damage) performance are empirical questions. The nonlinear, complex, and iterated couplings between brain and external resources, in which each may have effects on the other, render any boundary highly permeable, even the extent of context dependence varying widely across contexts and tasks. Such couplings may be precisely what make us the kind of creatures we are, easily extending our minds onto the environment, including the shared social space with which we are so mimetically adept. Indeed, given our extended childhoods, and the extensive shaping of our neuroplasticity during socialization, they make human history and civilization possible.

Internalism

Externalism has been the subject of lengthy controversy, and one can defend a more conventional *internalist* view, that the mind and all properly cognitive processes are contained within the brain. Adams and Aizawa (2008) argue that the “mark of the mental” has other necessary conditions for events to count as cognitive. They must involve *intrinsic content*, and they must be *causally individuated*. A third suggestion is that they must be *informationally integrated*.

Intrinsic content refers by virtue of the *natural* capacities of mental events rather than by *conventional* aspects of human symbols, which must be finally rooted in the natural to avoid an infinite regress. If the meanings of words depend upon the conventions of language, then their externalizations should not count as properly mental states. The problem is that even if this were true, proper mental states are not *limited* to such content, and there are plenty of examples of ordinary thought that *does* use such conventional systems. There are also clear cases of internal representations lacking intrinsic

content, which we do in fact count as mental content. In which case, why not count those which *include* external representations and artifacts.

The requirement of *causal individuation* is that proper mental states must be able to be distinguished in terms of causal regularities, and the set of potential external tools and resources which might be coupled with brains is simply too large and disparate to ever form the object of a science. Unfortunately, this may be one of the very points of contention: Even if *neurological* events and processes can be individuated as a natural kind, this does not entail that mental events can be. Is the mind identical to an entity closed under a relatively low level of causal regularities, if it is not so closed at the functional level of mental states, and their ineliminable intentionalities? Moreover, even putatively internal distinctions, e.g., between automatic and controlled processes, suggest that the mind itself is compounded of more than one natural kind, as are the objects of a number of other sciences.

A third objection is that while certain external supports contain information which guides behavior in the same way that beliefs do, they lack *informational integration*. Beliefs are normally updated holistically, interconnected to a wide network of beliefs. When Inga discovers that my car has broken down, she is likely to also update her belief that I will be driving the carpool tomorrow. An Alzheimer's patient who adds the former belief to a list in a notebook may be surprised when tomorrow's schedule no longer holds. Nevertheless, such integrations also have a time course that can be interrupted, attention which must also be sustained, and connections which are not always made, leaving beliefs with varying degrees of separation. Hence, while this may be a normal characteristic of ordinary beliefs, it is not a necessary one.

Religious and Theological Implications

Teed Rockwell (2005), drawing on the hypothesis of extended cognition, has explicitly endorsed a nondualist model, arguing that even if the brain has enduring substance, the mind itself is

a conventional rather than a natural kind, and there is no sharp border between mind and world. Evan Thompson's Buddhist view is that it is the egocentric attachment to a mentally imputed self that is the source of all suffering, and it suggests ethical practices of empathic imagination, to open oneself to a primary intersubjectivity prior to the imputation of "self" and "other" (Thompson 2007).

There are deep and historical contributions of Christianity to the understanding of interiority as separate, individuated, and bodily restricted and of redemption as a private, individual relationship with the sacred. There are, nevertheless, contemporary theological resources for an externalist view, including Barth's conception of the *imago dei* as existing not in individuals but in relationship itself and Karl Rahner's anti-Platonist view that the substantial unity of the human person is not merely *in praesenti statu vitae* but that we are inescapably wedded to the world. Stanley Grenz's encyclopedic work, *The Social God and the Relational Self* (Grenz 2001), sees a person not as a static entity, determined by its boundaries, but as a drive toward both integration and self-transcendence, and we are ourselves only in communion. What we are *about* is outside ourselves, is *other*. What we *are* even as individual selves are not internal spaces, connected to each other, but literally, and externally, composed of each other.

Cross-References

- [Cyborgs](#)
- [Empathy](#)
- [Epistemology](#)
- [Memory](#)
- [Philosophy of Mind](#)
- [Plasticity](#)
- [Relational Ontology](#)
- [Theoretical Psychology](#)

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Extraterrestrials

► [UFO Cults](#)

Eyewitness Memory

► [Forensic Psychology](#)

F

Fable

► [Myth](#)

Faculty of Innovation

► [Imagination](#)

Fairytale

► [Myth](#)

Faith

► [Hope, Theology of](#)

Faith and Belief

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Related Terms

[Belief](#); [Religious faith](#)

Description

A belief is a mental state (or thought) that has a propositional content (i.e., being either true or false) and which can function as a motivation or justification for someone to behave in accordance with that belief. If John believes that it is going to rain today, this belief explains why he takes an umbrella with him. Beliefs are different from knowledge in the sense that beliefs have the character of being slightly uncertain or provisory (i.e., liable to revision). If I believe I have left my jacket in the garage, I reckon with the situation that my jacket is not in the garage. However, when I go to the garage and find my jacket there, I *know* that I have left it in the garage, and if after having found my jacket in the garage I would say that I still *believe* I have left my jacket in the garage will be taken as silly or as misunderstanding the concept of knowledge.

“Faith,” “belief,” and “religious belief” are sometimes used interchangeably and treated as being synonymous, while in other contexts “faith” and “belief” are seen as opposites. So, e.g., in the cognitive sciences of religion, cognitive scientists and anthropologists are said to study religious belief, where they in fact study the faith – the beliefs and practices – of religious people (Atran 2006). Moreover, many languages have only one word which in some contexts denotes “belief” and in others “faith” (compare the Dutch *geloof* and the German *glaube*).

However, there is a difference in connotation between “faith” and “belief,” where “belief”

refers quite obviously to a propositional content, but where speaking about “faith” emphasizes an attitude of trust and confidence, which can be compared to trust in another human person. Consequently, a belief can be proven false, but this is not the case with faith. For example, someone claiming that “Jesus died around 30 A.D.” is expressing a belief that could be checked in principle and that is either true or false. Someone who says “Jesus Christ is my Lord and Savior” expresses a certain attitude of reverence and worship toward the person of Jesus Christ which cannot be said to be either true or false. Thus a belief can be true or false; faith cannot be said to be true or false but can be sincere, (dis-)honest, deluded, misplaced, and so on.

Faith does, however, presuppose certain beliefs. In both of the aforementioned examples, the person speaking presupposes a belief in the existence or reality of Jesus, although the beliefs in both examples may have different content. In the first case, the person may presuppose the belief in a historical person who died around 30 A.D. In the second case, the person presupposes the belief that Jesus Christ is the historical person who was crucified around 30 A.D. but who is also the risen Son of God. Depending on the faith of the person who makes the second claim, there may be presupposed a whole set of other religious beliefs about the existence and attributes of God, the Trinity, etc., although the person does not have to be conscious of those beliefs at the moment she makes her claim about Jesus Christ.

The difference between faith and belief is sometimes also expressed in terms of “belief that” (belief) and “belief in” (faith). The first expresses propositional content, such as “I believe that two and three makes five.” The second expresses an attitude, such as in the case of “I believe in him,” which may express, e.g., Jane’s conviction that John is capable of writing his first novel. In that case, we say that Jane has faith that John will succeed.

However, often the distinction between faith and belief is not so clear. The philosopher Ludwig Wittgenstein (1889–1951) gives the following example: “Suppose someone were a believer and

said: ‘I believe in a Last Judgment,’ and I said: ‘Well, I’m not so sure. Possibly.’ You would say that there is an enormous gulf between us. If he said ‘There is a German aeroplane overhead,’ and I said ‘Possibly. I’m not so sure,’ you’d say we were fairly near” (Wittgenstein 1978, p. 53). Although at first sight the two claims about the Last Judgment and about the aeroplane overhead have identical grammatical structures and thus may confuse someone, we could say that the first example is a matter of faith, while the second is a matter of belief. We could check in principle whether the aeroplane overhead was of a German type to verify the propositional content of the belief “There is a German aeroplane overhead.” However, someone who believes in the Last Judgment has not simply a belief about the Last Things. Wittgenstein says: “But he has what you might call an unshakeable belief. It will show, not by reasoning or by appeal to ordinary grounds for belief, but rather by regulating for all in his life” (Wittgenstein 1978, p. 54). Believing in the Last Judgment entails an attitude toward one’s entire life, and facts have only limited influence in that they neither verify nor falsify faith.

Another example of the relatedness and difference between belief and faith is John Wisdom’s (1904–1993) parable of the gardener (Wisdom 1951, p. 192 ff.). Two people return to their long neglected garden, and find between the weeds a few of their old plants in very good condition. One of them infers that there must have been a gardener who took care of these plants, whereas the other denies the existence of such a gardener. Both start an elaborate investigation as to the presence and activity of a gardener. As Wisdom (p. 193) emphasizes, “Each learns all the other learns about this and about the garden,” which means that they have equal access to the relevant facts (i.e., the propositional content of their beliefs is identical). But in the end, whereas for the one the faith in the presence and activity of a gardener remains despite the facts, the other believes that there is no gardener because of the facts. The facts are the same, but the attitude of the two persons toward the facts is different.

Although matters of faith and of belief are not often discussed explicitly in literature on science and religion, they are often underlying discussions of religion versus science. For example, creationists believing in the literal truth of the Genesis story have a different attitude toward the confession “I believe in God, Creator of heaven and earth” than other believers. For a creationist, the confession expresses the belief that God is the cause behind the Big Bang and the source of life on earth. This belief can be verified or falsified. The controversy over Darwinian evolutionary theory arises from the underlying belief that evolutionary theory is in direct confrontation with the belief that God is the Creator of life. Creationists thus fear that Darwinian evolution falsifies religious belief. Consequently, strategies have to be found (e.g., Intelligent Design) that falsify Darwinian theory and that prove the plausibility or even the truth of the creationist beliefs.

For many other religious believers, however, the biblical Genesis narrative and the confession “I believe in God, Creator of heaven and earth” is taken to give religious expression to the experience of the contingency of all-that-is, that the entire world ultimately depends for its existence on something (or someone) else that is not created. While the creationist belief may result in an attitude toward science, the second interpretation of the expression results in a faithful attitude toward the world as a whole. Yet, similar to the case of Wittgenstein’s example of the Last Judgment, both creationists and more liberal believers refer to the same expression.

Cross-References

- [Epistemology](#)
- [Epistemology, Reformed](#)
- [Existentialism](#)
- [Meaning, the Concept of](#)
- [Philosophy of Religion](#)
- [Realisms in Philosophy of Religion](#)
- [Religiosity](#)
- [Theological Anthropology](#)
- [Truth](#)

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Faith and Reason

- [Catholic Sociology](#)

Fallacy

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In general, arguments which are faulty or wrong, arguments that seem to be good but have some kind of error, bias, or ambiguity. Fallacies are arguments that transgress either formal rules of logic (against deduction), or some precept of scientific method (against induction, statistics, probability) or some criterion governing dialogue (against good persuasion dialogue). The last kind is known as informal fallacy.

Falsafa/hikma

- [Philosophy in Islam](#)

Falsifiability

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A very influential theory developed by Karl Popper (1902–1994). Only propositions, hypotheses, and theories that can be falsified can be considered scientific. Theories that do not admit of empirical counterexamples have no criteria on which they can be judged true either. Whereas it is easy to find some kind of empirical support for a theory, it remains much more difficult to avoid an empirical contradiction of a theory. Only theories that risk such contradictions can be considered scientific. Theories that put forward claims and arguments that cannot be contradicted remain ungrounded speculations.

Fancy

- [Imagination](#)

Fantasy

- [Imagination](#)

Fatalism

- [Causality in Physics](#)

Fate

- [Eschatology](#)

Feeling

- [Emotion](#)

Feelings

- [Passion and Emotion, Theories of](#)

Feminism in Judaism

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Related Terms

[Jewish feminism](#)

In 1972, a group of ten feminists from New York calling themselves *Ezrat Nashim* (a Hebrew term for the women's section of a traditional synagogue) petitioned the Conservative movement's rabbinical convention, demanding that Jewish women's sexual equality should entail their being subject to the same religious obligations as men. Underpinning this petition for women's full participation in prayer and study was the argument that Jewish women labor under a double social marginalization: that of being Jewish and female, and that masculine values and experiences have alone authorized Judaism's history, religious knowledge, and leadership.

The 1972 petition was but one instance of how the advances won by the Women's Liberation movement and other countercultural forces, in concert with increasing levels of advanced

religious, political, and historical education for women, were being imported into liberal synagogues, consciousness-raising groups, academic curricula, and other fora, by feminist rabbis, historians, theologians, philosophers, artists, and novelists, as well as by women with less public roles in communities all over the world, but especially among well-educated, middle-class Ashkenazi Jews (of central and eastern European origin) in Canada, the United States, and Britain. Since then, resistance to intra-Jewish sexual discrimination has centered on rereading scriptural, halakhic, liturgical, and other classic texts and reclaiming and creating sexually inclusive rituals and rites of passage, as well as vastly expanding historical, sociological, ethnographic, and cultural knowledge of Jewish women's lives. Jewish feminist art and literature's expressive contribution to the reimagining of women's past and future has, from the outset, been central to the project of rendering women the speaking subjects and agents of their own experience.

Because Jewishness also encompasses a culture that exceeds its own religious foundations, not all Jewish feminists are inclined to the reform of Judaism as a religion alone, but focus instead on the ethical, political, and artistic participation of women in a Jewish life that is considered separable from its devotional forms. Indeed, some Jewish feminists repudiate religious observance altogether as being irredeemably incompatible with feminist values, and others still may principally identify as Jewish feminists in solidarity against perceived antisemitism and antisemitic anti-Zionism in the wider women's movement. That being so, Jewish feminism is also unified by a conviction that the full humanity of women is the function of an essentially Jewish universalistic prophetic ethic, not a secular post-Enlightenment one. All Jewish feminists are concerned, to a lesser or greater degree, with the re-narration of Jewish history and the reconceptualization of tradition in ways that recognize women to be agents and resisters, not merely the victims of patriarchy and antisemitism, and as having an evolving, dynamic history of their own that is not always domestic and ancillary to that of men.

But it is important to note that Jewish feminism is not something espoused by women alone. Seldom is it acknowledged that liberal Jewish religious feminism's agenda had already been set by male leaders in the late eighteenth and early nineteenth centuries when the Reform movement, with its spirit of early egalitarianism, sought to make services more spiritually attractive and relevant to women (Meyer 2011). And more immediately, Jewish feminism developed as both praxis and discourse in a postwar context of gendered change affecting men as well as women: not least the traumatization of Jewish masculinity in the Shoah; the emergence of new, more macho, Israeli masculinities, and by the erosion of traditional masculine roles and identities in the wake of the sexual revolution and increasingly disproportionate numbers of women in many liberal congregations and rabbinical training schools. Jewish feminism has also influenced the sexual-political commitments of men in the neo-hasidic pro-feminist ► [Jewish Renewal Movement](#), and among generally non-orthodox male rabbis, some of whom are also gay activists in other Jewish sexual-political arenas.

Jewish feminism is also found among those on the Jewish fringes of neo-paganism, and on the left wing of Modern Orthodoxy. Its influence is felt even among some in Haredi (Ultra-Orthodox) circles, even if, collectively, the Haredim would strenuously deny it. It is, nonetheless, arguable that renewed Haredi insistence on women's traditional maternal and other enabling priorities, as well as ever more stringent requirements for female modesty, has constituted something of a contemporary backlash against the perceived threat of feminist ideas.

The different ways in which feminists use gender as a category of analysis to fund altered and renewed religious practice fall into three main categories. Operating under the Orthodox rubric that Jewish law is divine in origin, and that their gendered difference from men is divinely ordained, Modern Orthodox feminists, such as those within JOFA, the Jewish Orthodox Feminist Alliance, founded by Blu Greenberg in 1997, have sought to adapt Jewish law to better serve women's interests, though only so far as

men (effectively) consider Torah might permit. Since they would consider Judaism to be a practical and social religion before it is a speculative one, the view that Jewish feminist goals will be achieved by halakhic (religio-legal) reform rather than through a revised theology has predominated in these quarters. Orthodox feminism, therefore, tends to focus on specific halakhic problems, such as inequalities in the initiation of divorce; the possibility of developing forms of marriage that are not grounded in *kinyan* (acquisition of the wife by the husband); the requirements of women's *tstnius* (modesty) in dress, and fostering women's religious education, leadership, witness in religious courts, and time-bound ritual observance.

Although hardly indifferent to the rectification of halakhic inequalities, liberal feminists, qua liberals, are far less bound by the rule of law and custom and have been differently preoccupied. Supporting Judith Plaskow's early and well-known claim that the reform of the Jewish theological imaginary must take logical priority over the reformulation of halakhah, the revision of theological language, as well as the language of prayer books toward gender-inclusive or gender-neutral language has typically accompanied efforts to retrieve or create new liturgical sources and theological traditions (e.g., Plaskow 1990; Adler 1998; Raphael 2003). Misogynistic texts and traditions, however canonical their status, are considered to have forfeited their sanctity on those grounds alone. Non-orthodox feminists have also devoted much of their energy to reclaiming rituals considered to have been commandeered by men such as those attending the celebration of the new moon (Rosh Chodesh). Women's *seders*, with the story of liberation from slavery re-narrated in texts written for the occasion by and for women, have also been a social and symbolic focus of Jewish feminist activism since 1976 when the novelist E. M. Broner first held one in her Manhattan apartment, joined by other prominent Jewish feminists of the day such as Gloria Steinem and Bella Abzug, using her own and Naomi Nimrod's *The Women's Haggadah*.

More liberally inclined feminists tend to be of the view that Orthodox feminists can do little more than master a male-governed, masculinist halakhah that has actually made rather few concessions to women. Young Orthodox women, it is widely felt, are not transforming the tradition or learning to speak in their own halakhic voice. In 1998, in her book *Engendering Judaism*, the formerly Orthodox Rachel Adler argued that halakhah should be true to its Hebrew etymological root and take the form of an open-ended path-making, rather than remaining the closed halakhah of patriarchal norms and assumptions. She has not been alone in thinking that when women merely inherit halakhah without changing it they continue to defer to its androcentric narratives and requirements. It is futile for women to attain hermeneutical excellence when such does not methodologically and ethically challenge the texts' existing patriarchal precedents, priorities, and norms.

In her recent response to Adler, Tamar Ross, from an Orthodox Israeli perspective, explained that she cannot subscribe to a Reform commitment to the creation of a (rather than "the") halakhah, because such would fail to acknowledge the divine origin of a tradition that is essentially consensual in character and that derives its power as a cumulative revelation. If Orthodoxy is patriarchal, she claimed, it is not *only* oppressive, but also enables the transmissive continuity of the tradition and preserves the Jewish home and family that is the primary locus of the lived tradition (Ross 2004; Hartman 2007).

With their emphasis on the possibility of historico-ethical progress, liberal types of Jewish feminism are, inevitably, the most historically informed. As Paula Hyman and other Jewish feminist historians have always insisted, reclaiming unrecorded women's histories of leadership, learning, and activism changes the paradigm of what constitutes Jewish tradition and community. Liberal feminists, without any sense that traditional gender roles are divinely ordained by God, are keenly aware of how the antisemitic feminization of Jewish men's otherness has historically complicated the gendering of Jewish identity and practice, or how the history

of modern Jewish identity has tended to overestimate the extent of “assimilation” because it fails to recognize that women’s appointed role as domestic guardians of a family’s Jewishness allowed men to acculturate in public but retain their Jewish identity at home.

Thirdly, and overlapping in some respects with liberal Jewish feminism, there are also types of “postmodern,” post-traditional, Jewish feminism that have rejected what they see as the tendency of both Modern Orthodox and Reform feminisms to foster the kind of sexual equality that renders Jewish women merely honorary Jewish men. Postmodern Jewish feminism, drawing on the radical cultural feminism of the late 1970s and 1980s, as well as elements of contemporary Third Wave feminism, has taken a more eclectic, self-defining direction that is, inevitably, the least concerned about women’s exclusion from a canonical tradition written by and for men. More irreverent in approach, and with a greater willingness to embrace denominational fluidity, ethnic hybridity and queer or nonbinary sexualities, Third Wave Jewish feminists have demoted the classic Second Wave hermeneutic of *a priori* suspicion in favor of one in which a text or observance is not rejected on the assumption of its discriminatory misogyny, but reread for the ambiguities, multivocalities, instabilities, and suppressed possibilities in its construction of gender (Ruttenberg 2001, 2009). This approach, careless of any charge of syncretism or heresy, might therefore include elements of contemporary Goddess feminist spirituality and a vernacularized Jewish mysticism.

In short, the classic Second Wave feminist affirmation of the full humanity and rational, moral and spiritual competence of women has to varying degrees transformed all but the most Orthodox personal and communal Jewish relationships. Women have now joined almost all Jewish learning communities. And although it remains the case that most Jewish women still know traditional Jewish thought and practice from the perspective of canonical texts in which women are the marginal, nonnormative Other, attitudes to women in even relatively traditional communities have seen some quite

dramatic changes in their organizational, ritual, and educational spaces. In the liberal denominations, women’s recently acquired access to advanced religious education has driven liturgical revision and increased opportunities and spaces for women to study Talmud and other classic sources in seminaries and universities toward rabbinic ordination or academic posts in Jewish Studies. But Orthodox women, while excluded from the rabbinate, are also now able to study and teach Talmud in women’s yeshivot (seminaries), with some of them becoming halakhic advisors, though not decisors (*poskim*), particularly with regard to laws governing the intimate aspects of women’s lives, such as menstrual purity. In the United States especially, female cantors and synagogue presidents are now commonly accepted in all but the most conservative congregations. It remains to be seen whether the grandchildren of the Jewish feminists active in the closing decades of the twentieth century will explicitly identify themselves as Jewish feminists, but there is little doubt that Jewish girls’ expectations of their spiritual and intellectual choices and entitlements have been changed irrevocably by the movement.

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Feminism in Islam

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Women, Islam, Qur'an, Traditions, Veil, Secularism

In the seventh century, an Arabian trader launched a revolution in social norms that was to shape a faith-based community for 14 centuries. He was the Prophet Muhammad, the first feminist in Islam. In his life and in the revelations that he began to receive in 610 when he was 30 years old, Muhammad became the vehicle for a religion that paid particular attention to the rights of women.

The Qur'an and the Sunna, or the sayings and actions of the Prophet as witnessed by his companions and passed on through the ages, guarantee women life, wealth, and happiness. Before the advent of Islam, female infanticide was a practice among the Arabian tribes. Muhammad forbade it. In a chapter dedicated to women, the Qur'an mandates a woman's right to a dowry and to a half share of inheritance that will remain in her name. Polygyny that was rampant in what has come to be called the Age of Ignorance was severely curtailed. The number of women that a man might marry was reduced to four, and the conditions surrounding the right to marry more than one woman at a time were spelled out. Beyond the first wife, a man might only marry one or more women if they were widows with children. In other words, polygyny

was a form of social security for women whose husbands had died and left them without resources to provide for themselves and their children. Women's rights to happiness in marriage were further protected by a contract that allowed them to stipulate what they expected from their partner. If they did not relish the thought of sharing their man with another woman, they could write such a clause into their contract. Women could demand a man's right to sexual pleasure. Any violation of the contract would liberate them from the bonds of marriage. Women are declared equal with men, created at the same moment out of a single soul, and not wrought out of a man's rib. The introduction of evil into the world is not blamed on a woman, but it is the fault of humanity writ large. Such were the laws sent down from heaven. They were practiced and supplemented in the life of the Prophet.

Muhammad loved women, none more so than his first wife Khadija. She was 15 years his senior and his boss, and it was she who proposed to him. She was the first person to believe in his message and to reassure him that the voice he was hearing was not Satan's but the Angel Gabriel's. His tenderness toward their daughter Fatima was legendary. He did not marry other women until after Khadija's death in 619, and most of the nine women he married were in need. His last and youngest wife Aisha became his greatest confidant, and it is from her that we now have the largest number of traditions that make up the Sunna.

The revolution was betrayed within the first years of the caliphate. The four so-called rightly guided caliphs or successors to the mantle of the Prophet did not follow his lead in caring for the welfare of women. The most noteworthy example can be found right in the heart of the family of the Prophet. Upon the death of her father, Fatima expected to be given her share of the inheritance, but she was denied. Abu Bakr and his entourage claimed that the members of the family were exempt from conditions prevailing for others. When Fatima protested, she was told that her share was to be divided among needy Muslims. Social welfare was invoked to deprive a woman of one of her sacred rights.

That was the beginning of a decline in the moral and social well-being of Muslim women. The swift spread of Islam across Asia and Africa brought Muslims into contact with other cultures and religions that were less solicitous of the rights of women. For the Byzantines, Sassanians, and Jews, women were second-class citizens without basic rights. Whenever possible they were to be kept out of the public eye, expected to devote themselves to domestic duties. When women, especially middle- and upper-class women, ventured out of the house, they were to be shrouded in an all-encompassing garment that indicated their status as possessions of men who could afford to keep their women at home. As Muslims adapted to these new environments, they adopted some of their norms and values. That was how the veil became coded Islamic, the right to knowledge basic to the message of Islam was obfuscated, and the misogynist tradition concerning women's lack in religion and reason was invented.

The manufacture of false traditions, especially ones connected with women, became a cottage industry, and in the ninth century two legal scholars started to clean house. Abu 'Abdallah al-Bukhari and Muslim ibn al-Hajjaj devised a way to distinguish the weak and false traditions from the sound, or *sahih*, ones: "They sifted through 360,000 Traditions to come up with no more than 10,000 sound ones, thereby invalidating 350,000" (S&H, 234).

Their compilations of sound traditions, known as *Sahih Bukhari* and *Sahih Muslim* or *The Two Sounds*, became the unquestionable source for information about the Prophet's life and therefore the sure foundation for the Islamic legal system. Nonetheless, many continued to invoke false traditions and to invent new ones to justify their blatant abuse of women.

Literacy was central to the vouchsafing of women's rights. As long as women were denied education, they remained ignorant of their rights, and men could continue to fashion a world of privilege for themselves. Over time, it was primarily women from the upper classes who learned to read and write and to demand equal opportunities with the men. They were often

members of the rulers' households, like the Valide Sultan or mothers of the Ottoman rulers during the sixteenth and seventeenth centuries. In most cases, their knowledge did not trickle down to the masses, and the oppression of women in Muslim societies became institutionalized.

It was only toward the end of the nineteenth century that middle-class women began to research and assert their rights in Islam. And they did so in tandem with women around the globe. Modernity was marked above all by the visibility of women in public places, and the contact established between Europe and Muslim majority countries emphasized to progressive and conservative Muslims alike the role women should play for a society to be considered modern. The veil and gender segregation came under attack as reformists tried to understand why it was that their societies appeared to be so much less developed than those in Europe. Was the absence of half the population from the public sphere a reason to consider?

Obviously it was, but there was a major problem in answering this question. Women's complaints of gender discrimination seemed to echo the colonizers' criticism of the societies they wanted to control and whose resources they wanted to own. Indeed, the advent of colonialism with its so-called feminist civilizing mission jeopardized the call for women's education and presence in public affairs. Muslim men asserted the need to protect national honor, aka women, from the prying eyes of French, British, and Italian men. At a time when it was clear that women had to play a major role for a society to modernize, the civilizing missions of Europe into Asian and African countries led to a further seclusion of women and renewed insistence on the Islamic imperative of the veil. Women had to be circumspect in articulating any criticism of Islamic norms and values lest their criticism serves the purposes of the enemy.

While it is nineteenth-century male reformists in Lebanon and Egypt who have been recognized for their efforts to change misogynist norms and values, women were also active even if in less

visible ways. The feminist encyclopedist Zaynab Fawwaz and the writers Mayy Ziyada and Aisha Taymuriya were pioneers of a women's movement in the Arab world. In 1892, the first official women's magazine was published in Lebanon, and during the following 30 years, several more women's journals appeared.

The women's press provided space for women to explore the possibilities of participation in the public sphere. Biographies of famous foremothers in Islamic history inspired women to go against convention and to demand the same rights that women at the time of the Prophet Muhammad had enjoyed. He had said that all Muslims should seek knowledge even if it meant that they had to travel as far as China, and these women reiterated his call.

Muslim feminists were careful not to compare themselves with western women. They knew they would be accused of cultural betrayal if they held up colonial societies as being in any way worthy of emulation. Further, colonial leaders had used local men's bad treatment of their women as an excuse to intervene in the private lives of citizens in countries they wanted to dominate. Their superficially feminist position was transparent, and anyone calling for a transformation in gender relations in order to become more western might be suspected of being in collaboration with the outside oppressors.

In the turn of the century, Egypt women began to participate collectively in political culture. In March 1919 Sa'd Zaghlul had asked the British, who were then occupying Egypt, to send an Egyptian delegation, or *wafd*, to Versailles where the Arab world was to be carved into European spheres of control. His request was denied, and he was deported. Immediately, demonstrations were held in many Egyptian towns, and the Wafd Party came into existence. Among the many protests, a "ladies' demonstration" in Cairo hit the headlines. Most of the participants were wives of prominent men, and their leader was Safiyya Zaghlul, Sa'd's wife. Calling themselves "mothers of the nation," women nationalists drew an empowering parallel between family and nation that demanded attention to women's roles in the political arena.

After her husband's departure into exile in 1919, Safiyya continued to hold meetings in their home, the so-called house of the nation. People named her "mother of the Egyptians," and she in turn addressed Egyptians as "devoted sons." Less than a year after the end of World War I, Egyptian women were widely acknowledged to be essential to the success of the anti-colonial struggle (Baron 2005, 135–161). These pioneers foreshadowed the New Woman who did not veil, who did not live in a harem, and whose marriage was not arranged. She was educated and happy in her bourgeois family with a loving husband by her side. When this loving husband died, as did Safiyya's in 1927, the wife was expected to fight for both women's rights and the rights of the nation that were then conflated. To counter this secularized image of the New Woman, the Muslim activist Labiba Ahmad introduced the image of the "new Islamic woman" (190) who took part in society even if behind the veil. Her paper *Al-Nahda al-Nisa'iya* (Women's Awakening) took the lead in promoting the image of a modern, believing woman.

Women were revealing the patriarchal assumptions at the core of nationalist and reform movements whether European and secular or male dominated and Islamic. Founding clubs and associations, they demanded reforms in both religious and civil laws and campaigned for women's rights to education, suffrage, and labor.

In order to dispel doubts and accusations that all they wanted was to become western and secular, some feminists justified their demands using the language and argumentation of Islamic reformers. Concerned not to raise anxiety about their demands for greater equality and visibility, they used family-oriented and socially conservative language. Far from derailing moral norms, their revolution would enhance them and contribute to economic and political progress. Many promoted a modern even if still patriarchal bourgeois nuclear family.

The face veil became inordinately important in the debate over Muslim women's rights, and elite women were at the vanguard of the fight to remove it. By the end of the nineteenth century,

Christian women had generally unveiled, and so the veil acquired a religious meaning when it was Muslim women only who were expected to wear it. Feminists were careful not to link the veil with Islam lest they empower the shaykhs to use counterarguments. Instead, they might couch their opposition to the face veil in physical terms – it was bad for women's health – or in social terms – segregation was bad for society as a whole.

Throughout the twenties, women were testing reactions to unveiling. In 1920, the Syrian Nazik al-'Abid took off her veil in order to fight the French in the battle of Maysoloun. In 1923, Huda Shaarawi, president of the Egyptian Feminist Union, shocked the Muslim world when she stepped off a train in the Cairo railway station with her face uncovered. About the same time in Turkey, the father of the new republic Atatürk launched his secularism campaign with an attack on Islamic symbols, including turbans and veils. In the 1930s the Shah of Iran outlawed the face veil.

Whatever their approaches to women's public assertiveness, there was no denying that a feminist revolution was under way. Technology was transforming the house, and social arrangements in urban arenas were changing as rural migrants used to gender integration moved to the cities.

The feminist revolution, especially against misogynist religious authorities, was underwritten by a widespread attack on religious stagnation and corruption among the shaykhs. In 1926, the blind Egyptian scholar Taha Husayn caused an outcry when he published his autobiography entitled *The Days*. It uncovered corruption pervading religious education. He was harshest on the Azhar scholars who were outraged at such an assault on the central institution of Islamic education.

Muslim women in Asia and Africa began to appear in public their faces uncovered, the upper classes in the Levant and Egypt wearing elegant turbans, flapper dresses, silk stockings, and high heels. Such were the provocations that drove some Syrian shaykhs in the summer of 1927 to pressure the French mandate authorities to order women to veil. Their pronouncement encouraged some zealots to throw acid on women who dared to leave the house unveiled.

Like Egyptian women 8 years earlier, Syrian women took to the streets and a 19-year-old Lebanese Druze named Nazira Zayn al-Din (1908–1976) took to her pen. Citing Qur'an, Sunna, and religious authorities on almost every page, she declared that the veil was not Islamic, but rather a custom. She wrote over 300 pages about the harm to society of covering women's faces and argued for women's equality with men. Within a few months she was done, and in April 1928 she published *Unveiling and Veiling: The Liberation of Woman and the Renewal of the Islamic World*. The second half of the title was a clear salute to Qasim Amin, the Egyptian lawyer who in 1899 had published *The Liberation of Woman*, a book that had caused a stir across the Muslim world (Zayn al-Din 1928/1998, 1929/1998).

In all her writings, Zayn al-Din insisted on the need for *ijtihad*, or independent reasoning, when dealing with matters of faith. Her passionate plea to women to use their minds, to develop individual powers of reasoning, and not to obey blindly the dictates of the shaykhs comes from her readings of reformers like the Iranian Jamal al-Din al-Afghani (1839–1897) and the Egyptian Muhammad 'Abduh (1849–1905), the respected modernist reformers in Egypt who had said that Islam demands the use of reason. They believed that faith without reason was not true faith. Like them, she declared that women's invisibility drags a whole society down and makes it lag behind others that have included women in public space. No society can be just as long as women are not respected and their rights are not protected. That is the universal message she frames in the particular language of the veil and the seclusion of women. The veil is not the sign of lack and inferiority; it is its instrument. *Unveiling and Veiling* created a furor around the world. Letters poured in and the book was reviewed in major journals and newspapers around the world. Some loved it; some hated it. Zayn al-Din collected the letters and reviews and published them the following year in *The Girl and the Shaykhs* (1929).

During the middle decades of the twentieth century, wars of independence from European

rule in Muslim countries, like Algeria, Palestine, and Niger, engaged women as combatants. Some called themselves *mujahidat*, thus linking their action to spiritual and martial struggle in Islam. The importance of women's contributions to national liberation created concern about their power and influence. A backlash ensued similar to the Rosie the Riveter syndrome in post-World War II America.

In the 1960s Muslim women burst on to the literary scene. Writers like the Egyptian Nawal El Saadawi, the Pakistani Qurrat al-Ayn, and the Algerian Assia Djebar wrote angrily about the conditions in which their countrywomen lived. They criticized the male nationalists who did not fulfill their promises of a social revolution in the wake of the colonial expulsions. Another path was chosen by a Muslim sister, called Zaynab al-Ghazali. Closely connected with the Muslim Brothers, she established in 1936 the Association for Muslim Ladies, and 30 years later she found herself in prison with some of the brothers for suspected conspiracy to overthrow the Nasser regime. The memoir that she wrote after her release has all the trappings of a feminist hagiography. She is a saint whose spirituality is so great that she can overcome obstacles like torture that defeat mere men. She attacked Nasser, his regime that was too western and secular for her liking, and even the brothers with her in prison for their weakness and insufficient faith (Cooke 2001).

In this early independence period, women experimented with multiple critiques that allowed them to target the colonizers, the nationalists, the Islamic extremists, and patriarchy without falling into cultural betrayal. The louder these women's voices rose, the more virulent did the Muslim men's responses become. Feminist writings were censured and banned.

The tension between Muslim political extremism and Islamic feminism has grown over the course of the twentieth century. 1979 was a crucial year in this battle. In Iran Ayatollah Khomeini brought an Islamic theocracy to power. Once a bastion of liberal modernity that boasted one of the highest levels of education and skilled employment for women, Iran became

a harsh patriarchy in which women could appear in public only if covered with the black chador. In order to combat the imposition of discriminatory laws in the name of Islam, some Iranian women have been training to become Islamic scholars in women-only seminaries. Others have spoken out against the theocrats and have established transnational feminist coalitions to fight for gender justice at home.

In 1979 also the Pakistani General Zia-ul-Haq promulgated the Hudood Ordinances as part of the Islamization of the country. Hudood included the Zina (or, adultery) Ordinance that criminalizes sex outside marriage with stoning to death as punishment. The "legal definition of zina blurs the lines between adultery [among the married], fornication [among the unmarried] and rape" (Khan 2006, 8). Rape is defined as forced zina, with the burden of proof falling on the woman to produce four witnesses to attest to her violation. If "coercion cannot be proved, the victim becomes an offender who has enjoyed illicit sexual activity" (9). It has been professional women who have opposed the Islamist Jamat-i-Islami and organized resistance against the Zina Ordinance in the name of a well-understood Islam. They are "the daughters and granddaughters of women who participated in the struggle for Pakistan from colonial Britain . . . (who wanted) to expose these laws as having no basis in Islam" (86, 87).

Islamic feminists in Iran, Algeria, Pakistan, Sudan, Yemen, Indonesia, Egypt, and America believe that misogynist laws promulgated in the name of Islam must be resisted, often with arguments articulated within an Islamic paradigm. Some resist individually. The American religious studies scholar Amina Wadud, like Zayn al-Din before her, has been at the forefront of a movement to provide a textual interpretation of the Qur'an from a feminist perspective. Others, like the Revolutionary Association of the Women of Afghanistan and the Pakistani Women Against Fundamentalism, resist collectively by forming associations that advocate Islamic feminist agendas.

In 1982 El Saadawi founded her Arab Women's Solidarity Association with an unveiling agenda: the veil is not merely a piece

of cloth over the face; it is a shroud for the mind. Six years later the government closed the association under pressure from Islamists. Ten years later, infuriated by her continued defiance in books, articles, and interviews, Islamists took El Saadawi to court for apostasy. She won. In 1996 the Revolutionary Association of Women of Afghanistan immediately acted against the misogynist laws the Taliban imposed. More recently, Indonesia, long thought to be a haven for Muslim women, is becoming a battleground for struggles between women and religious extremists.

In their debates with Islamists and others over whether Islam gives women rights to education, work, and control over their bodies, the veil has been central. Turkish and French feminists are fighting their secular governments for the right to cover, while Afghan, Indonesian, and Iraqi women are mobilizing against it and their Islamist regimes. Islamic feminists are uncompromising in their opposition to individuals, institutions, and regimes that claim exclusive authority over their lives and bodies.

Cross-References

- [Critical and Cultural Theory](#)
- [Cultural Studies](#)
- [Feminist Philosophy of Religion](#)
- [Humanism in Islam](#)
- [Islam: An Overview](#)

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Feminist Philosophy of Religion

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Description

Feminist philosophers of religion may self-identify with analytic or continental philosophical traditions or combinations thereof and adhere to any one of a multitude of feminist positions. Feminist philosophy of religion does therefore not represent one single philosophical or feminist position. What characterizes feminist philosophy of religion as a discipline in its own right is rather its being a philosophical discipline with religion as its object of study (making it a subdiscipline of philosophy of religion) that employs feminist perspectives and insights in its choice of material, philosophical problems, methods, and theories (thus making it a *feminist* philosophy of religion).

Its emergence as a subject in its own right is fairly recent. For several reasons, feminist philosophical reflections on religion took place within departments of theology and religious studies long before they reached the departments of philosophy where neither religion nor gender was in high priority. Eventually, feminist philosophers began interesting themselves in the subject of religion, in spite of feminism's in general critical stance toward religion, largely identifying religion with patriarchal oppressive systems. Also the need rose within feminist theology for more philosophically stringent work.

Publications from within the emerging specialization feminist philosophy of religion have been increasingly forthcoming since the 1990s. As late as 1994, Nancy Frankenberry could urgently ask "Where are all the feminist philosophers of

religion?" in *Hypatia*, a journal of feminist philosophy (Nancy and Marilyn 1994). The body of literature, self-identified as feminist philosophy of religion, is rapidly growing though, with two monographs tentatively delineating a feminist philosophy of religion, by Pamela Sue Anderson (1998) and Grace Jantzen (1999) (Anderson 1998; Jantzen 1998), a couple of anthologies on the subject (Anderson and Sue 2009; Anderson and Clack 2004), and a growing number of articles on feminist philosophy of religion in collected works and journals of general philosophy, philosophy of religion, feminist and ► [gender](#) studies, and feminist theology. An inclusion of the entry *feminist philosophy of religion* in encyclopedias of philosophy (of religion) is also a sign that the discipline is maturing (Nancy 2005). There is not though yet a journal specifically dedicated to feminist philosophy of religion.

Feminist philosophy of religion currently tries out different avenues in its critical and constructive work, allying itself with and utilizing methods from psychoanalytical or poststructuralist schools, pragmatism, and postcolonialist feminism, among others. What unites the different paths is the emphasis on difference, and that difference matters for how to do philosophy of religion, be it difference in gender, ethnicity, sexual orientation, religion, nationality, class, or age. What also unites feminist philosophers of religion of different standings is an interest in topics such as the concept of God, rationality and epistemology, the human – divine relation, and the relation between humans. The constructive contributions toward these topics are multifaceted, and the critical and deconstructive focus on traditional patriarchal models and presumptions is the same.

Self-identification

Science

In as far as philosophy is considered to be a science, so, consequently, is feminist philosophy of religion. Philosophy is, however, often considered to be more of a metascience, characterized by its analyzing, deconstructive, criticizing, and reconstructive activities, rather than by seeking new knowledge

and discovering new facts, and so, then, consequently, is feminist philosophy of religion.

Religion

Philosophical problems and questions arising from religion as a human phenomenon, with its doctrines, scriptures, rituals, activities, beliefs, language, sociological settings, etc., including the discussion of how to conceptualize religion itself and the divine, are the object of study for the feminist philosopher of religion, who may or may not be religious him/herself. The results from the field of feminist philosophy of religion may of course be useful for theologians in general and for feminist theologians in particular and may shed new light on issues for individual religious believers, but feminist philosophy of religion in itself does in no way self-identify as a religion.

Characteristics

Feminist philosophy of religion is distinctive among other philosophical subdisciplines in its awareness of and focus on feminist and ► [gender](#) issues. Examples include making visible and analyzing women's situations regarding, for instance, power and oppression in language, symbolic and praxis, and introducing philosophical questions and methods originating in women's experiences of, for instance, giving birth, or existing in a marginalized position. While feminist philosophy of religion thus widens the scope of philosophy of religion theoretically, materially, and methodologically, it also questions and deconstructs traditional philosophical presumptions underlying concepts such as rationality, subject, god, knowledge, and objectivity, as being male prejudiced.

Among other feminist academic disciplines, such as feminist theology or gender studies, and among feminist-influenced religious traditions, such as goddess religions, feminist philosophy of religion is distinctive in its strict adherence to philosophical standards of argument and methods of criticism and deconstruction. Its purpose lies in formulating and analyzing philosophical problems arising from a religious context, certainly

suggesting alternative solutions and constructive ideas, but nevertheless leaving matters of application in the religious/theological context to others.

Relevance to Science and Religion

Some feminist philosophers, such as Sandra Harding and Lynn Hankinson Nelson, have analyzed how the methods, models, and underlying worldview of natural sciences are characterized by male language and traditional epistemology, where man is a rational objective subject and nature is an object to be seized and subjugated, a hierarchical relation mirrored in the relation between man and woman, male and female. Feminist philosophy of religion has, in their turn, indicated how these hierarchical models together with religion's likewise hierarchical model of the God-man relation create a destructive potential not only for the male–female relation but also for our environment. This has led feminist philosophers of religion to reconsider the concept of God/the divine and criticize the standard philosophical theistic concept of God.

As feminist philosophy of religion is generally more interested in the implied issues of power and male bias in the existing debates in philosophy of religion than in the debates themselves, this is true also for the debates concerning science and religion, which then become interesting only in as far as they actualize such issues.

Sources of Authority

As feminist philosophy of religion is a fairly new discipline, it still relies heavily on academic works from other disciplines/subdisciplines, in particular continental philosophy (Jacques Derrida, Michel Foucault, Luce Irigaray, and Julie Kristeva), feminist philosophy (Genieve Lloyd, Sandra Harding), feminist and gender studies (Simone de Beauvoir), and feminist theology (Elisabeth Johnson, Daphne Hampson, and Mary Daly). Needless to say, since feminist philosophy of religion does not self-identify as a religion, it does not view religious texts as sources of authority.

Academic works from within the emerging specialization feminist philosophy of religion have been published for scarcely two decades, but the number is growing. As there is not as yet a journal specifically dedicated to feminist philosophy of religion, articles will be dispersed in journals of closely related fields within philosophy, theology, and feminist and gender studies.

Generally, as the discipline is in its forming stage, the more recent a publication is, the more it should have been able to accumulatively further the development of the discipline. More recent publications thus have the potential to become more authoritative than older ones, unless the latter have achieved the status of having become classics within the discipline, as, for instance, Anderson (1998) and Jantzen (1999) presumably have (Anderson 1998; Jantzen 1998).

Ethical Principles

Scholarly work within feminist philosophy of religion is guided by the same general ethical principles as other academic work: it should display intellectual honesty, not succumb to plagiarism, account openly for all material, and give credit where credit belongs.

Key Values

Justice and equality are key values of feminist philosophy of religion and are expressed in the ambition to ensure a fair voice to the marginalized in different contexts, who often are women. Other key values are to stand by sound philosophical principles and methods and to further feminist progress.

Conceptualization

As feminist philosophy of religion is a philosophical discipline where several philosophical schools and traditions are represented, several disparate understandings of the following concepts will coexist within the discipline.

Feminist philosophy of religion will furthermore relate to the following concepts primarily as constituting grounds for philosophical analysis, analyzing their use and the implications and consequences thereof, rather than presenting discipline-specific definitions of the concepts in question. Therefore, the emphasis in the following will be on the philosophical issues actualized by the concepts for feminist philosophers of religion. Some examples will also be given of how feminist philosophers of religion have developed conceptualizations of their own.

Nature/World

Nature/world is significant as a member of a typical Enlightenment hierarchical dichotomy, and nature/culture is mirroring the underlying view that one of the two is more valuable and has power over the other. As culture is viewed as superior to nature, so man is viewed as superior to woman and God as superior to man. Dichotomies such as these and their interdependence are a prime target for the deconstructive activities of feminist philosophy of religion, especially since woman is associated with nature in contrast to man which is associated with culture.

Human Being

Human being understood as a generic male, where the male and the masculine pronoun are taken to unproblematically represent the whole human race, men and women alike, as is often the case in religious and philosophical discourse, is questioned by feminist philosophy of religion, as having far-reaching consequences. Human being as understood as being divided into two distinct separate genders/sexes may also be questioned. The dualistic view of sex and gender predominantly presupposed within religion is, according to feminist philosophy of religion, simplified and does not reflect the more recent developments within feminist theory and medical science. The view of human being as an undivided rational, objective subject/mind, finally, is questioned by foremost continentally influenced feminist philosophy of religion and is replaced with a view of human being as divided, irrational, subjective, bodily, relational, and changing.

Life and Death

The issue of life and death is generating some general discussion within feminist philosophy of religion, though not by way of the traditional interest in life after death. For instance, Grace Jantzen calls attention to traditional religion's focus on death and immortality and argues how/why that might be a result of religion's male origin and dominance. Jantzen suggests, inspired by the psychoanalytic works by Julie Kristeva and Luce Irigaray, that a feminist philosophical understanding of religion should rather promote the love of life and focus on the fact that we are all born, making use of the feminist symbolic of natality (Jantzen 1998).

Reality

For feminist philosophy of religion as influenced by continental and postmodern philosophical thinking, reality is conceptualized as a social and/or linguistic construction. Metaphysical realism is generally criticized, which leads to a potential conflict with the feminist political agenda where realism regarding the real existence of men and women, moral values, and oppressive situations is presumed in order to be able to make claims for changes and reforms. Non- or antirealism, at least with regard to these entities, is for that reason for many feminist philosophers of religion not a viable option. It is not uncommon for feminist philosophers of religion to advocate some kind of critical or pragmatic realism that enables us to speak of a reality and of real injustices, but without having to embrace the problematic God's eye view of metaphysical realism.

Another philosophical issue actualized by the concept of reality is how descriptions and conceptualizations of reality in religion (including God and other religious entities) are colored by their male and patriarchal context and origin, how that in its turn reflects on what we can say or not say about reality apart from human experience, and how women's experience when conceptualized and allowed in to the religious view of ultimate reality will affect it.

Knowledge

The Enlightenment view of knowledge as the product of the isolated rational subject is rejected and instead is emphasized that knowledge is

relational, communal, divided, and multifaceted. Feminist standpoint epistemology is one way, though not the only one, of expressing the thought that what is possible to know depends on where you stand. Those in the margin (often women, poor, or oppressed ethnical or religious groups) have a privileged access to knowledge that those in the center (typically wealthy Western white men) do not have access to. Ramifications of this for religious knowledge and for whose knowledge is counted as authoritative in a religious context are subject to analyze by feminist philosophers of religion.

Truth

Depending on the training and context of the individual feminist philosopher of religion, the conceptualization of truth may differ accordingly, encompassing most current philosophical views of truths. The issue of truth as such is seldom discussed in works of feminist philosophy of religion. See also *reality*.

Perception

Feminist philosophy of religion finds it important to reintroduce the embodied and gendered subject into philosophy of religion and to view sense perception not only as a useful parallel to justify religious experience, as does philosopher of religion William Alston, but as a valuable part of being human and a religious subject, contributing to how theologies are shaped and philosophy of religion is done.

Time

Feminist philosophy of religion is not especially interested in the concept of time.

Consciousness

A well-known feminist concept from feminism's early days in the late 1960s is the concept of consciousness-raising, denoting an activity designed to make women politically conscious of their own oppression. Feminist philosophy of religion often has an implicit or explicit aim to contribute to this consciousness-raising process.

Feminist philosophy of religion is otherwise not especially interested in the concept of consciousness.

Rationality/Reason

One of feminist philosophy's main criticisms of analytic philosophy of religion is its deeply rooted association of rationality/reason with man and maleness and its dichotomy between the rational mind and the sensual body. Feminist philosophy of religion maintains that we cannot separate mind/rationality from the body; as bodily creatures, we need an embodied concept of rationality. Anderson argues specifically that our experiences of desire and yearning must be incorporated into the concept of rationality (Anderson 1998). It is also a matter of concern that rationality has traditionally been viewed as being the property of the isolated rational subject, whereas feminist philosophy of religion emphasizes the role of human relations for rationality.

Mystery

Religion often has a mystic dimension with purportedly ineffable experiences of the divine and is of interest to feminist philosophy of religion only in so far as it actualizes feminist issues. From another point of view, one might say that feminist philosophy of religion revels in the mystery of religion, if mystery is understood as that which analytic rationality cannot grasp, that which dwells in the presymbolic in unarticulated experiences.

Cross-References

- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Critical Realism in Theology and Science](#)
- ▶ [Epistemology](#)
- ▶ [Sex and Gender](#)
- ▶ [Transcendence and Immanence](#)

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Fiction

- [Creative Writing](#)

Fictional Tale

- [Myth](#)

Fine Art

- [Art, Studio](#)

Finitude

- [Death](#)

Fire-Walking

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Related Terms

[Anatenaria](#); [Religious ritual](#); [Theemithi](#)

Fire-walking is the ► [ritual](#) practice of walking barefoot over fire, hot embers, ashes, or rocks. Accounts of fire-walking are found in early historical records, such as Stabo's descriptions of such rituals in Italy and Cappadocia (*Georgraphy* 5.2.9; 12.2.7). Contemporary fire-walking ► [rituals](#) are performed in many parts of the world, including Greece, Bulgaria, Spain ([Fig. 1](#)), Fiji, South Africa, Paraguay, Sri Lanka, Malaysia, Singapore, Mauritius, the Seychelles, Hawaii, India, Japan, Brazil, Haiti, and Papua New Guinea.

In some cultures, fire-walking is an act of deep religious devotion, such as in the ► [Anastenaria](#) of Greece and Bulgaria, who perform this ► [ritual](#) in honor of saints Helen and Constantine (Danforth 1989; Xygalatas 2012), or the Tamil Hindu festival of ► [Theemithi](#). Participants in such rituals often consider fire-walking as a miracle, claiming that they do not get burned due to divine protection (for a study of a secular fire-walking ritual, see Xygalates et al. 2011). In other cases, most prominently in the USA, fire-walking is part of various New Age movements or performed by professional instructors as a technique for team-building, self-empowerment, fear-control, etc.

However, although it might seem counter-intuitive, it is generally possible to fire-walk unharmed, without any special technique or preparation, physical, mental, or otherwise. The explanation lies in physics: Hardwood, embers, and volcanic rock are very poor conductors of heat. Thus, contact for a short period of time does not usually harm the skin. This is why you do not get burned if you quickly pick up a glowing ember and throw it back into the fireplace. Think of the following example: when baking bread in the oven at high temperatures, you can insert your hand and touch the bread for 1 or 2 s without getting a blister (although you will feel the heat). However, if you touch the metal racks for the same length of time, you will get a blister. The bread and the rack have the same temperature, and, for that matter, so does the air in the oven when you first open it. The reason for not getting burned is that the air and the bread have low thermal conductivity, while the metal rack is an excellent conductor of heat (Leikind and McCarthy 1985). Thus, walking at a normal pace on burning embers is not likely to cause any damage



Fire-Walking, Fig. 1 A fire-walker traversing a coal-bed measured at 677 degrees Celsius (1250 Fahrenheit) while carrying his father on his back, in the Spanish village of San Pedro Manrique

to the feet, although sometimes fire-walkers do get burned, most commonly when an ember gets stuck between their toes, they step on a sharp piece of burning wood, they walk too slowly, etc.

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Cross-References

- [Anastenaria](#)
- [Experience](#)
- [Pain \(Suffering\)](#)
- [Religious Experiences](#)
- [Religious Studies](#)
- [Ritual](#)

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Firewall

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A security tool that breaks the normal behavior of data transfers in a way that provides a defense from threats. Firewall examples include application firewalls (breaks data transfers to/from applications where the data is dangerous to the application or its users), network firewalls (firewalls that break high-risk and unauthorized network traffic), and

host firewalls (firewalls that limit applications on desktops, laptops, and servers to behaviors that are explicitly defined or expected).

First Order

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Logical languages that allow atomic predicates and quantification over individuals of the universe only, and not over subsets, predicates, or relations. If the latter is allowed we have second-order logic, and so on.

A first-order structure is a set together with a family of subsets of its Cartesian powers. It may also have distinguished individuals and functions, but these are reducible to relations. Higher-order structures, allowing relations among first-order relations, etc., are reducible to particular first-order structures with an extra binary relation symbol (membership).

First Philosophy

► [Ontology](#)

First-Order Logic

► [Logic, Predicate](#)

Five Pillars

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The Five Pillars are the basic foundational points in Islam. All five are mandatory for the Muslims

and are the minimal qualifications for what a Muslim is. They are as follows: (1) Shahada, or the “Declaration of Faith,” which states, “I bear witness that there is no god but God, and that Muhammad is his Messenger.” (2) Salat, or the five daily ritual prayers. (3) Zakah, or almsgiving to the poor. (4) Sawm, fasting during the entire month of Ramadan, and (5) Hajj, or the pilgrimage to Mecca in today’s Saudi Arabia.

Fixed Action Pattern

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According to a classical concept of ethology, a *key stimulus* activates an *innate releasing mechanism* that triggers the adequate *fixed action pattern*. These terms were critically discussed, particularly the prefixes *key*, *innate*, and *fixed*. Fixed action pattern refers to an inherited movement coordination that is characteristic to the species. These movements need not be learned and suggest a genetically fixed ability. “Fixed” misleadingly may denote a rigid and invariable motor performance which, however, has not been observed yet.

Flow of Time

► [Time](#)

Flowcharts

► [Algorithms, Computer](#)

fMRI

► [Functional Magnetic Resonance Imaging \(fMRI\)](#)

Focalization

► [Attention](#)

Folk Physics

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A term for people spontaneously understanding the workings of the physical world. Contrary to scientific physics, folk physics is based on immediate human understanding of the nature of physical objects and intuitive human prediction of physical events in nature. It can be seen as a naïve or common sense approach to human environment. Human interaction with the physical environment is normally based on habits and practical understanding that are very different from the theoretical approach of scientific physics. Thus, insights gained by folk physics are often characterized as contrary to those of scientific physics, and are therefore deemed wrong and misleading with respect to a scientific understanding of the physical world.

Folk Psychology

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A term for people intuitively understanding and talking about human psychology. Humans have an immediate understanding of themselves and other people. People behave and talk with other people on the immediate assumption that they generally understand, more or less, how persons

think and feel. Intersubjective relationships are formed and developed by means of folk psychology. When people talk about their mental life, they use words such as “belief,” “idea,” “conviction,” “joy,” “sadness,” “happiness,” and so on. These terms are all part of folk psychology. There is an intense dispute over the status of folk psychology. Some philosophers and cognitive scientists believe folk psychology to be an outdated and ontologically wrong theory of human psychology. We need to substitute the theory with a scientifically more precise theory that can be applied to the physical and biological constitution of the mind. Others contest this as being an expression of a narrow scientific view on human nature. In their eyes, human psychological nature is best explained by means of an elaborated folk psychology.

Cross-References

► [Theory of Mind](#)

Folklife Research

► [Ethnology](#)

Folkloristics

► [Ethnology](#)

Folktale

► [Myth](#)

Force of Attraction

► [Gravity: From Classical to Quantum](#)

Forensic and Legal Medicine

► Forensic Medicine

Forensic Medicine

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Related Terms

[Forensic medicine](#); [Forensic pathology](#); [Forensic and legal medicine](#); [Legal medicine](#)

Description

Forensic medicine is that medical speciality that embraces all medical matters involving the law and all kinds of judicial process. Two main branches exist, clinical forensic medicine, which deals predominantly with the living person and is undertaken by forensic physicians and forensic pathology, undertaken by forensic pathologists which deals predominantly with the dead. Forensic pathology is a branch of pathology concerned with determining the cause of death by examination of a cadaver. The autopsy is performed by the pathologist at the request of a coroner usually during the investigation of criminal law cases and civil law cases in some jurisdictions. [Table 1](#) gives examples of the potential roles for forensic physicians. The training, structure, and delivery of forensic medicine varies around the world, and in some countries both clinical and pathological aspects of forensic medicine are dealt with by the same medical practitioner (Payne-James [2011](#)).

The origins of forensic medicine go back many centuries, although Smith rightly

commented that “forensic medicine [cannot be thought of] as an entity... until a stage of civilization is reached in which we have ... a recognizable legal system ... and an integrated body of medical knowledge and opinion” (Smith [1951](#)).

The specific terms forensic medicine and medical jurisprudence (also referred to as juridical medicine) in the English language date back to the early nineteenth century. In 1840, Thomas Stuart Traill ([1840](#)), referring to the connection between medicine and legislation, stated that “it is known in Germany..... by the name of State Medicine, in Italy and France..... Legal Medicine; [in the United Kingdom] it is usually denominated Medical Jurisprudence or Forensic Medicine.” However, there are many previous references to the use of medical experts to assist the legal process in many other jurisdictions; these physicians would be involved in criminal or civil cases as well as public health. There is much dispute as to when medical expertise in the determination of legal issues was first utilized. In 1975, Chinese archaeologists discovered a number of bamboo pieces dating from about 220 B.C. (Qin dynasty) with rules and regulations for examining injuries inscribed on them. Other historical examples of the link between medicine and the law can be found around the world.

In the Roman Republic, the “Lex Duodecim Tabularum” (laws drafted on 12 tablets and accepted as a single statute in 449 B.C.) had minor references to medicolegal matters, including punishments dependent on the degree of injury caused by an assailant, and poisoning (Brittain). Papyri, related to Roman Egypt, dating from the latter part of the first century to the latter part of the fourth century A.D., contain information about forensic medical examinations or investigations (Amundsen and Ferngren [1978](#)). The “Constitutio Criminalis Carolina,” the code of law published and proclaimed in 1532 in Germany by Emperor Charles V, is considered to have originated Legal Medicine as a specialty: expert medical testimony became a requirement rather than an option in cases of murder, wounding, poisoning, hanging, drowning,

Forensic Medicine, Table 1

Potential roles of a forensic physician

- Determination of fitness to be detained in custody
- Determination of fitness to be released
- Determination of fitness to be charged: competent to understand charge
- Determination of fitness to transfer
- Determination of fitness to be interviewed by the police or detaining body
- Advise that an independent person is required to ensure rights for the vulnerable or mentally disordered
- Assessment of alcohol and drug intoxication and withdrawal
- Comprehensive examination to assess a person's ability to drive a motor vehicle, in general medical terms and related to alcohol and drug misuse
- Undertake intimate body searches for drugs
- Documentation and interpretation of injuries
- Take forensic samples
- Assess and treat personnel injured whilst on duty (e.g., police personnel) including needle stick injuries
- Pronounce life extinct at a scene of death and undertake preliminary advisory role
- Undertake mental state examinations
- Examine adult complainants of serious sexual assault and the alleged perpetrators
- Examine alleged child victims of neglect, physical or sexual abuse
- Examine victims and assailants in alleged police assaults

Additional Roles

- Expert opinion in courts and tribunals
- Death in custody investigation
- Complaints against government officers (e.g., police, security, army)
- Pressure group and independent investigators in ethical and moral issues
 - Victims of torture
 - War crimes
 - Female genital mutilation
- Refugee medicine (medical and forensic issues)
- Asylum seeker medicine (medical and forensic issues)
- Implement principles of immediate management in biological or chemical incidents

For all these examinations a forensic physician must accurately document findings and when needed produce these as written reports for appropriate civil, criminal or other agencies and courts. The forensic physician will be also able to present and interpret the information orally to a court or other tribunal or forum

infanticide, and abortion. Beginning in the latter part of the eighteenth century, a number of books and treatises were published in English concerning forensic medicine and medical jurisprudence. John Gordon Smith writes in 1821 in the Preface to his own book (Smith 1821) “The earliest production in this country, professing to treat of Medical Jurisprudence *generaliter*, was an abstract from a foreign work, comprised in a very small space. It bears the name of “Dr Farr’s Elements, &c and first appeared above thirty years ago.” In fact, it was translated from the 1767 publication *Elemental Medicinae Forensis* by Fazellius of Geneva. Davis (1974) refers to these and to *Remarks on Medical Jurisprudence* by William Dease of Dublin, as well as the *Treatise on Forensic Medicine or Medical Jurisprudence* by O. W. Bartley of Bristol. Davis considers the latter two works of poor quality, stating that the “first original and satisfactory work” was George Male’s *Epitome of Juridical or Forensic Medicine*, published in 1816 (second edition, 1821). Texts on forensic medicine began to appear more rapidly and with much broader content. John Gordon Smith (9) stated in *The Principles of Forensic Medicine Systematically Arranged and Applied to British Practice* (1821) that “Forensic Medicine—Legal, Judiciary or Juridical Medicine—and Medical Jurisprudence are synonymous terms.” Having referred in the Preface to the earlier books, he notes, “It is but justice to mention that the American schools have outstripped us in attention to Forensic Medicine”; he may have been referring to the work of Theodric Romeyn Beck and others. Beck published the first American textbook 2 years later in 1823 and a third (London) edition had been published by 1829 (8). Prior to this, in 1804, J. A. Stringham, who was trained in Edinburgh being awarded an MD in 1799, was appointed as a Professor in Medical Jurisprudence at the College of Physicians and Surgeons of New York and given a Chair in 1813 (11).

Thus, by the end of the nineteenth century, a framework of forensic medicine that persists today had been established in Europe, the UK, America, and related jurisdictions.

The recent growth in awareness of abuses of human rights, torture, disappearances, and civil liberties has directed attention to the conditions of detention of prisoners and to the application of justice to both victim and suspect. Examples of injustice and failure to observe basic human rights or rights enshrined in statute in which the input of medical professionals may be considered, at least, of poor quality and, at worst, criminally negligent have occurred and continue to occur worldwide.

Self-Identification

Science

Forensic medicine is predominantly a science as it is based on medical knowledge. The basic training which underpins forensic medicine derives from a knowledge of anatomy, physiology, biochemistry, and pathology, all scientific disciplines.

Characteristics

Forensic medicine is distinctive from other medical disciplines in that it requires knowledge and understanding related to subjects outside medicine, namely, law and forensic science. Forensic medical practitioners are required to utilize their medical knowledge and interpret it in the context of other nonmedical major disciplines. Additionally, forensic medical practitioners are often faced with moral and ethical decisions related to their professional duties and how they apply those to, for example, complainants, perpetrators, families, employing bodies (e.g., the state), lawyers and judges, without compromising the basic medical duties of consent and confidentiality. The balancing act of duties to the patients and duties to others who may be involved within a legal or judicial process can be complex, but this is part of the day-to-day responsibilities of forensic medicine practitioners.

Relevance to Science and Religion

Forensic medicine is practiced throughout the world and as such works within judicial systems in which religion, culture, and related values may play a greater or lesser part. Thus, medical knowledge may impact on religious issues in implicit or explicit variable ways (e.g., euthanasia, judicial killing) and there may thus be substantial interest by theologians in aspects of forensic medicine and religion.

Sources of Authority

Key sources for medical information should lie predominantly with peer-reviewed studies of randomized, controlled research that have been published and are accessible to all. Forensic medicine, perhaps uniquely among medical disciplines, does not look at how interventions (such as drugs, operations, or procedures) may impact on an individual patient's clinical outcome, but looks at how previous (often nonmedical) interventions, such as stabbing, shooting, sexual assault, drug misuse have affected the person or deceased who is being assessed. There are substantial ethical problems with undertaking research in patient groups assessed by forensic medical practitioners, because of issues of getting true fully informed consent, or in the case of the deceased, consent from families or coroners. Thus, much research is based on historical data. There are however substantial written texts (e.g., *Encyclopedia of Forensic and Legal Medicine*; *Forensic Medicine: Clinical and Pathological Aspects*) that give information on forensic medical issues, and increasing amounts of research are now available and being published which explore clinical issues such as medical findings after sexual assault, and pathological issues such as findings after deaths from drug use. Increasingly sophisticated techniques are being applied, for example, identifying genetic causes for sudden unexplained adult or child deaths.

The majority of peer-reviewed forensic medical journals (e.g., *Journal of Forensic and Legal Medicine*, *Forensic Science International*, *Legal Medicine*, *American Journal of Forensic Medicine and Pathology*) are now also electronically published. Forensic medicine by its very nature links closely with other disciplines such as forensic science, forensic anthropology, and forensic toxicology and there is considerable overlap in the sources of current information. Credibility of such work is dependent on appropriate independent peer review in publications cited in major citation indices (e.g., Pubmed and ISI).

Ethical Principles

The overarching principles of forensic medicine would be generally accepted as the principles espoused by Hippocrates. However, not all doctors take the “Hippocratic Oath.” The principles in general have been enhanced and clarified by both international and national initiatives. An example of the former would be the Declaration of Helsinki. Medical bodies in many countries define how doctors should behave – Table 2 shows the current guidelines for “Good Medical Practice” provided by the General Medical Council that apply to all registered medical practitioners working as doctors in the UK. It will be noted that relationships with and responsibilities to not only patients, but also professional colleagues are explained. It is to be expected that the medical professional organizations in all countries should have published ethical principles to which others can refer.

Key Values

The key values espoused by practitioners or forensic medicine are: (a) to provide appropriate medical care, or interpretation of medical issues within a legal, judicial, or police setting in an independent and unbiased manner –

Forensic Medicine, Table 2 Good medical practice – General Medical Council (United Kingdom – 2006) (the complete documents may be viewed at http://www.gmc-uk.org/guidance/good_medical_practice/index.asp) (Below are reproduced the introductory paragraphs at the time of uniting. Updates are issued on a regular basis)

The duties of a doctor registered with the General Medical Council

Patients must be able to trust doctors with their lives and health. To justify that trust you must show respect for human life and you must:

- Make the care of your patient your first concern
- Protect and promote the health of patients and the public
- Provide a good standard of practice and care
- Keep your professional knowledge and skills up to date
- Recognize and work within the limits of your competence
- Work with colleagues in the ways that best serve patients’ interests
- Treat patients as individuals and respect their dignity
 - Treat patients politely and considerately
 - Respect patients’ right to confidentiality
- Work in partnership with patients
 - Listen to patients and respond to their concerns and preferences
 - Give patients the information they want or need in a way they can understand
 - Respect patients’ right to reach decisions with you about their treatment and care
 - Support patients in caring for themselves to improve and maintain their health
- Be honest and open and act with integrity
 - Act without delay if you have good reason to believe that you or a colleague may be putting patients at risk
 - Never discriminate unfairly against patients or colleagues
 - Never abuse your patients’ trust in you or the public’s trust in the profession

You are personally accountable for your professional practice and must always be prepared to justify your decisions and actions

without allowing personal, religious, moral, or other issues to affect treatment or conclusions, (b) where conflicts occur (e.g., employment status, coercion by authorities) to ensure that duties as a medical practitioner are not compromised, (c) by fulfilling the values in (a) and (b) ensuring that medical issues do not contribute to potential miscarriages of justice.

Conceptualization

It should be emphasized that as forensic medical practitioners are derived from a wide variety of cultures, societies, and religious background, the definitions and concepts of the terms described below will vary according to the individual's personal construct. The comments below are not rigid and may reflect the author's personal interpretations.

Nature/World

The forensic medicine concept of nature and the world is that of the all medical disciplines and reflects striving for a scientific understanding of the world and those that inhabit it.

Human Being

The forensic medical approach to the concept of a human being reflects the belief that humans are sentient and in general are autonomous beings with rights and duties to each other conferred by a variety of moral, ethical, and societal frameworks.

Life and Death

Origins of life are not defined by forensic medical practitioners and will be dependent on their own background. Death can be interpreted and defined in a medical sense by a number of means, which range from brain death with a functioning body, to skeletonized remains. The definitions used will be dependent on the context for which the determination of death is required (e.g., in organ donation).

Reality

Reality reflects that which can be perceived by humans using the sensory and intellectual functions which they possess.

Knowledge

Knowledge is understood to have an objective dimension, such that it is the wisdom that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries. However, knowledge is also understood to have a subjective dimension, which is taken to be the amount of information a person

can retrieve from memory voluntarily, or by being cued.

Truth

Truth as a concept in forensic medicine embodies that which is scientifically correct, and that which may be determined following legal or judicial process, and there may be apparent conflict between the two.

Perception

Perception reflects what is interpreted by an individual from the sensory input supplied to them. In forensic medicine, perception may also be influenced by what others have observed.

Time

Forensic medicine has no particular definition or concept of time beyond that of the ordinary sense. Timing of events may have particular relevance within the forensic medical setting.

Consciousness

Consciousness in the medical sense is the responsiveness of subjects to any external physical or other stimulus. It can vary dependent on many factors including use of drugs, injury, and medical treatment.

Rationality/Reason

Forensic medicine has no particular definition or concept of rationality beyond that used in the ordinary sense. Reason may be applied to events or medical findings in the contexts of observation or perceptions of others, in order to arrive at a conclusion – for example, in the causation of injury.

Mystery

Many would argue that the role of forensic medicine is to assist in solving mysteries.

Relevant Themes

The most important current themes regarding forensic medicine relate to a need for increased

awareness and respect for the living and deceased individual in terms of human rights and medical ethics in the context of duties of doctors. These themes embrace not only healthcare and forensic issues of convicted and nonconvicted detainees in any type of custody, the detection and documentation of torture, appropriate recovery and autopsy processes, but also any setting in which those temporarily or permanently deprived of liberty are in contact with medical practitioners in any setting within legal or judicial process.

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Forensic Pathology

► [Forensic Medicine](#)

Forensic Psychology

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Related Terms

[Eyewitness memory](#); [Legal psychology](#); [Psychology and law](#)

Description

Forensic psychology is the application of psychological principles to problems faced by the legal system whereby psychologists intend to help the legal system arrive at fair and unbiased decisions. In a joint publication by the American Psychology and Law Society and the American Academy of Forensic Psychology, forensic psychology is defined as “all professional practice by any psychologist working within any sub-discipline of psychology (e.g., clinical, developmental, cognitive, social) when applying the scientific, technical, or specialized knowledge of psychology to the law” (p. 3) (Ogloff 1999). Some scholars have described the purpose of forensic psychology is to further the cause of social justice in the legal system. Shah, one of the early pioneers in this field, described it eloquently when he wrote, “a basic challenge for psychology in its interactions with legal and social process is to bring relevant knowledge and skill to bear on major social inequities so that the policies and practices in our society can more truly comport with the deepest notions of what is fair and just” (p. 5) (Ogloff 1999).

Historically, research in this field has focused on the topic of eyewitness accuracy. Hugo Munsterberg, who is considered a founding father in forensic psychology, published a seminal piece entitled *On the Witness Stand* (Munsterberg 1908).

Eyewitness research has continued to be important because of the conviction and wrongful imprisonment of innocent persons due to errors in eyewitness testimony (Lindsay et al. 2006; Toglia et al. 2007). The magnitude of the problem was documented by a study that reported 28 cases where DNA testing exonerated the accused; 90 % of the wrongful convictions were due to errors in eyewitness identification (Connors et al. 1996). This is a particularly troublesome result given that research has found that eyewitness memory or identification evidence is perceived to be the most believable evidence that can be offered in a criminal trial (Wells and Bradfield 1998).

The field of forensic psychology has expanded to include direct consultation with attorneys working on both criminal and civil cases. In criminal cases, for example, psychologists may help with determinations of mental status, examination of the quality of the evidence, and assist with jury selection. Civil cases offer psychologists the opportunity to assist with the preparation of a case to maximize jury understanding, determine the impact of events on the long-term psychological status of the plaintiff, and also assist in jury selection among other duties.

Characteristics

Forensic psychology is distinctive because no other subdiscipline of psychology includes as part of its purpose the improvement of legal procedures. While other disciplines may be interested in social justice, forensic psychology is unique in that its practitioners look at social justice issues within the legal system.

Relevance to Science and Religion

Forensic psychology is specifically designed to empirically test assumptions about human psychology that are made by the legal system. Therefore, the issues and questions in this field emerge from a scientific and legal foundation, not a religious one.

Sources of Authority

Forensic psychologists rely on empirical evidence from many areas of psychology to support their work. This empirical evidence is published in stringent peer-reviewed journals that require scientific rigor. Examples of highly respected journals that publish forensic psychology articles include, but are not limited to, *Law and Human Behavior*, *Psychology*, *Public Policy and Law*, *Journal of Experimental Psychology: Applied*, *Behavioral Sciences and the Law*, and *Applied Cognitive Psychology* (Helms 2009).

Ethical Principles

In 1991, the American Academy of Forensic Psychology (AAFP) in conjunction with the American Psychology-Law Society developed a set of ethical principles for forensic psychologists. Those guidelines were published in *Law and Human Behavior* (Committee on Ethical Guidelines for Forensic Psychologists 1991). The Committee on the Revision of the Specialty Guidelines for Forensic Psychology has been revising those guidelines, and the most recent draft, 2008, is awaiting approval (Committee on the Revision of the Specialty Guidelines for Forensic Psychology 2008).

Key Values

The primary value within forensic psychology is to seek the truth about how individuals behave in legal settings. However, because forensic psychology involves a marriage between psychology and law, there are important, fundamental differences between how that occurs in the two disciplines. The legal arena is an adversarial system whereby through cross-examination and presentation of the evidence the truth will emerge. In psychology, the truth is sought through experimentation, observation, and testing hypotheses about human behavior in legal settings. The search for the truth is scientific and not adversarial. The outcome is an

explanation of what and why humans behave the way they do in the legal arena.

Conceptualization

Nature/World

Forensic psychology defines the world in two ways. First, it involves the various settings where forensic psychologists collect information that is used to assist problems faced by the legal system. This would include, for example, the laboratory where psychologists conduct empirical research, or therapeutic settings. The second “world” in forensic psychology is the courtroom or any other legal setting where psychologists attempt to provide information related to problems experienced by those in the legal system.

Human Being

Human being is defined by all of the people involved in the field of psychology and the law from the forensic psychologists who collect information that is presented to the legal system, as well as those in the legal system that are the recipients of that information (judges, lawyers, jurors, defendants, etc.).

Life and Death

In forensic psychology, the terms life and death are very different depending on whether the case is criminal or civil. For instance, in a criminal case that involves the defendant being charged with a crime punishable by death, the trial is held in two parts, the guilt phase and the penalty phase. In the guilt phase, a forensic psychologist may conduct a clinical evaluation to determine whether or not the defendant is competent to stand trial – meaning that he or she is aware of the legal process and can assist his or her lawyers in defending the case, a clinical evaluation to determine the mental status of the defendant, and/or a neurological evaluation to determine whether or not the defendant has brain damage that may impact his or her ability to stand trial. Therefore, a forensic psychologist could participate in several ways during the guilt phase of the trial. If

a defendant is convicted of the crime, then the trial enters the penalty phase whereby the prosecution and defense present additional information to the jury used to determine whether or not to give a penalty of death. During the penalty phase, the prosecution typically has the family of the deceased testify to talk about the pain of their loss in hopes that it will provide justification for the jury to give the death penalty. The defense will use a mitigation specialist, who is typically a forensic psychologist who has done an extensive background analysis of the life of the defendant and can report on “mitigating” circumstances that may help explain the defendant’s behavior. For instance, the mitigation specialist may explain that the defendant came from a very violent and broken home and was physically and sexually abused as a child. The presentation of the mitigating circumstances by the forensic psychologist will be used by the defense attorney to argue that the defendant’s life should be spared.

In a civil case that involves a wrongful death, a forensic psychologist may be employed by the plaintiff to evaluate the family of the deceased. The psychologist would then testify about the psychological injury suffered by the loss of love, affection, and companionship that resulted from the death – a concept referred to in the legal arena as loss of consortium. In many wrongful death cases, the monetary damage award that a jury is allowed to give involves a separate allocation for loss of consortium. Therefore, the way the concept of death and life is viewed by forensic psychologists differs dramatically depending on whether the case is criminal or civil in nature.

Reality

Reality is defined by the observable action of humans in the physical world and the self-reported thoughts they use to describe their motivation for that behavior. From a psychological perspective, reality evolves slowly through the scientific process of collecting and analyzing data and drawing conclusions. In the legal context, reality is the result of an adversarial process whereby both sides present their case to the court.

Knowledge

Forensic psychologists describe knowledge as originating in two forms. Psychologists rely on the evidence from scientific descriptions to create the corpus. The legal system relies on the addition of the logical analysis of the text of the rules developed by cultural institutions, including the previous understanding reflected in precedents.

Truth

Truth is what forensic psychologists seek from conducting empirical research. Truth in the legal system is the result of an adversarial process of both sides presenting their case in court; truth is the outcome of the institutional structures that develop the law.

Perception

Forensic psychologists define perception as the way in which an individual looks at the world as a function of his or her beliefs, attitudes, and experiences. Reality is what we perceive to be true and is often highly individualistic and variable.

Time

Time has multiple meanings to forensic psychologists depending on their subspecialty. Of interest here is how time is measured. For cognitive psychologists who use the concept of time to determine the accuracy of an eyewitness, two critical concepts are related to time. They are (1) exposure duration, the length of time that the witness had to see the perpetrator and (2) retention interval, the amount of time between observing the crime and being presented with the lineup. (3) Additionally, a forensic psychologist may also be interested in reaction time, or the amount of time that an eyewitness took to complete an eyewitness identification task. Each of these three aspects of time (exposure duration, retention interval, and reaction time) is critical to evaluating the accuracy of an eyewitness. Therefore, in terms of estimating or evaluating the memory function of an eyewitness, the concept of time is critical.

Consciousness

There is a great deal of research in human cognition that indicates that much of the information that we observe and process can be done deliberately or consciously with effort, or unconsciously or automatically with little to no effort. Understanding the role of conscious/deliberate or unconscious/automatic processing in the legal arena is vital. Often individuals, like jurors and witnesses, have a poor understanding of their own thought processes and the factors that influence their thoughts. This lack of awareness can lead to biased decision-making and distorted memories. Thus, the role of consciousness is very important to forensic psychologists.

Rationality/Reason

Rationality and reason are defined by forensic psychologists who work on criminal cases which involve understanding the mental processes used by the defendant. As stated earlier, considerable time is spent on understanding mens rea or the psychological status of a defendant at the time the alleged crime took place. Forensic psychologists may be asked to evaluate a defendant and conduct a competency evaluation to determine if the defendant is aware of the charges and can participate in his or her own defense. A battery of mental tests may be given to provide an estimation of the defendant's IQ, ability to engage in mental reasoning, and to determine the source of any mental disease that is detected.

Mystery

A mystery is merely a challenge to resolve the unknown or to clarify information or situations that are difficult to understand. Forensic psychologists seek to remove that which is mysterious by providing empirically or clinically based explanations. However, every forensic psychologist might not arrive at the same conclusion to a given mystery, thus the mystery remains. The problem of not knowing can be transferred from a laboratory to the courtroom, and the mystery can be perpetuated. The problem is that there are many aspects of human behavior that fall outside of scientific understanding that then land in the courtroom and must be evaluated by the trier of fact.

Relevant Themes

Forensic psychology is based on a foundation of science, not religion. However, some of the issues that are examined by forensic psychologists have moral overtones. Perhaps the single most important moral issue in the field involves the question of how society can justify having a legal system that administers the death penalty when it is clear that the system makes mistakes. There are DNA exoneration studies that indicate that many wrongful convictions were based on eyewitness errors, and some involved individuals were convicted of capital crimes and given the death penalty (Huff et al. 1986). It is certainly a moral and to some a religious issue of how can we have a system that invokes the ultimate punishment when it is clear that the system makes mistakes, and under the constitution if a mistake is made, it should favor the accused and not the state. Additionally, how does one further justify the use of the death penalty when it is not distributed equally in states that have the death penalty, as research has demonstrated that demographic factors such as race of defendant, race of the victim, and geographic location impact the likelihood of receiving the death penalty? Additionally, how does society justify having the death penalty in one state and not the other? Therefore, forensic psychologists who study these issues work diligently to do so with an objective eye focusing only on the science, but the outcome of the research certainly has moral, if not ethical, and perhaps even religious connotations that may result in society looking into a mirror and evaluating its own sense of what is right and wrong.

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Formal Logic

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The abstract study of deductive arguments. The discipline abstracts from the content of the propositions of the argument the structures or *logical forms* that they embody. For doing this it customarily uses a symbolic *notation* to express such structures clearly and unambiguously and to enable manipulations and tests of validity to be more easily applied.

Formalism

- [Functionalism](#)

Foundational Theology

- [Fundamental Theology](#)

Four Noble Truths

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The Four Noble Truths are the basic formulation about suffering that was developed by the Buddha. They are as follows: (1) All of life is suffering. (2) Suffering is caused by attachment. (3) The cessation of suffering is possible. (4) The Eight Fold Path can bring the cessation of suffering. These four statements represent the foundation of Buddha's understanding of human existence.

FPGA

- [Electronic Circuits in Computers](#)

Frankfurt School

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A school of thought associated with neo-Marxist social theory. These scholars were/are mainly interested in circumstances in society that

contribute to social change. Many scholars within this field held/hold traditional Marxist beliefs, but could not appropriately utilize Marx to explain the growth and changes in capitalism during the twentieth century.

Cross-References

- [Critical and Cultural Theory](#)
- [Critical Theory](#)

Free Action

- [Free Will](#)

Free Choice

- [Free Will](#)

Free Will

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Related Terms

[Autonomy](#); [Free action](#); [Free choice](#)

Description

Can humans have free will when it seems that all events on the macro level of human action are determined by preceding causes (Searle 2007)? The problem of free will is of fundamental importance because many would argue that all human endeavors lose their rationality if humans do not have free will. The aim of this entry is to give an overview of the main positions held in the

English-speaking philosophical discussion of free will over the last 50 years.

What is meant by the term “free will”? Opinions vary, but most philosophers accept that free will implies that an agent being in a decision-making situation can choose between different alternatives, and that she is the cause of her choice so that it was up to her which alternative was chosen. This condition must at least apply to some of our choices, even if not all. As will be shown below, some reject that freedom requires the choice between alternatives, and argue that such a choice can be understood in different ways. The relationship between an agent and her choice can also be understood in different ways.

Most people will say that they experience from their first-person perspective that they have free will. But this experience of having free will seems to be incompatible with both determinism and indeterminism at the macro level of human action. On the one hand, if the world is determined, it seems that everything that happens was determined before our birth, so that no choices are up to us. On the other hand, if indeterminism is part of our choices, it seems to be a matter of chance or luck what we choose, and so again the choice seems not to be up to us. Faced with this problem, some believe that there is no free will. But the *compatibilists* believe that free will is compatible with determinism, and the *libertarians* argue that free will is only compatible with indeterminism. An important question in the debate about free will is hence whether the world is determined or not.

Determinism and Indeterminism

There are many different definitions of “determinism,” but in philosophical discussions of free will today, it is mostly understood as a metaphysical hypothesis referring to the belief that everything that happens necessarily must happen exactly as it does, because of previous causes, so that there is at any time only one possible future. These previous causes may be understood as destiny, God’s predestination, logical necessities, or physical causes, but they all have in common that they determine what will

happen with necessity so that only one future is possible. However, it is physical determinism which is mostly discussed within the philosophy of free will today. Physical determinism means that the laws of nature together with the other basic physical constituents of the world determine one future with physical necessity.

Is the world determined? Determinism has been a very fruitful presupposition for scientists to work with. A common understanding is that Newtonian and relativity physics are deterministic, while quantum mechanics is indeterministic, but this view needs to be nuanced. John Earman shows that there is indeterminism also in Newtonian and relativity physics (Earman 1986). Concerning quantum mechanics, the most common interpretation is the Copenhagen Interpretation and it is indeterministic. But there are also other interpretations, like the deBroglie-Bohm interpretation, which is deterministic.

Most likely we will never know for certain whether or not the world is determined, for there can always be a deeper and unknown level of reality which makes the world at more superficial levels seem either deterministic or not. But in the free will debate focus is on whether our current data support determinism at the macro level of the brain or not. Some, like Max Tegmark, argue that the micro indeterminism of quantum mechanics cancels out at the macro level of the brain. Others, like Stephen Kellert and Henry Stapp, argue that quantum indeterminism at the micro level can be amplified to the macro level of the brain. Yet others, like Roger Penrose and David Hodgson, try to use quantum mechanics to solve the problem of free will by arguing that quantum mechanics can explain first how consciousness arises and then how it gives us free will.

Many remain critical that it would support free will to show that there is indeterminism in the brain. But one should note that there are two very different understandings of indeterminism. One implies a chaotic and random “swerve of atoms” where things happen without causes. But indeterminism need not mean causelessness, but may instead mean that causes are probabilistic. Thus understood, all events have a cause, but they are

not caused with necessity – there is a slight chance that something else might happen instead. It is this kind of indeterminism that libertarians mostly ascribe to (Kane 1996). Critics nevertheless hold that indeterminism makes choices a matter of luck.

Since determinism and indeterminism are important for the free will discussion, this means that other related concepts may also strongly influence how one understands free will. How should one understand the laws of nature or the concept of causality? And what is a human being? Is everything that happens in the human mind the effect of physical causes, or is agent-causation a unique kind of causation which gives humans the ability not to be determined by natural laws and previous physical states of affairs? These questions will not be discussed here, but show that the problem of free will is complex and addresses several disciplines.

There are many positions in the free will debate trying to present a coherent theory of what free will is. Some scholars reject that free will exists, because they believe it is incompatible with either determinism or indeterminism or both. Others again believe that we have free will, but do not understand how it is possible that we do. Other revisions and alternatives also exist, but this entry focuses on the two main positions in the debate: compatibilism and libertarianism.

Compatibilism

The majority of philosophers working with the problem of free will are compatibilists, however in different ways. A first distinction should be made between classical and contemporary compatibilism. The classical compatibilists, like Thomas Hobbes, understood free will as the freedom to do what you want to do. The requirement that one should be “able to do otherwise” they interpreted conditionally in the sense that one “could have done otherwise *if* one had wanted to.” They considered this to be compatible with determinism, because they did not think it important what causes the things we want, only that we are free from constraints when we act.

This understanding should rather be called freedom of *action* (that we can *do* what we

will), but not freedom of *will* (that we can *will* what we will). Harry Frankfurt criticized classical compatibilism (Frankfurt 1971) by arguing that it is also important to take into consideration what causes your willing. For example, it could be that God has decided what your desires and intentions are at every moment of life or that your desires are caused by a machine, an addiction, a phobia, etc. In such cases, you are not free.

Contemporary compatibilists agree that classical compatibilism is no solution to the problem of free will. A trend among these is to reject or redefine what it means to say that freedom requires alternative possibilities. A main argument against the requirement of alternative possibilities comes from the Frankfurt-style examples, originally introduced by Harry Frankfurt: Imagine that someone has full control over your brain, and wants you to perform an evil act. If a prior sign shows that you are about to choose by yourself to do the act, then the control person will not interfere. But if you do not choose to do the act, the control person will manipulate your will in order to make sure you choose and perform the act.

What conclusions can be drawn from the Frankfurt-style examples have been heavily discussed. For if the world is indeterministic, it seems that the evil controller cannot know what the person will choose before she has chosen, but if the world is deterministic, then there were no alternative possibilities anyway. Nevertheless, there is a group of contemporary compatibilists who do not think that having free will and responsibility requires alternative possibilities in the sense that several futures must be possible. The two main positions among contemporary compatibilists are *mesh theories* and *reasons-responsive theories*.

Mesh Theories

Mesh theories claim that a person is free when she has the right connections or “mesh” between internal parts of her mental life. One subcategory is known as hierarchical mesh theories, such as Harry Frankfurt’s and also Gerald Dworkin’s theory. Frankfurt argues that we have several desires whose object is an action or a state,

which he calls first-order desires. But we also have desires whose object is the first-order desire, and these he calls second-order desires. A person may have a first-order desire for drugs, and a second-order desire which either approves or disapproves that first-order desire. According to Frankfurt, we are free when our second-order desires approve our first-order desires, because only then do we have the will we want. Such a mesh between first- and second-order desires is the mesh required for free will.

Frankfurt's theory has been criticized in different ways. For example, it seems that the right mesh can be manipulated into fit by external means, which according to Frankfurt implies that one is free, but this position seems counter-intuitive. Another critique concerns so-called weakness of the will, since it seems we can approve our first-order desires not to smoke, and still smoke. In this case we are not free and responsible Frankfurt maintains, but critics disagree. A third critique is that it is unclear why second-order approval makes it the will of the agent – what is so special with second-order approval if this is as determined as anything else?

There are other kinds of mesh theories besides the hierarchical theories. For example, Gary Watson argues that people are free if their first-order desires are in agreement with their values. Similar critique as that raised against Frankfurt can be raised here: Is the person then not free when acting against her values, or is she free if the agreement has been manipulated? Is the person not free if acting out of weakness of the will? And why are the person's values most important?

Michael Bratman has developed a hierarchical mesh theory which tries to answer much of the critique against Frankfurt, Dworkin, and Watson. Bratman focuses on higher-order intentions and how different desires fit into a larger plan of an agent, and argues that it is the mesh with the greater plan that makes the agent free. These larger plans are created and held over time and give the agent her identity. This means that the agent creates her identity through choices over time, so that one cannot criticize Bratman's theory by saying that an evil scientist could have created the condition that makes the agent free.

But weakness of the will is still a problem in Bratman's theory, since such actions would not count as free in his theory, but intuitively they are.

Reasons-Responsive Theories

Apart from mesh theories, contemporary compatibilists adapt reasons-responsive theories, which hold that a person is free when her actions are based on a rational response to reasons for action. This approach is meant to solve the problem that a correct mesh in mesh theories may have been manipulated, as for example, by way of brainwashing techniques.

Defending such a theory, Susan Wolf argues that one is free when one does the right things for the right reasons, i.e., a person is free when she acts morally good. This theory has been criticized for the problematic consequence that when people act morally bad, they are not free.

A recently much discussed reasons-responsive theory is the semi-compatibilist theory by John Martin Fischer and Mark Ravizza (1998). They agree that the freedom to act on alternative possibilities is incompatible with determinism. But they accept Frankfurt-style examples, believing that freedom with alternative possibilities is not necessary in order to be responsible. Hence, they distinguish between two different types of freedom called *regulative control* and *guidance control*. Regulative control is the strongest type of freedom and includes alternative possibilities. However, Fischer and Ravizza do not believe that humans have such control. Instead, they argue that only guidance control is necessary in order to be responsible, and that this is all the freedom we need: freedom enough to be responsible.

But how can one be responsive to reasons without having alternative possibilities? Is not reason-responding all about being able to do otherwise in different circumstances? Fischer and Ravizza argue that the process that leads an agent to action may include responding to reasons as part of the process even if the agent could not have done otherwise due to, for example, an evil controller as in Frankfurt-style examples. This seems to be correct, but requires that the process

that leads to action is part of or owned by the agent. Critics argue that guidance control is not enough to qualify as free will. Fischer and Ravizza should clarify how the reason-responsive process works and what makes it owned by the agent.

Libertarianism

Libertarians believe that we have free will and that free will is incompatible with determinism. In order to argue that this view is correct, they have both to defend that free will is incompatible with determinism and that the world is not determined. After having rejected compatibilism, they need to show how free will is compatible with indeterminism. A common argument against compatibilism is the *Consequence Argument*, which states, in basic terms, that if determinism is true, then what happens in the future is determined by laws of nature and events that took place in the distant past. Since the future was determined before our birth, it cannot be up to us what happens, and therefore we cannot have free will (Van Inwagen 1983). This argument has been thoroughly debated. Does it follow from determinism that we cannot change the future even if we cannot change the past and the laws of nature? And can a person still be the cause of an action at one level of description even if the Big Bang and the laws of nature are the causes of the same action at another level of description? Despite criticism, the Consequence Argument is still a main reason for libertarians to reject compatibilism.

In addition to defending indeterminism and incompatibilism, the greatest challenge for libertarians is the intelligibility question – to give a positive account of how free will is possible in an indeterministic world. The problem for libertarians is that in the case of indeterminism, it seems to be a matter of chance whether an event occurs or not. But as chance events are not under control of an agent, can then an action be free and responsible? It is important to recall that there are two quite different understandings of indeterminism, and libertarians defend the kind which does not preclude that events can be caused. Nevertheless, libertarian theories are

commonly criticized for making choices a matter of luck.

Different strands of libertarianism can be classified according to how its proponents think actions are caused. *Non-causalists* believe that free actions are not caused at all, but intelligible in light of the purpose of the action. *Agent-causalists* believe that there is a unique and irreducible kind of causation that only free agents can employ. *Event-causalists* reject that actions have special causes, but believe instead that all causes are of the same kind. They argue that events cause events, both in the mind and in the world in general. These views will now be presented and criticized.

Non-causalism

Non-causalists like Carl Ginet believe that actions are not caused at all. Agency is a kind of event different from how other events in the world are caused. Human action can be explained by intentions instead of causes, and these are totally different things. A classic charge against such a view derives from Donald Davidson (1963). He pointed out that even if a person has a reason for doing something, this does not mean that his reason is what actually led the event to happen. There often are several reasons pointing in different directions in the course of acting. The challenge to non-causalists is to explain what links the personal reason to the action.

Agent-Causalism

Agent-causalists like Timothy O'Connor and the early Randolph Clarke hold that agents are enduring irreducible substances who have a unique ability to cause actions. This line of thinking does not have to imply substance dualism, even though, for example, Richard Swinburne is a substance dualist and agent-causalist. A substance dualist view is that it is the soul that chooses among undetermined options. But one may as well conceive of the agent as emerging from physical parts, as long as the agent is understood as an irreducible entity different from the sum of its physical parts.

When agent-causalists explain action, they refer to the reasons the agent has for choosing

one action. A similar critique as raised against non-causalists is relevant here as well, namely the problem of explaining how the reason makes an action happen. Persons often have some reasons for doing A and other reasons for not doing A at the same time, so what is it that makes a reason actually lead to action? Agent-causalists are typically criticized both for appealing to a mysterious agent and a mysterious form of causation, and for not explaining how reasons can make actions happen.

Event-Causalism

Event-causalists hold that mental events can cause free actions. Different opinions on how this happens can be sorted according to when in the deliberation process indeterminism occurs. The advocates of *centered* event-causal theories believe that there is indeterminism until and in the moment of choice (e.g., Robert Kane 1996). The advocates of the *deliberative* event-causal theories hold that there is indeterminism early in the deliberation process creating different ideas in the mind (alternative possibilities), but that the rest of the deliberation process is determined (e.g., the two-stage model of Bob Doyle, inspired by Daniel Dennett and Alfred Mele).

The luck-objection is the most common objection against centered event-causal theories. Let us say there is a 70 % probability that Jack will decide to have pancakes for breakfast. If history had been rolled back a hundred times and played again up to the moment of choice, it seems that Jack would decide to have pancakes 70 times and not 30 times. But if the exact same history up to the moment of choice can give completely different choices, it seems to be a matter of luck what Jack decides to do. The same point can be made with identical worlds up to the moment of choice, where Jack1 and Jack2 make different choices.

Deliberative event-causal theories are meant to evade this problem by moving the indeterminism to an earlier point in the deliberation process. But if what happens at the first stage is undetermined and outside of the agent's control, and then everything is determined at the second stage, the choice still seems outside of the agent's control, and a matter of luck.

Free Will and Neuroscience

Neuroscientists do not generally participate in the philosophical discussion of free will, so when they do speak of free will, it is often ambiguous which sense of "free will" they refer to. However, the neurosciences have brought forth important data and experiments that the philosophers need to take into account. In particular, two kinds of findings are often mentioned. The first is data which suggest that the brain determines what a person does before the person is conscious of having a desire and making a choice. The second is data which suggest that persons do not know the real causes of their actions, but invent a false reason which they believe was their actual reason for action.

As regards the first kind of data, the most famous experiments were done by Benjamin Libet in 1983 and later. His experiments showed that what participants reported as free voluntary acts were preceded by a specific electrical charge beginning 550 ms before the act, while they reported being conscious of their desire to act 350–400 ms after this. Since that leaves around 200 ms before the motoric act, Libet concluded that free will was not disproved since the subjects could still veto the act before it started (Libet et al. 1999).

Libet's experiments have been criticized on many points by philosophers like Alfred Mele. Firstly, the participants were given an assignment where they consciously chose to prepare to flex, so consciousness is already involved in the process. Secondly, the act in question was to flex a finger whenever they wanted. Since this is a choice which does not matter to people, it is hard to conclude from such indifferent choices that the same applies to other choices. Thirdly, the machines only registered when persons flexed, so we do not know if the same electric charge was present when the persons did not flex. Fourthly, the participants flexed when they felt an urge, and Libet uses terms like "intention," "urge," "wanting," "decision," "will," and "wish" as imprecise terms for this desire to move the finger, whereas Mele thinks that there is a great difference between an urge and a decision. Fifthly, the test only applies to choices

to do something now, not to choices to do something later.

Even if it is difficult to draw general conclusions from Libet's experiments, it seems likely that there are nonconscious predecessors to at least some of our choices. Chun Siong Soon et al. set up an experiment similar to Libet's, but designed to counter some of the criticism of his test method. They wanted to investigate more what happens in the brain before making more complicated choices than in the Libet experiment. A group of subjects were asked to press either a left or a right button when they wanted to. At the same time they were shown a slide show of letters K, T, D, etc., in random order. They were asked to note which letter they saw at the same time as they consciously decided to press either the left or the right button. All this were done while their brains were monitored using fMRI-scanning. The scientists discovered patterns in the brains consistent with their choices up to 10 s before they reported that they were conscious of making the choice. It was also possible for the scientists to predict (with 70 % reliability) the choices about to be made up to 5 s before the test persons reported being conscious of a desire to act (Soon et al. 2008).

Both of these experiments have been criticized for their dependence on the memory and report from the test persons. An experiment designed to avoid this critique was done by Masao Matsushashi and Mark Hallett in 2008. They asked their participants to extend their finger as soon as they felt an intention to move. While they also found a readiness potential happening before the conscious intention to move, sometimes it was the other way around, and this suggests a more complex relation between readiness potential and intention than earlier suggested (Matsushashi and Hallett 2008).

The second kind of data concerns examples of confabulation, meaning that a person invents a reason to act differently from his or her actual cause of action. Experiments by Michael Gazzaniga and others on split brain patients have given many such examples. For instance, one patient was shown the word "walk" only to the right hemisphere, and he got out of bed and

started walking. He was then asked why, but the language center is in the left hemisphere, which had not seen the word "walk." He answered that he wanted to go and get a coke (Gazzaniga 2005). Experiments like these are relevant because they fit well with other experiments, suggesting that all persons confabulate, and this raises the question of how often we do.

Several experiments have been done where people were electrically stimulated in the motor area of the brain without knowing it, and the stimulation made them move their fingers. When asked why they moved their fingers, they answered that they had chosen to do so of their own free will. There are even some experiments where scientists stimulate an area of the brain and people say that they feel an intention to perform a certain act. When more electricity is put to the same area, they report that they have actually performed the act, even if they have not.

Gazzaniga argues that there is an interpreter in the brain which gives us the sense of a self in charge. And there are many examples of how brain damage can influence personality, areas of the brain can be triggered to cause various desires, and other examples which suggest that consciousness is totally dependent on what happens in the brain. This raises the question of whether or not the self is just an epiphenomenon with no causal influence. On the other hand, it seems that evolution must have selected consciousness for a reason, so that it actually must contribute somehow.

To sum up, there are many positions to choose between in the free will debate, and all of them have their problems. With all the new information coming from the neurosciences, there is every reason to believe that the debate will continue.

Cross-References

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- ▶ [Cognitive Neuroscience](#)
- ▶ [Determinism and Indeterminism](#)
- ▶ [Freedom](#)
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Freedom

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Related Terms

[Free will](#)

Description

By freedom we can refer to several different things. When we can talk about freedom in a political or social sense, we are referring to the autonomy of individuals or certain human groups to set their own legal and moral standards or form their own government. To be free in this

sense is to be independent from legal control (or oppression) that comes from outside the individual (or the group). This implies that there is an underlying, basic notion of freedom: To be free is to be able to realize one's desires without external constraint. In this sense, one is free when one takes the job one wants or chooses what kind of clothes one wears. Philosopher Robert Kane calls freedoms such as these surface freedoms. But there is also a deeper kind of freedom, a freedom to have an influence on one's own desires and beliefs.

To see the difference between surface freedoms and deep freedom, consider the following case. Imagine that there is a man, let us call him Thomas, who has always wanted to be a fighter pilot. Given the notion of surface freedom, we would say that Thomas is free, if he can become a fighter pilot and is not coerced to do something else. But the fact that Thomas has this surface freedom does not mean that he is free in a deeper sense. Let us further imagine that his father, a fighter pilot himself and a big Top Gun fan, had had Thomas genetically engineered to be extremely responsive to his wishes. Of course his father wants Thomas to become a fighter pilot and makes him watch Top Gun all the time. Thus, Thomas forms an unstoppable desire to be a fighter pilot. Now, it seems that Thomas is not free in the deeper sense that we just described. In what follows, we will be discussing the nature and the possibility of freedom in this deep sense.

The Problem of Free Will

Discussions and debates of this kind are often conducted under the heading of "free will." The issue, however, far exceeds individual choice. What we are interested here are issues such as the criteria for moral responsibility, determinism in nature, the nature of alternative future possibilities, causation, and rationality. Thus, there is no single "problem of free will." Instead, we have a cluster of problems and a cluster of answers (Kane 2002 has essays on all the relevant issues).

Having said that, we can present the following basic outline of the problem of free will. Normally, humans think that they are free to choose

what they want. The implicit assumption here is that there are alternative possible futures, say, a future in which Thomas is a fighter pilot and another where he is not. Further, it is Thomas' choice that makes the difference (among many other things, of course) between these alternative futures. The problem is that given what we know about the natural and physical world through science, it seems that human beings are part of that physical world and that the future events of the world are determined by the past and the laws of nature. Further, the choices we make should be based on good reasons: Should those reasons not determine our choices? In the case of Thomas, it seems that Thomas' reasons for his choice are not in his control. Instead, they are determined by his psychology and his environment.

A further question can then be proposed: How could Thomas be morally responsible for his actions, if they are caused by events that are out of his own control? Our basic intuition is that a necessary condition for moral responsibility is the power to do otherwise. Further, this power can only be realized by rational reflection of different alternative actions. If a person has no choice, then it seems that he or she is not morally responsible. This is the reason why we normally do not hold animals morally responsible. They lack the power of rational reflection and, thus, cannot choose between alternative actions. But can we really choose between alternative actions if our actions and choices are determined by past events (be they reasonable or not)?

Several solutions to these problems have been presented. We can sort out the positions by examining the kinds of freedom they allow:

1. According to classical compatibilism, we are free if we have the freedom of self-realization. In other words, we are free to the extent we have the power or the ability to do what we want and we are not subject to any external constraints.
2. Many "new compatibilists" hold that free will entails the freedom of rational self-control. What this means is that to be free is to understand and reflectively evaluate the reasons that one has for wanting to act in a certain way. Further, one needs to be able to control one's own behavior according to reflected reasons.
3. Some libertarians hold that free will requires the freedom of self-determination. What they mean by this is that one is free to the extent one has the power or ability to act on the grounds of the character, beliefs, and motivation that one have oneself influenced. The idea is that the person herself is the one who is ultimately responsible of her character and motivation.
4. Finally, many libertarians claim that the previous type of freedom includes a deeper kind of freedom, the freedom of self-formation. This freedom entails that one has the power to shape one's own will in a way that is undetermined by the past self-forming decisions or actions.

We can now look at these positions in more detail.

Compatibilism

There are many types of compatibilist analysis of free will. I will briefly examine two: classical compatibilism and what we might call "new compatibilism." Compatibilists agree that (a) all human actions are determined by antecedent causes (past events) and laws of nature, that is, they believe that determinism is true, (b) that free will and moral responsibility exists, and that (c) free will and determinism are compatible.

For the classical compatibilist, there are only surface freedoms, no deep freedom. The only freedom is the freedom of self-realization: We are free to the extent that we have the power to do what we want and are not constrained by external factors. Notice how this way of defining freedom says nothing about alternative futures. No alternative possible futures are required to be free. To be free is to act on the basis of one's own beliefs and desires and not be constrained.

It is easy to see how such a freedom is compatible with determinism. Consider the following example. Let us say that Thomas decides to cycle to work by bus one morning. Was this a free act? The classical compatibilist would analyze the situation as follows. Did Thomas want to go to work by bike? If he did and was not constrained

by anything external to him, then the act was free. It need not be possible that Thomas had had the power to do something else, say, take the bus instead of cycling. It is enough that if Thomas had decided to take the bus, it would have happened (given that there had not been any external constraints). But given Thomas' beliefs, desires, and his character (Thomas hates pollution and cars), it was impossible for him to choose any other means of travel than his bike. This way of understanding Thomas' freedom to choose is sometimes called hypothetical freedom: Thomas cycled to work because he wanted to and if he had different desires, he could have acted upon them, since there was no external constraint.

The major problem with classical compatibilism is that it does not accommodate compulsive or otherwise engineered desires and motivations. We see this, if we return to our earlier example of Thomas, the fighter pilot. In that case, Thomas is free to become a fighter pilot in the sense of self-realization, but Thomas has no control over his desires and motivations. The same thing can be said about pathological desires as well. Let us say that Thomas gets a metal fragment in his brain in a training accident that makes him to want ice cream all the time. He then goes and gets ice cream. This sort of compulsive behavior would be considered free on classical compatibilism.

Several contemporary compatibilists, such as Harry Frankfurt and Daniel Dennett, have argued for a deeper compatibilist freedom to avoid the problems of classical compatibilism. It is not enough to have the power to act on one's desires, one also need the power to reflect, evaluate, and control one's own reasons and the subsequent behavior (see, e.g., Dennett 2004). This involves a distinction between first-order and second-order desires. Let us return to Thomas, the fighter pilot. The contemporary compatibilist would say that Thomas has a strong first-order desire to become a fighter pilot and nothing prevents him from choosing to become one. But this does not mean that he is free. He is free in the sense of self-realization, but not in the sense of having rational self-control. For Thomas to be free in the sense of having rational self-control is for him to have the

power to evaluate his reasons for wanting what he wants and adjust his behavior according to such second-order desires. Given that Thomas is both genetically and socially programmed to become a fighter pilot, he does not have such control and, therefore, is not free.

Libertarianism

A libertarian is a person who believes that (a) indeterminism is true and determinism is false, (b) free will is not compatible with determinism, (c) and that we can make sense of indeterministic free will (O'Connor 1995 has essays for and against libertarianism). So the libertarian has to advance two kinds of arguments: arguments for the fact that compatibilist freedoms are not enough or are incoherent and forward a theory of indeterministic free will.

The most famous argument for the incompatibility of free will and determinism is the consequence argument (van Inwagen 1983). The argument can be summarized like this:

1. There is nothing we can do to change the past and the laws of nature.
2. Our present actions are the necessary consequence of the past and the laws of nature (determinism).
3. Therefore, there is nothing we can do to change the fact that our present actions occur.

To put it in another way, we are unable to do otherwise than we actually do. It follows from this that if determinism is indeed true, no one ever has the power to do otherwise.

The most common way to respond to this argument is to insist that the power to do otherwise is not a necessary condition of having free will. Compatibilist freedoms, such as the aforementioned freedom of self-realization and freedom of rational self-control, do not require the power to do otherwise. The libertarian response at this point is that even if the power to do otherwise is not necessary for free will, the notions of control and responsibility are. Compatibilists, they argue, cannot make sense of the deep seated intuition that to be free is to be the agent of one's own actions. For the libertarian, the person herself must be ultimately responsible for her character and motivations that are underdetermined

by past events. And this is what compatibilism cannot offer.

The second problem that libertarians have to deal with is that indeterminism does not seem to give any more support to free will than determinism. If there is genuine indeterminacy in nature, say, quantum indeterminacy of some kind, the outcomes are random, that is to say, nothing determines them. This does not help free will either: To have free will is to have the power to influence what possible future actualizes. If indeterminism is true, possible futures are realized randomly, not by human deliberation.

The first issue in a libertarian theory of free will is whether libertarian free actions have causes or not. The compatibilist argues that if actions do not have causes (reasons, desires, etc.), actions are merely random and completely irrational. Thus, to be rational, actions need to have causes of the right kind. The so-called non-causal libertarians (sometimes called simple indeterminists) claim that free actions do not have causes in any meaningful sense. Volitions are, according to this view, basic mental states that are not caused by anything.

Most libertarians, however, affirm that free actions do have causes. They reject non-causal libertarianism, because it is not able to explain how basic, non-caused volitional states are related to reasons for actions. Free will cannot simply appear from nothing without any reason. What the libertarian must do here is to show how free actions are caused, but not determined by factors that are out of the control of the agent. One possibility is to say that some extra factor – a nonnatural factor – comes in at the point of decision making that causes one alternative future to be realized. Usually, this is achieved by arguing that there exists a nonphysical and nonnatural soul that can have physical influence without being itself part to the causal nexus of past events.

Another possibility is to argue for what are usually called event-causal theories of free will. The event-causal theorist admits that there is a chain of causes leading up to the free act of the agent. The agent's reasons, motivations, and character are indeed causally efficacious. So far

this sounds like compatibilism. What the event-causal libertarian adds to this is that the agent must be responsible for the sufficient reason or motive for the action occurring. This immediately raises the problem of endless regress. If Thomas needs to be responsible for A, he needs to be responsible for his reasons to do A. To be responsible for these, he needs to do B and be responsible of his reasons for B and so on. Event-causal theorists attempt to sever the regress by introducing choices that determine the agent's will and character for subsequent events. These are called will-determining choices. Will-determining choices are choices that we make in conditions of uncertainty about what we want and where there is the possibility to do otherwise. Once such a choice is made, it causes the agent to make similar choices in the future.

Finally, many philosophers, such as Roderick Chisholm, have argued for agent-causation to give robust content to the freedoms of self-determination and self-formation. The event-causal theorist, as we have seen, argues that free actions are caused by antecedent will-determining choices, will-determining events. Contrary to this, the agent-causal libertarian argues that it is not enough that our actions are caused by antecedent events that we have control over, they have to be caused by the agent itself in some more robust sense. Thus, freedom must involve some kind of basic or brute fact agent-causation between the agent itself and the body of the agent. The nature of the agent itself can be understood in terms of the soul, in which case the agent-causal theory would be an extension of dualism, or in terms of some materialistic theory of what persons are, so far as the theory does presuppose that persons are identical to their bodies.

Agent-causal theories are open to criticisms as to the exact nature of the causation between the agent and her body. It seems that the agent-causal theorist must introduce a new factor into the causal mix, a factor that is not part of the ordinary flow of natural events. Be this new factor a materially constituted agent or essentially nonphysical agent (a soul), one still has to explain how this nonnatural thing can have physical

effects. The nature of causation involved, the critic claims, is mysterious.

Hard Determinism and Mysterianism

There are those who reject both libertarianism and compatibilism. The so-called hard determinist (contrary to compatibilists who are sometimes called soft determinists) will claim that (a) determinism is true and indeterminism is false, (b) free will is incompatible with determinism, and, therefore, (c) there is no such thing as free will. Free will in any meaningful sense of moral responsibility, they claim, is not compatible with determinism and determinism is what science requires us to believe. Thus, science trumps our everyday idea of free decisions and responsibility. We need to learn to live without the idea of free will.

Another, more popular, position is one that we could call mysterianism. The classical mysterians, such as Immanuel Kant, and contemporary mysterians, such as Peter van Inwagen, argue that (a) either indeterminism or determinism is true, (b) free will is incompatible with both determinism and indeterminism but (c) we cannot help but to believe in free will anyway (van Inwagen 1983). Free will, according to van Inwagen, is the power to do otherwise on the basis of rational deliberation. As the consequence argument concludes, if determinism is true, then we have no power to do otherwise. But, for the reasons already mentioned before, we lack that power to otherwise even if indeterminism is true. At this point, the compatibilist would say that we should give up the idea of free will as being able to otherwise. Van Inwagen argues that we really cannot do this. The problem is that free will as a power to do otherwise is constitutional to our everyday understanding of ourselves and our actions in the world. We cannot live without it. So, we find ourselves in a situation where we have no idea how free will is possible, but must believe in it nevertheless. Free will is, therefore, a complete mystery.

Science, Determinism, and Free Will

As we can see, ideas about the laws of nature are crucial for the whole free will debate.

Determinism is usually defined in terms of laws of nature: Determinism is true if at time t , everything that has happened in the past in conjunction with the laws of nature make only one future possible. But this way of defining determinism has some serious problems.

It is not the case that universal determinism is supported by contemporary physics. Quantum indeterminacy, complexity, and chaotic systems suggest that there is some indeterminacy in physical systems. This, one thinks, is good news for the libertarian: Science does not support determinism. Things are not that simple. Most philosophers and scientists still believe in determinism in human behavior, because of developments outside physics. The progress of biology, social sciences, neurosciences, and psychology has produced massive amount of information about the genetic, cognitive, social, and neurological causes of human behavior. There might be indeterminacy at the fundamental physical level, but the more we find out about human behavior, the more we see how it is driven by causes that are outside human control. The main issue, it seems, is not really whether determinism or indeterminism is supported by contemporary physics, but rather the suggestion of contemporary neurosciences, biology, and social sciences that there are many different kinds of non-voluntary causes that influence our decisions.

Consider the following argument for neurobiological determinism. If we reject the existence of nonnatural factors influencing human organisms (souls, etc.), then we must conclude that human brains are physical systems. As all other physical systems, everything that goes on in the brain has sufficient physical causes – causes that are explicable in terms of neuroscience. Since every mental event is also a physical event with sufficient physical causes, the mental events themselves make no difference to what happens next. Our thoughts and acts are, thus, necessitated by the physical functions of our brains, not our choices, reflections, or deliberations.

One way of responding to the problem of neurobiological determinism is to argue that psychological theories do not provide laws in the sense of universal generalizations. Instead, they

produce idealized models of certain, very specific causal relationships. Instead of one single “complete picture” of what happens in the mind, psychological sciences give us laws that track the truth in one very particular area of human cognition and brain. But because of the piecemeal nature of these laws, they do not, all by themselves, rule out the possibility of other factors influencing the brain in some way. Another possibility is to argue that the complexity of our brains as physical systems, higher-level events, or systems can have influence on lower-level events or systems. This is usually called top-down influence. Top-down influence, the argument goes, makes complex interaction between thinking, action, and deliberation possible to such an extent that the human action and decision making is not subject to any clear-cut laws. Both these solutions claim that given the sciences we now have, we do not know whether all mental events have sufficient physical causes that can be given in terms of low-level neuroscience. Thus, when we understand what science actually tells us, we see that neurobiological determinism is a philosophical position rather than something simply flowing out of the sciences of the mind themselves (Horst 2011).

God, Freedom, and Future

It seems that if the traditional theistic God were to exist, certain analysis of what free will is would be ruled out. Traditionally, one of the biggest problems has been the seeming incompatibility of God’s foreknowledge and human freedom. One way to look at the problem is this: If God knows the future and is omnipotent, then free creatures cannot choose otherwise than what God has intended. Further, if God exerts providential control over the world and knows what is going to happen because of this, it seems that the future will be set regardless of how we decide to act. This is a view known as theological fatalism.

There are several different ways to steer clear of theological fatalism. We can get the best grip on these solutions, if we present them as responses to the following simplified argument for theological fatalism. The argument here is based on one single human action. Notice,

however, that if the argument works, it can be applied to all human actions.

1. God knows at t_1 that Thomas will read *Crime and Punishment* by Dostoyevsky at t_2 .
2. God’s beliefs are infallible, that is, God’s beliefs cannot be false.
3. Thomas is free to read *Crime and Punishment* at t_2 , if he can choose not to read *Crime and Punishment* at t_2 .
4. Given 1. and 2. Thomas cannot choose not to read *Crime and Punishment* at t_2 .
5. Therefore, Thomas is not free: He is determined to read *Crime and Punishment* at t_2 .

This argument is rather similar to the consequence argument discussed earlier. Premise 1 is based on the classical notion of omniscience, according to which, God’s knowledge is perfect. In other words, God knows everything that can be known. Premise 2 is based on another standard component of classical theism, that is, God possesses his properties, omniscience in this case, necessarily. If God is necessarily such that He knows everything that can be known, then it follows that God’s beliefs cannot be false. God is, therefore, infallible in all possible worlds. Premise 3 invokes the idea that alternative possibilities are necessary for free will. That is, if it is not possible for Thomas to realize the states of affairs of reading *Crime and Punishment* at t_2 , then Thomas is not free. But if 1 and 2 are correct, then Thomas cannot choose not to read *Crime and Punishment* at t_2 , because that would mean that one of God’s beliefs is wrong.

There have been several attempts to solve this problem in the history of theistic philosophy and theology (see Zagzebski 1991). First, according to hard theological determinism, the argument is sound and humans are not free. Second, soft theological determinism accepts 1 and 2, but denies 3. Instead, it claims that God indeed knows that Thomas will read *Crime and Punishment* at t_2 and Thomas cannot do otherwise, but this does not impinge upon Thomas’ freedom. Both soft and hard theological determinism have been relatively popular in Christian philosophy and theology. According to thinkers such as Augustine and Jean Calvin, nothing in the created world happens by chance. Instead, everything

that happens is both ultimately determined and known by God. If the theological determinist does not want to reject free will altogether (as the hard theological determinist must do), a compatibilist analysis of human freedom seems to be the only option.

Contrary to this, some have claimed that it might be possible to hold onto libertarian free will and theological determinism at the same time. This solution invokes the atemporality of God, namely, the idea that God does not have temporal properties. Let us call this the Boethian solution (after Boethius). An advocate of this view would deny 1 and claim that since God is atemporal, God does not know anything at t_1 . Instead, God has all his beliefs “timelessly,” that is to say, God’s having the belief that Thomas reads *Crime and Punishment* at t_2 is not related to our time in any way. Further, this allows Boethius and other eternalists (such as Aquinas) to say that since God does not have his infallible belief at any time before (or after), Thomas actually reads *Crime and Punishment*, Thomas is free to make the choice and whatever that choice may be, God knows it eternally.

Fourth, the so-called Molinist solution (after Luis de Molina, sixteenth century Jesuit) denies 3 and argues that God’s knowledge does not remove Thomas’ freedom to choose, because God knows what Thomas would freely choose in all possible circumstances. In other words, God knows that Thomas will read *Crime and Punishment* at t_2 , but he knows this by not determining the event, but by knowing what Thomas will freely choose in circumstances that He puts him. Thus, Molinism is committed to the existence of a special type of knowledge, that is usually called middle knowledge. Medieval thinkers distinguished God’s free knowledge from his natural knowledge. God’s natural knowledge has to do with abstract truths (mathematical and logical truths) that are necessary and independent of God’s will. God’s free knowledge is His knowledge of contingent truths that are dependent on His will (truths about the created world). To these two types of knowledge, Molina added a third way of knowing: middle knowledge. Middle knowledge is knowledge about

truths that are, similarly as His free knowledge, contingent, but not dependent of His will. In our case, God would have access to middle knowledge that would be something like this:

If Thomas is put in circumstances C, he will freely choose to read *Crime and Punishment*.

As we can see, middle knowledge is presented here in a counterfactual form. In the literature on Molinism, such propositions are often referred to as counterfactuals of freedom (or counterfactuals of creaturely freedom). By knowing the truth of such propositions, God could know that Thomas will read *Crime and Punishment* at t_2 without removing Thomas’ free choice.

Fifth, many contemporary philosophers and theologians, such as Richard Swinburne, Keith Ward, and John Polkinghorne, defend a group of views usually called Open Theism. Open Theism accepts 2 but denies 1: According to Open Theism, God does not know at t_1 that Thomas will read *Crime and Punishment* at t_2 . But does this result in denying God’s omniscience? No, says the open theist, because omniscience requires only that God knows everything that can be known. Propositions of future free choices do not have a truth value before those choices are actually made and thus there are no truths to be known about them. In this way, God’s omniscience as well as libertarian free will is preserved. If one accepts Open Theism, one must also accept that God is, at least to some extent, temporal and does not determine the future completely.

All these solutions have their distinctive problems. The problems of theological determinism have to do with the problem of evil. If humans do not have libertarian free will, then it might seem that they are not responsible for moral evil, but God is. In other words, theological determinism sets the bar of a successful theodicy very high. The Boethian solution is believable if one has independent reasons to believe that God is atemporal and one can make sense of God’s atemporal believing. The biggest obstacle of Molinism is the so-called grounding problem. If Molinism is true, then there will be truths of what all possible free entities would do in all possible situations even

if God does not create a world at all. What makes middle knowledge true? It is not God's nature, nor is it his choices, but there is nothing else left. Further, the critic of Molinism can ask how God knows these truths. They do not resemble abstract and necessary truths of logic and mathematics that God could know by knowing his own nature and mind. Neither are they truths that God knows on the basis of what he has created. Finally, Open Theism has its own problems as well. One problem is that many do not recognize the existence of propositions about future actions whose truth value is indeterminate. Another problem is that on Open Theism, it looks as if God's promises could fail to be realized. Since God does not know the future (as there are no truths to be known about future free choices), it is possible that some free choice will thwart God's plan. For many theists, preserving libertarian free will by giving up God's absolute providence is a price too high to pay.

Cross-References

- [Determinism and Indeterminism](#)
- [Divine Action](#)
- [Free Will](#)
- [Metaphysics](#)
- [Philosophical Anthropology](#)
- [Philosophy of Mind](#)
- [Rationality \(Philosophical\)](#)
- [Self](#)
- [Soul](#)

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Fulguration

- [Emergence, Theories of](#)

Function

- [Functionalism](#)

Functional Explanation

- [Functionalism](#)

Functional Magnetic Resonance Imaging (fMRI)

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Related Terms

[fMRI](#)

Description

Functional magnetic resonance imaging (fMRI) is the term used in general to describe a group of MRI techniques that are capable of tracking physiological changes in living tissue, as well as delineating anatomy. The term was first applied by Moonen and colleagues (1990) to denote MRI methods for the detection of the motion of water in processes such as vascular flow, capillary flow, diffusion, and exchange, and also for measuring the concentrations of various metabolites involved in the regional regulation of metabolism.

When Ogawa et al. (1990), Williams et al. (1992), Turner et al. (1991), and Kwong et al. (1992)

developed noninvasive methods in 1990–1992 that enabled MRI to localize brain areas associated with specific functional activity, the term “fMRI” rapidly became specialized almost exclusively to denote MRI techniques for the study of brain function. Entirely noninvasive, using only a set of carefully controlled magnetic fields, fMRI methods map local variations over time in either cerebral blood oxygenation or cerebral blood flow. The observed signal arises from the nuclear magnetic resonance of the proton nuclei of hydrogen atoms in the water molecules which make up most of the volume of brain tissue.

Because the international availability of MRI scanners capable of performing these specialized MRI techniques has rapidly increased, the use of fMRI has expanded dramatically in the fields of cognitive science, neurology, psychology, neuroradiology, and psychiatry. Never before has there been a noninvasive technique for studying the human brain which combines a spatial resolution of better than 1 mm with a temporal resolution of about a second (mainly limited by the slow response of blood flow to changes in neural activity). Typical research themes extend from the exploration of visual-processing brain areas mapped according to where light falls on the retina, to the spatial organization of brain areas responding to rewarding experiences. Recent studies measure how learning and memory processes remodel brain tissue, both in functional activity and even physical dimensions. It is now possible, by studying the functional brain activity of a given human volunteer subject in a task involving choice, to predict the outcome of the choice sooner than the subject is aware of their decision (Soon et al. 2008).

Self-identification

Science

The experimental techniques of fMRI are entirely derived from the physics of nuclear magnetic resonance. This is a very well-established area of science, which arose from the greatly increased understanding of the quantum physics

of atomic nuclei in the 1940s and 1950s. Fundamentally, the observable phenomena arise from the fact that some nuclei, such as protons, have a net spin, which means that their energy states are dependent on an applied magnetic field. This fact can be readily demonstrated using suitable easily constructed apparatus. The physics of condensed matter and basic thermodynamics are also involved in the quantification of the NMR signal, and hence in the creation of the cross-sectional grey scale images of brain tissue that form the raw materials of fMRI science.

The biophysical relationship between the MR image intensity changes and underlying changes in brain activity is not so straightforward. Considerable work has been devoted in recent years to understand the mechanisms of neural control of blood flow, and the process of oxygen extraction from the blood by metabolizing brain tissue. Some effort was also required to model accurately the important effect of deoxygenated blood, which is more paramagnetic than oxygenated blood, on the MRI signal. This effect is utilized in the most popular form of fMRI, blood oxygen level-dependent contrast (BOLD). Empirical work, however, notably by Logothetis et al. (2001), comparing recordings from electrodes implanted in living animal brains with the changes in fMRI signal occurring nearly simultaneously in the same location, has given researchers great confidence that what they observe is not artifactual.

The design of fMRI experiments and the analysis of fMRI data, on the other hand, are far more dependent on culturally dependent assumptions. For instance, early work in imaging neuroscience assumed that there are no interactions among the cognitive components of a task, so that to identify brain areas important to a particular task one would need only to provide two experimental conditions, with and without the task, and perform a simple subtraction of the functional images thus obtained. In time it was realized (e.g., Friston et al. 1996) that a mammalian brain is never idle, so that much better defined experimental conditions, and more sophisticated (e.g., factorial) analyses are required unambiguously to isolate brain areas with specific

functions. Methods for analysis of brain imaging data are still undergoing rapid development.

Beyond this, what still underlies much of imaging neuroscience consists of an uneasy and usually unreflective combination of naive empiricism, positivism, behaviorism, materialist reductionism, and philosophical idealism. The choices of explanatory concepts and models are inherited largely from experimental psychology, and other relevant human sciences – anthropology, sociology, developmental psychology – are often ignored. The term “neuropsychology” has unfortunately come to denote (in the hands of Churchland and others) the use of the findings of fMRI and other neuroscientific results to justify a sometimes intolerant and fundamentalist atheism, but it can be strongly argued that such an activity, in the true meaning of the term “philosophy,” is greatly needed to clarify and refine the conceptual bases for imaging neuroscience.

Be this as it may, fMRI is now very well accepted as a methodology within cognitive science, neurology, experimental psychology, and psychiatry. Presentations relating to fMRI form about 20% of the proceedings of the annual meetings of the International Society for Magnetic Resonance in Medicine, and perhaps 70% of the annual International Conferences on Human Brain Mapping. Results based on fMRI are presented uncontroversially at meetings of the Society for Neuroscience and the Society for Cognitive Neuroscience, and at all major neurology and psychiatry conferences. Two journals, *NeuroImage* and *Human Brain Mapping*, have a high proportion of fMRI-based publications, and the high-impact journals *Science*, *Nature*, *Nature Neuroscience*, *Journal of Neuroscience*, *Neuron*, and *Cerebral Cortex* often publish fMRI-derived results.

Characteristics

fMRI is distinctive within the field of neuroscience in two respects. Firstly, most of the experiments involve human subjects. Much basic work has been performed with experimental animals, but this primarily addresses validation of

techniques to be applied with humans. The reason for this focus on human subjects is the excellent noninvasiveness of fMRI, which allows human subjects to be scanned indefinitely frequently. In the study of cognition and psychology, use of human subjects is highly desirable because humans are uniquely compliant in performing experimental tasks, and because most of the important theoretical questions in these fields relate primarily to our species.

The second respect in which fMRI is distinctive within neuroscience is its dependence on the “big science” of MRI physics. Scanners are expensive, and the researchers that invent and optimize fMRI techniques are highly skilled and highly paid scientists, invariably with PhDs in physics or related subjects. Major multinational high-technology companies, such as Siemens and Philips in Europe, and GE in the USA, produce thousands of MRI scanners per year in a highly profitable business, mostly supplying radiology departments of hospitals with instruments for clinical diagnosis and monitoring. Use of fMRI is an offshoot of this business, which allows brain scientists an otherwise inaccessible opportunity to use reliable, very powerful, and highly developed scanners to address fundamental questions of brain organization.

This second aspect makes fMRI also distinctive within neuropsychology and cognitive psychology, where typically the experimental equipment required is relatively simple and inexpensive.

Relevance to Science and Religion

Because the brains of populations of normal human subjects can be studied easily using the techniques of fMRI, a number of brain scientists have been attracted to the possibility of finding objective material correlates for mental states that have traditionally been associated with religion. It is commonly assumed that, to any mental state, or mental act, there corresponds respectively a brain state, or change in brain activity. Thus, several types of meditation have been studied (well reviewed in Pagnoni et al. 2008), where skilled and unskilled meditator subjects lay in the scanner while meditating, with a variety of

control conditions. One carefully performed recent experiment (Wiech et al. 2008) investigated the effect on pain thresholds and regional brain activation when symbolic religious images were shown to religious and nonreligious subjects, lying in the MRI scanner while a painful stimulus was applied. Another study (Schjødt et al. 2008) showed activation specific to the caudate nucleus, part of the dopaminergic reward system, when volunteer subjects were silently praying while being scanned.

Generally speaking, when subject groups have been carefully characterized in religion-related studies, significant fMRI-observable differences relating tasks to various brain areas were indeed found. The causal interpretation of such differences, associating them with religious training or socialization, of course remains difficult, but insight can perhaps be gained by referring to other simpler tasks that these brain areas are known to perform.

There remains the deeper problem of how to define the term “religion.” If this term is taken generally to denote coherent systems of belief and accompanying ritual actions, as is common in anthropological studies of non-Western societies, it perforce includes much of what one would more normally call “science” in the context of Western culture.

While this interdisciplinary discourse between the neurosciences and the humanities is still in its infancy, the anthropologist Victor Turner wrote presciently (1985) that “ritual can perhaps be thought of, however crudely, as given its momentum by brain neurophysiology.” A deeper understanding is currently being built of the brain systems dealing with reward and the emotions, through the work of Critchley et al. (2004), Schultz et al. (1997), and others, which often entails the use of fMRI, and it is to be hoped that these insights will permeate fresh thinking about the prevalence and necessity of human ritual action.

Sources of Authority

As regards the experimental techniques of fMRI, the primary sources of authority are the published

experimental results (Ogawa et al. 1990; Turner et al. 1991; Williams et al. 1992; Kwong et al. 1992; Ogawa et al. 1992) showing that changes in cerebral blood flow and oxygenation can be observed using the NMR methods. These experimental results have been replicated very frequently in labs worldwide. Correlations between such changes and the neural activity they are considered to indicate have been studied invasively in monkey brain (Logothetis et al. 2001) and often in rat brain (e.g., Yang et al. 1996). As available magnetic field strengths increase, and MRI methods improve, the colocalization of fMRI signals and neural electrical activity becomes more precise. Combining observed changes in blood flow and blood oxygenation with an appropriate calibration technique (Zappe et al. 2008) has enabled the mapping of oxygen extraction, a reliable index of neural work.

The data analysis methods that are now mostly used are those of classical parametric analysis, which is standard across the quantitative sciences, together with a growing use of Bayesian statistics. Various reasonably well-validated methods are used for data mining, and for inferring effective connectivity between brain areas. All of these methods are made authoritative by testing their mathematical correctness and consistency.

Interpretation of fMRI results rests on the known neuroanatomy, neurophysiology, and neurology of the brain. Authoritative knowledge in these areas derives from the same sources as the science of Neurology (q.v.)

Ethical Principles

The ethical principles guiding fMRI work on human subjects are those common to the medical profession – subjects are only examined after they have given fully informed consent. Since the technique has an exceptionally good safety record, with no dangers apart from the obvious ones such as ballistic ferromagnetic objects, human subjects very happily volunteer to be scanned for periods sometimes up to 90 min.

Most experimental paradigms involve presentation of stimuli or performance of a task while the subject is in the scanner bore, and generally these are fully described beforehand. For a few experimental paradigms, where it is an important component of the neuropsychological enquiry for the subject not to anticipate a particular task or stimulus, mild deceptions can be used.

Use of animals for validation or development of fMRI techniques is governed by widely shared legislative regulations that prohibit wanton infliction of pain.

Key Values

The first, most specific key value of fMRI is making the best use of the historically unprecedented opportunity of making explicit, in the form of images, the activities that take place within a person's skull. On the distance scale of a few millimeters that is accessible to MRI, it has become clear that our understanding of the relationship between the mind and the brain can be greatly enhanced. This has profound implications for the medical fields of psychiatry and neurology. It is likely to have a considerable impact on educational theory, microeconomic theory, anthropological theory, and linguistics.

Otherwise fMRI shares its values with many other sciences – integrity, scholarship, truthfulness, and explicitness.

Conceptualization

Nature/World

fMRI uses the physicist's conception of nature, comprising the range of entities that are amenable to precise quantitative measurement. This includes material objects down to the scale of the electron, the different forms of energy, and all well-established physical forces, such as electromagnetic and nuclear forces.

For fMRI scientists, the world is the physically known universe. Of course, there is a significant focus on living matter.

Human Being

The human being is considered as a biological being equipped with a highly developed complex brain, which enables unique functions including speech, abstract thinking, creativity, and the development of ethical categories such as morality, science, and art. Thus, humans are considered to be distinctive from the rest of the animal world in virtue of the unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body, it includes functioning of the different organs, including the nervous system. Death is considered the cessation of such physical functions. A special case, which has raised ethical challenges for Medicine, is that of so-called brain death, which is observed in intensive care medicine. Here, non-brain bodily functions are maintained, but there is no evident brain activity.

Reality

Reality is considered the physical world around us that humans can observe with their senses.

Knowledge

Knowledge is understood to have an objective dimension, such that it is the wisdom that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries. However, knowledge is also understood to have a subjective dimension, which is taken to be the amount of information a person can retrieve from memory voluntarily, or by being cued.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal, which humans can grasp only partially.

Perception

Perception is the conscious sensation of the forces and influences the external physical

world exerts on living beings. Diseases of the human brain may disrupt or impair perception.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time objectively and perceive it owing to the changes observed in the surrounding environment. Human perception of time can be affected by the focus of attention or impaired by diseases of the brain.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of alertness ranging from drowsiness to full alertness, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally, or in differentiated fashions.

Rationality/Reason

Rationality is a foundation of accountable and responsible human behavior and of understanding reason as ultimate authority. It is impaired in mental diseases such as dementia or neuropsychological disorders.

Mystery

Often mystery is considered to be contradictory to modern medicine, including the brain sciences.

However, better-informed scientists recognize that the operations of such an extremely complex system as a human brain may be very elusive to characterize or explain. Even the conceptualization and terminology of cognitive science remain problematic. Thus, fMRI, like neurology, acknowledges, in principle, a place for mystery, that is, that which is as yet unknown. In this view, mystery is understood as potentially explicable once the research questions have been properly framed, appropriate experiments conducted, and the resulting scientific knowledge accumulated and understood.

Relevant Themes

A critical issue in fMRI, as indeed with the other subdisciplines comprising brain science, in the context of “Science and Religion,” is the notion of subjectivity. Subjectivity includes the individual’s perception of the outside world and their own body, as well as their individual reasoning and evaluation of personal experiences, short-lived thoughts, and long-standing ethical categories. An increasing number of fMRI studies have successfully used the subjective reports of experience as a useful parameter, localizing brain areas specific to such conscious percepts.

Cross-References

- [Anatomy of the Brain](#)
- [Cognitive Neuroscience](#)
- [Cognitive Psychology](#)
- [Neuroimaging](#)

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Functional Stereotactic Neurosurgery

► Deep Brain Stimulation

Functional System

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Units in the *nervous system* affording the specific functions, such as movement, limb coordination, olfaction, somatosensation, vision, orientation to space and time, and reasoning.

Functionalism

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Related Terms

Adaptationism; Biology; Formalism; Function; Functional explanation; Materialism; Mental states; Mind-body problem; Philosophy of mind; Psychology; Sociology; Structure; System; Technology

Description

The label “functionalism” comprises a variety of schools of thought pertaining to different disciplines, and certain precautions should therefore be taken if it is to be used properly. For some authors, functionalism is an explanatory schema,

applicable to nearly all complex systems, according to which each and every part of a system fulfills a necessary, though not always explicit, function for the system as a whole. In this sense, functionalism has significant teleological, finalistic, or at least etiological connotations (Huisinger 2003). Other authors define functionalism as the ontological thesis that function is all-important and stuff (or composition) irrelevant. In this sense, functionalism is a basic ontology which intends to offer a (modern) philosophical alternative to the classical type of metaphysics, that is, to substance metaphysics. The triad system-structure-function substitutes for the old noble concept of substance. Functionalism and structuralism are therefore akin to philosophical positions, even though sometimes they are seen as opposed to each other as a dynamic to a static approach (Ferrater Mora 1994, p. 412). In any case, the precise relationship between these two views of functionalism, the teleological (or better, quasi-teleological) and the ontological, can only be determined through a careful analysis of the use of the concept of function as well as functionalist accounts and explanations (for an attempt in this direction, see Bunge and Mahner 2001).

Functionalism is important in at least five intellectual domains: social science, biology, architecture/technology, psychology, and philosophy of mind. After saying some words about each one of the first four areas, we will focus our attention on the fifth, where functionalism is one of the major doctrines. This expository sequence has an additional benefit: In areas 1–3 the quasi-teleological view of functionalism (let's call it adaptationist functionalism) prevails, whereas in area 5, the ontological view of functionalism (say formalist or black-box functionalism) predominates, psychology (area 4) being a transitional ground from one sort of functionalism into the other.

Let us begin with social science. Here functionalist views (represented, among others, by sociologists Emile Durkheim, Talcott Parsons and Robert Merton as well as by anthropologists Bronislaw Malinowski and A.R. Radcliffe-

Brown) underscore the context in order to explain the nature and function of a given social institution: The adaptability of this to the circumstances amounts to its functionality. A second emphasis is on the organic unity of society, which highlights the homeostatic nature of social systems, that is, their tendency to maintain equilibrium and return to it when external shocks disturb the balance among social institutions. Functionalist theories have been criticized for their equilibrium bias and social conservative orientation. But modern neo-functionalism, which takes cybernetic concepts into account, and autopoietic systems theories, like those of Niklas Luhmann, show that functional analysis need not be static.

Functional analysis has also been applied to religion. Different authors highlight different functions of religious institutions for society, ranging from its power of integration (e.g., Durkheim) to its ability to cope with experiences of contingency and reduce complexity (e.g., Luhmann). They contribute to the survival of the social system as a whole. American sociologist Robert Bellah fruitfully combines a structural-functional approach to religion with the historic-genetic study of human social evolution. In science and religion dialogue, functional approaches are advocated above all by Ralph W. Burhoe, whose scientific theology intends to be a functional equivalent of religion in the development and survival of human culture. Theologian Philip Hefner suggests that Burhoe's view must be complemented by a functional understanding of science within a religious or theological framework (Meisinger 2003).

In biology, functionalism usually also takes the form of adaptationism. This is the thesis that all (or at least most) phenotypic traits in biological populations are ultimately adaptive, that is to say, a solution to a hypothetical design problem assuring the satisfaction of individual or group needs. The main difference between functional explanations in sociology and biology (apart from the sense of intention, purpose, or goal characteristic of human life) is that the latter can furnish a concrete mechanism which selects adaptive traits, that is, natural selection, whereas

no specific mechanism of cultural selection is known. As a matter of fact, biological adaptationism is a program which, in contradistinction to biological pluralism, views natural selection as the only important cause of the evolution of a trait. In some cases, like in Daniel Dennett's thesis of evolution as a substrate-neutral algorithmic process, evolution is reduced to natural selection to such an extent that critics speak of panselectionism (Bunge and Mahner 2001, p. 87). Other outspoken advocates of biological adaptationism are Ronald Fischer, John Maynard Smith, William Donald Hamilton, and Richard Dawkins. Critics of adaptationism (most notably Stephen Jay Gould and Richard Lewontin, who in 1979 published together a very influential paper on the matter, but also Sewall Wright already in the 1930s) contend that the power of natural selection to shape individual traits to an evolutionary optimum is thus overemphasized and the role of developmental constraints and other genetic factors ignored. Selection is a sorting process, not a source of qualitative novelty.

Regardless of specific differences among them, all sorts of technology tend to be adaptationist-functionalist because technologists' tasks consist of designing artifacts that perform well-defined, preassigned functions. The concrete mechanisms which realize those functions are moreover of the outmost importance. Users of artifacts, however, need not care about such mechanisms and may adopt a more formalist, still functionalist stance. Adaptationist functionalism in technology can be radical or moderate, depending on whether everything is subordinated to a key function or other considerations are also taken into account. A good example of radical adaptationist functionalism is found in architecture, where starting in the 1920s Louis Sullivan and Frank Lloyd Wright advocated the principle: "Form follows function," which captures the belief that all characteristics of a building must be driven solely by its function. This program was taken even further by the Bauhaus, which celebrated an austere functionalism with little or no ornamentation. Postmodern architecture was a reaction against such a latent utilitarianism.

Successful technology is only moderately functionalist. Then, efficiency is not all-important, and other values, such as social profit, play a balancing role (Bunge and Mahner 2001, p. 92).

In psychology, the functionalist school of Chicago, inspired by William James and founded by James Rowland Angell at the turn of the nineteenth into the twentieth century as reaction to the psychological structuralism of Wilhelm Wundt, adopted an adaptationist approach to mental activities. Mental life and behavior were conceived as an active adaptation to the person's environment in order to satisfy the needs of the organism. Pragmatists John Dewey and Georg Herbert Mead shared this view. (Radical) behaviorism is also often characterized as functionalist. But in spite of J.B. Watson having been a close disciple of Angell, the behaviorist concept of function has different connotations than that of the Chicago functionalists: These retained an emphasis on conscious experience, underlined continuous interaction of environment and organism, and accepted the existence of mechanisms of action and reaction not determined by conditioning; moreover, controlled experiments played almost no role in their theories (Ferrater Mora 1994, pp. 410–411).

The most important contemporary descendant of this form of psychological functionalism is evolutionary psychology, a discipline based on the idea that studying the evolutionary functions of consciousness is necessary for the complete understanding of the human psyche. Its best known advocates are Leda Cosmides and John Tooby. According to them, the main theses of evolutionary psychology are: (1) rather than with organs, psychology deals with functions or purposes, with every function susceptible of being instantiated in a variety of systems; (2) psychological functions are subject to natural selection; (3) there are innate psychological mechanisms, all of which are information-processing programs that map informational input into behavioral output; (4) the psychological mechanisms in charge of learning special tasks are Darwinian algorithms which organize experience into adaptively meaningful schemas or frames. This

combination of adaptationist and formalist functionalism, akin to Dennett's, has been seriously challenged. Not all types of functions are substrate independent. Furthermore, it is not clear what "psychological mechanism" is supposed to mean, since a mechanism is a process within a concrete thing: There are brain mechanisms, but not psychological ones. There is, finally, no evidence for the algorithmic nature of all cognitive processes, which turns evolutionary psychology into a merely speculative theory (Bunge and Mahner 2001, p. 88). The proposals of evolutionary psychology and the criticism they have provoked lead us directly into our next item.

Functionalism in the philosophy of mind is the doctrine that asserts what makes something a mental state of a particular type is not its internal constitution, but rather the way it functions, or in other words: not what it is made of, but what it does. Mental states are thus functional entities, whose functions are usually taken to be those of mediating between certain stimuli (inputs) and given mental states on the one hand, and certain behaviors (outputs) and resulting mental states on the other. It was Hilary Putnam's and Jerry A. Fodor's converging contribution to model these functions using computing machines and programs, initially Turing's machine, as inspiration (see, for example, Putnam 1975). Mental states are just like the states of an automaton and can be characterized in terms that involve only logico-mathematical language (for relations between states) and terms for input signals and behavioral outputs, that is, in entirely nonmental terminology. Both machine and non-machine versions of functionalism insist on such nonmental characterizations of mental states. Non-machine versions turn to psychological theories instead of computers as a guide in their depiction of functional identities. A priori or analytic functionalists (e.g., David Lewis, Sydney Shoemaker) appeal to common-sense psychological theory, whereas empirical functionalists (e.g., later proposals of both Putnam and Fodor, also Gilbert Harman) appeal rather to one or other scientific psychological theories. Moreover, the former regard functional analyses as elucidations of the

meanings of mental terms, the latter see them instead as substantive scientific hypotheses (for these categorizations of functionalists, see Block 1978, pp. 266–271; for an outstanding overview of functionalism see van Gulick 2011).

In order to understand functionalism's core idea more deeply, it may be helpful to remember that in the 1960s, functionalism was initially proposed as a solution to the mind-body problem, which at that time seemed stuck in a dead end. Cartesian dualism postulates a special mental substance; behaviorism identifies mental states with behavioral dispositions; and identity physicalism reduces mental states to brain states. Fundamentally avoiding dualism, functionalists intended to follow a middle road between behaviorism and physicalism, which were the two materialist alternatives to dualism. On the one hand, (logical) behaviorism argues that mental terms are synonymous with dispositional terms (which mediate between stimuli and behaviors, inputs and outputs), offering thus a relational account of mental properties, but at the cost of ultimately depriving them of all causal import. On the other hand, identity physicalism sustains that mental terms refer to neurophysiological states, so that mental processes must have the causal properties of the corresponding neurophysiological processes. For the identity theorist, the concept of mental causation is therefore as rich as the concept of physical causation. But for him mental concepts are not interdefined; the relations among them are not constitutive. Functionalism can make sense of both the causal and the relational character of the mental. And the way to do it is to tie both aspects together or, in other words, to construe the concept of causal role so that a mental state can be defined by its causal relations to other mental states (for this depiction of functionalism as capturing the best features of the materialist alternatives to dualism, see Fodor 1981, pp. 119–121; see also Lycan 2003).

This move gives mental states a degree of objective reality which cannot be accounted for by behaviorism. But at the same time, it questions the one-to-one correlation between mental and

brain states which forms the backbone of identity physicalism. Mental states are not uniquely realized (in human brain states), as identity physicalism requires; rather, they can be multiply realized, not only in (terrestrial) biological systems, but also in other kinds of systems (say, computers or Martian brains), provided they still play the same causal role, i.e., function. This thesis, known as multiply realizability, comes originally from the computer-science distinction between hardware and software: The mind is like software which can be run on different types of hardware. Many of the strengths of functionalism in the philosophy of mind (and its very character of formalist or black-box functionalism), but also many of its weaknesses, are connected with such a claim. Multiple realizability as such has been strongly criticized (for example, Bunge and Mahner 2001), but most troubling are some of its consequences, graphically pointed out by critics of functionalism. Before going on to deal with that point, we would like to observe that, all in all, functionalism has succeeded in advancing a very compelling version of non-reductive materialism, which has fostered the development of fields like cognitive psychology and artificial intelligence.

The main objection against functionalism is, of course, that it does not adequately characterize mental states. According to their content, the traditional view in the philosophy of mind divides mental states into intentional and qualitative. Some critics of functionalism contend that intentional mental states (beliefs and desires) cannot be completely characterized in functional terms since that leaves out the distinctive “intentionality” or the “aboutness” of the mind. This is also the intent of John Searle’s famous “Chinese room” argument. Someone who does not understand Chinese is placed, well equipped with books and writing materials, in a room with two hatches. Through one hatch Chinese symbols are handed to this person, who, following the instructions laid down in the books, arranges on a paper a different combination of Chinese symbols and sends it out through the other hatch. It turns out that she has correctly answered questions in

Chinese. Would the person in the room really be said to understand Chinese? The point is that the system including the person, the books, and the written materials is functionally, but not psychologically, identical to a person who really understands Chinese. Since functionalism holds that two functionally equivalent systems should also be the same in regard to their mental states, this is incompatible with functionalism. However, functionalists reply that Searle begs the question when he asserts the whole system lacks understanding.

Some other critics of functionalism sustain that the problem for functionalism lies rather in the characterization of feelings, sensations, and other conscious mental states, since it cannot capture their distinctive “qualitative” or “phenomenal” character, which seems to be intrinsic and non-relational. This concern was at first discussed under the name “absent qualia” (see Shoemaker 1975). Another version of the argument poses the problem of “inverted qualia”. Recently, the discussion has been cast rather in terms of “zombies”: There might be two creatures functionally identical, but differing in their mental states, since one of them has a normal conscious life and the other none. This second twin would be the philosophical “zombie.” This possibility implies, to the non-functionalists, that the functionalist view is inadequate. Although such a criticism may also be pre-supposing the thing it is arguing for –, i.e., the existence of proper qualia –, the problem of conscious life, of consciousness itself, remains an ongoing controversy and probably represents the greatest challenge for functionalism in the philosophy of mind.

All advocates of functionalism are persuaded that intentional mental states can be adequately explained from a functional point of view. Some functionalists consider functionalism to apply also to qualitative mental states; other maintain it does not. So, it is possible to distinguish between strong and weak versions of functionalism. According to the strong versions, every mental state is completely constituted by its relations to inputs, outputs, and other mental states; no mental state exists therefore on its own. William Lycan seems

to hold this view. Weak versions allow for some, most frequently qualitative mental states to be basic and nonfunctional. That could be the view defended by Jaegwon Kim in his latest writings. Strong versions of functionalism are exposed in a higher degree to the criticism that functional characterization of mental states is holistic. Weak versions of functionalism do not succeed in explaining the mental in nonmental terms.

Furthermore, Ned Block (1978, pp. 310–314) says that all versions of functionalism are doomed to be guilty either of “liberalism” or of “chauvinism.” Theories are liberal when, building on functional equivalence, they (potentially) ascribe mental properties to things that do not in fact have them, for instance, to the entire population of China connected per radio among them and with an artificial body or robot, of which it plays the role of an external “brain” (this is also put sometimes as the problem of the “brain in the vat”). Theories are chauvinistic insofar as they falsely deny that certain systems have mental properties. And that happens whenever, in order to avoid liberalism, we include too much of human neurophysiology in our theory. The resulting functional description will not apply to (eventual) intelligent Martians, whose neurophysiology would probably be different from ours. All this has to do with the difficulty, not to say impossibility, of finding a description of inputs and outputs which is specific enough to avoid liberalism, yet general enough to avoid chauvinism.

Functionalism in the philosophy of mind offers interesting possibilities for the dialogue with theology. The most obvious regards, of course, the mind-body problem. Insofar as functionalism intends to be a non-reductive materialism, there is no a priori incompatibility between it and non-dualistic theological positions. It is not clear, however, whether functionalism can account for what we take to be the causal efficacy of mental states, an important point for any theological depiction of mind. Another thought-provoking proposal has been advanced by William Alston, who tries to capitalize on the principle of multiple realizability in order to show that “the same

functional concept of knowledge that *p*, or purpose to bring about *R*, could be applicable to God and to man, even though the realization of that function is radically different” (Alston 1985, p. 225). He aims to assert a certain degree of univocity in divine-human predication without compromising the otherness of God.

Cross-References

- Cognitive Psychology
- Complex Systems
- Consciousness, The Problem of
- Evolution
- Philosophy of Mind
- Relational Ontology
- Religion, Sociology of
- Self

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Functionalism in Sociology

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Description

Although Functionalism was at one time considered the most typical expression of contemporary American sociology, it did not originate in the United States since we can find its earliest formulations in British anthropology.

In particular, Bronislaw Malinowski, a Polish-born British anthropologist, proposed the functional analysis as a solution to the tendency of interpreting social situations through intuition rather than through observation. The functional analysis, according to Malinowski, brings a scientific attention in the study of cultures that have to be different from the ones of observers. Therefore, according to this school of thought, before analyzing a social phenomenon that is typical of a given culture (an institution, a material object, an idea); you must first think of what function the phenomenon fulfills within this culture.

So the Malinowskian assumption of Functionalism is that in every type of civilization, every custom, every material object, idea, or opinion fulfills a vital function, meaning with “vital function” the contribution that each cultural path gives to the maintenance of the entire culture, that is, to the *integration* of the whole social system.

The core of functionalist theory is, therefore, the problem of integration.

Another anthropologist, Radcliffe-Brown, specifies, “the function of each recurrent activity is the part it plays in the social life as a whole and therefore the contribution it makes to the maintenance of the structural continuity.” He explicitly refers to Durkheim, according to which “the function of a social institution is the correspondence

between it and the needs of the social organism” and proposes to replace in this definition the word “needs” with the expression “necessary conditions for existence.” Let us see how he emphasizes the themes of cohesion and stability.

These issues (cohesion and stability) are the most evident limitations and targets of criticism that this school of thought has suffered. Among them, the most common is the claim that this system can only explain how to reduce or eliminate conflicts but it can never say why they came out or how and why they are increasing.

Another critique to Structural-Functionalism is that it is structurally related with the interests of the British colonial power for which these scholars worked.

It is also worth noticing that both Social Anthropology and the History of Sociological Thought focus their attention on normative and cultural aspects of social life rather than on economic or technical ones.

Hence, the method of Functionalism is to explain any social institution through the role it plays in the maintenance of society.

Talcott Parsons: From the Theory of Social Being to the Social System. The Functional Prerequisites

Parsons is perhaps the best-known representative of Structural-Functionalism, as the foundation of his sociology is the idea of integration understood in terms of cultural and normative aspects, although it has assumed different shades over the years.

Many European scholars including Malinowski and Weber influenced Talcott Parsons (1902–1979). His sociological orientation seems to be related to the practical needs of American society and it is not, as it has been argued by many, an ideological justification of the current economic, political, and cultural situation but rather – and above all – an attempt to identify the minimum requirements of integration in a society composed of different ethnic groups, with their traditions and cultures, in which integration appears as a need and a goal to reach. This

explains why cultural integration becomes the central problem of most of the American society.

In his essays, which were mostly produced in the period from the 1930s to the 1960s, he built a theory that claimed to be extremely general, and which sometimes has been called “The Grand Theory”. While Functionalism, especially in the medium-range theories held by Robert Merton, produces *ad hoc* explanations of everything that exists and happens in a particular time, Parsons aims at a general formulation of how all social systems work.

The Grand Theory has been very successful for a certain period of time, especially in the 1950s, but later has been heavily criticized by Neo-Marxism, by the Conflict Theory, and by the Microsociology theories like Symbolic Interactionism and Social Phenomenology. However, in the 1970s, the Grand Theory gained new fame, especially among German sociologists like Niklas Luhmann, Jürgen Habermas, and Richard Münch. More recently, some American sociologists led by Jeffrey Alexander have taken up and reworked on the Grand Theory in a revised form.

The Structure of Social Action (1937)

Parsons, opposing the positivist conception of action (understood in terms of a reaction to an external stimulation), tries to emphasize the voluntary aspects of action itself. He identifies some necessary elements for a social act that are listed below:

1. There is someone who performs the action (**the actor**).
2. Each action must necessarily have a “**finality**” (a future condition toward which the action is oriented).
3. Every action begins in a “**situation**” (whose lines of development can be different thinking of the situation toward which the action is directed).

In every situation, you can find elements that cannot be transformed by the Action (these are the **conditions**) and elements that can be transformed from it (the **means**). To choose the most appropriate means to achieve a goal, you need to conform to certain **rules**: These rules must be considered a necessary element of the

Action and are defined as the features that give shape to the finality.

According to Parsons, people do not only respond to stimulations but also try to conform their action to specific models, which are considered desirable by the actor and by other members of the community.

An action is a social action only when social purposes and standards are identified in a context of interactions that consider such finalities and such rules an integral part of the social situation.

According to Parsons, also Pareto, Durkheim and Weber arrived at the same conclusions. Even though the conclusions resulted from different ways and were based on different theoretical premises, this testifies the correctness of the voluntaristic conception of Action.

From Parson’s point of view, a society is possible only in the presence of finalities and common standards: In this perspective, the importance of the integration problem is clear.

Parsons tries to identify the key issues of the above-mentioned authors in order to build a general theory. From Durkheim, he revisits the concept of “heritage of common values” and the problem of integration as a moment and implementation of the so-called collective conscience, symbol of social solidarity.

From Marshall and Pareto, he revisits the idea of theoretical system and synthetic sociological theory supported by integrated values.

From Weber, he renews the concept and the theory of the social action.

We have Parsons structural-functionalistic theory by the confluence of the three elements (unhistorical by nature) which follow:

- Parsons takes Weber’s action theory (that in Weber itself moves from a methodological point of view to an empirical-inductive analysis) and gives it a new meaning that does not include all the historical elements; it has a meta-temporal connotation and therefore is taken from a deductive point of view.
- Durkheim’s heritage of common values is taken up in Parsons perhaps more aprioristic meaning; this could validate Luciano Cavalli’s theory on Parsons’s hostility toward philosophy of history and its background of irrationalism.

- The system concept is necessary to integrate these assumptions and to give some meaning and boundaries to Parsons's primary problem: "The Hobbesian question of order."

Because of these basic *aporias*, Parsons structural-functionalistic theory is produced as a crystallization of the theory of action, in itself partly unhistorical, in an undisputed and extemporaneous system of values, tending to the conservation of a social structure model. This happens because at its base there is an unhistorical concept of the theory of action becoming stiff as it is projected in an extra-historical and meta-temporal scheme of values.

The Social System (1951)

The integration problem is central and introduces the notion of **system**. Parsons says that since individuals perform their actions not in a random way but according to defined principles, as the agent has certain expectations from objects and from other individuals, you can talk about "personality system." System is as well the coordinated set of symbols that make the interaction possible and the network of relationships between people that do not act in an uncoordinated way but according to the positions assigned to them in this network of relations.

The cultural system, the personality system, and the society system have to be congruent with each other.

The culture, in particular, has the fundamental task of attending directly in the creation process of people's personality through the development of an internalization of rules and values in a society (where internalizing means to own and deeply assimilate them).

The internalization of cultural models guarantees order and gives stability to the system because all the people tend to behave in a way that conforms to society's expectations.

In every action there is a finality, a goal to reach and, of course, negative consequences to avoid: This is what Parsons calls a "cathectic" element; in addition, to conduct an action you must also have knowledge of the situation, and this is the "knowledge" element; finally you have to be able to pick out among the many possible

choices: This is the "evaluation" element. These three moments of the action can be distinguished only in an analysis but are indistinguishable in reality.

The individual's personality therefore can only arise in a context of social relations, which is able to develop a system of common signs and symbols, namely, in a cultural context.

The social system is thus defined in terms of interaction, but the interaction is taking place not between individuals, on the contrary in mutual relations among people acting in terms of status (social position of the agent) and roles (agent's activities related to his/her social position).

The status defines the position that a person occupies in a system of relations considered as a structure, regardless of the personality of the individual him/herself.

On the contrary, the role relates to what the subject does in its relations with others and it is typical of a certain status.

Example: I am a teacher (in society, since I am a teacher a certain position is assigned to me, regardless of whether I am a good teacher or not, or if I am more or less sympathetic, etc.) and I behave in a certain way during my work. I exercise my role (I will hold a certain behavior – as a professor – with my students); my students (as students and therefore regardless of their individual personality), for their point of view, expect from me a certain behavior, linked to the teaching profession.

According to Parsons, a person (*ego*) always has expectations in another person (*alter*), and the second person always has a set of expectations regarding the behavior of the first. *Alter*, however, is not a particular individual but is a "generalized other" (a concept already proposed by George Herbert Mead). *Alter's* reactions can also be considered like "sanctions" against *ego*, which consequently will tend to behave according to the related expectations and the specific roles they (*Ego* and *Alter*) perform. To sum up, expectations are linked to roles.

A single person in his/her life may occupy of a series of status and exercise the related roles.

The reciprocal expectations and sanctions related to the single roles create the *institution*

that is defined by Parsons as “a social structure unit, whose level is higher than the one of the role because it is composed by a plurality of interdependent role models and their own components.”

According to this definition, however, you cannot understand why and how in reality there exist several systems different from each other.

Parsons replied that the systems differ from each other following the alternatives of roles that the actor has to choose between: During the action, the actor receives a series of different alternatives that are always limited and defined in any way.

These alternatives are the “structural variables,” as follows:

- (a) Dilemma between reward and discipline: *affectivity – emotional neutrality* (need of choice between immediate satisfaction according to the emotional impulse or renunciation)
- (b) Alternative between private and collective interests: *egoistic orientation – altruistic orientation* (namely toward community)
- (c) Choice between universality and particularity: depending on whether the actor considers the object that is in relation with in the features that make it *common to an entire class or in its singularity*
- (d) Difference between construction and attribution: depending on whether the object is considered *for what it produces or what it is in itself, for its intrinsic qualities*
- (e) Quandary between specificity and diffusion: if the actor considers *some aspects of the object or its totality*

Parsons adds that these structural variables do not combine with each other in a random way but they follow certain rules, as they must be integrated into a system that has to be coherent in order to guarantee itself in time: For the survival of the system, some functional requirements have to be fulfilled. For example, in a system like the family, the roles have to be affective, particularistic, pervasive, and attributive, while in a company they will have to be universalistic, pervasive, profitable, and specific.

The modern industrial society is constituted by a system of universalistic, neutral, profitable, and specific roles.

Parsons’s theoretical conclusion is that every social system, in order to survive, must necessarily resolve a fundamental functional problem, defined as the “problem of allocation,” which has three characteristics: the allocation of the staffs (including the ones acting among the roles), the assignment of resources, and the attribution of gratifications.

Parsons deconstructs and reconstructs its structural variables with the aim of building different models of the possible “structural type,” which means different types of social systems and societies, and explaining his interpretation of the foundations to the various social sciences.

In his works that followed *The Social System*, Parsons abandons his explanation scheme based on structural variables and elaborates a “functional square” scheme where each frame represents a “functional prerequisite.”

The two dichotomous dimensions of internal/external very abstractly generate this scheme and means/finalities: Anything inside the system can be considered as operating or in the direction toward the inside or outside the system and can be either a mean or finality.

By crossing these two dimensions, we obtain the four quadrants that Parsons calls “AGIL”:

A for Adaptation, which is equivalent to adjustment, and it refers to the way the system maintains itself as a physical entity in connection with the material environment. Here we can find Economics.

G for Goal Attainment, which is the quadrant of achieving the objective. It deals with the fact that each system has a certain purpose and it tries to achieve it in relation to its environment – relating to the society, here we find Politics.

I for Integration, which is the quadrant by which the system keeps actively together its different parts – here we find all the institutions that promote social integration and the *corpus* of laws and rules under which all the members behave.

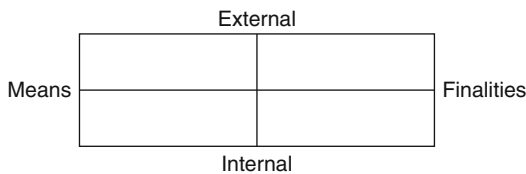
L for Latency, which is the quadrant of the latent model. It means that every system needs to

have some basic models: This quadrant involves all those institutions that produce basic cultural models and that transmit them to the individuals (by family, education, religion).

L and I are both subsystems within the system as they deal with the relationships inside the society: L are the means, I are the finalities.

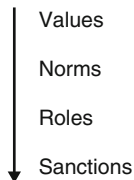
A and G are both external subsystems: A is a mean, G is a finality (achieving the purpose).

Each of these quadrants can be divided in its own set of dials. Hence, you can go to the larger system rather than to the smaller one, as it is shown below:



In this way, Parsons's system provides a grid of the basic elements that each organization must realistically own. These functions are analytic (then, abstract) and apply to all the levels of analysis: individual personality, special organizations, institutions, communities, nations, or the whole world.

Furthermore, the different elements of the system operate together in order to ensure that people carry out their role in an appropriate way. There is, anyway, a hierarchy of control within the system, as we indicate below:



More generally, the system elaborates particular values; in the specific interaction situation, this general value is specified in certain norms, which are structured in roles, according to the position held by individuals in an organization. People guarantee the respect of norms attached to the various roles by applying sanctions, by

rewarding the ones who comply, and by punishing those who violate them.

To sum up, values are specified in norms, modeled in roles and reinforced by sanctions.

Robert K. Merton and the Middle Range Theories

While Parsons builds his “Grand Theory” as an explanatory system based on the functional analysis, with general and unhistorical characteristics, Functionalism in the United States takes very different directions from his position. The most important representative approach that differs from Parsons’s Functionalism is the one proposed by Robert K. Merton, who asserts the need for sociology to build “medium-range theories” that differ from large generalizations. These are not verifiable in empirical terms and differ from empiricism that only collects data without framing them in a theory.

These mid-range theories occupy an intermediate position between general theories of social systems (too far away from particular categories of behavior, organization, and social changes to provide an explanation of what is observed) and detailed descriptions of facts that are not minimally generalized.

The mid-range theories deal with limited aspects of social phenomena and refer to the summation of results from empirical surveys. Rather than considering only each single research for itself or building sociological theories not sufficiently supported by surveys, thinkers should build theories that are more than the single result of a research, but at the same time, they do not have to be unverifiable theoretical constructions.

Empirical research should be organized so that they, when you have empirical uniformities, when and if they are discovered, directly influence the theoretical system.

With this innovative position, Merton criticizes the first Functionalism by opposing a critique from within: He does not reject the interpreting key but the postulates (statements

that lie outside the empirical testing). Hence, he implicitly criticizes Parsons.

Merton identifies, in particular, three postulates of the first functionalists:

1. Postulate of Functional Unit: all the elements of a culture and all the social activities are functional to the whole social or cultural system.
2. Postulate of Universal Functionalism: every aspect of a social or cultural system plays a positive role toward social integration.
3. Postulate of Indispensability: each element existing in a society or culture is indispensable to perform a specific function as well as every specific function is essential to the whole system.

He criticizes them in the following way:

- (a) The fact that every society presents some integration is assumed. However, it is not true that all societies show the same high quantity of integration so that every action and every conviction is functional to society as a unit and at the same time is functional to the people who live in it.
- (b) You cannot say that everything that exists, because of its existence, has a positive role toward social integration.
- (c) It is not assumed that in every society you have the indispensable elements to perform certain functions, which may be performed by different elements or by way of the same elements always playing the same functions.

Without any doubt, Merton's conception of Functionalism admits the presence, together with integration factors, of dysfunctional factors: They tend to disintegration rather than to integration or they do not have any function. In addition, the functional analysis is considered a heuristic method.

Merton also introduces the distinction between manifest and latent functions: The former are wanted and recognized consequences of the action; the latter are the unconscious ones. However, Merton does not specify that the functional analysis makes sense as a specific method only if you search the latent functions, because it would not add anything new to the already known.

Merton tries to apply his medium-range theories to concrete societal problems, so he deals with issues such as anomie, reference groups, and sociology of knowledge.

Talking about anomie, Merton says that it comes from the discrepancy between the cultural structure of a society (which sets the goals to be pursued as well as the norms you have to follow in order to achieve these goals) and the social structure (organization of roles and status) of the same society. According to Merton, in this situation you can have different reactions. To properly analyze the problem you must make a threefold distinction and understand that: (1) on the one hand, in a social system, there are certain cultural goals, purposes, finalities, and aspirations that are based on the prevailing values of a specific "cultural structure"; (2) on the other hand, there are "norms" that prescribe the means that individuals can legitimately use for achieving their goals; (3) a third order of elements are the institutionalized methods arising from the concordance between the possible means for achieving goals and the opportunity to achieve goals in a way that does not disobey norms.

If a fracture occurs between these three variables, there can be deviant behavior in individuals or in social units that compose a particular social system.

The cultural structure prescribes the goals to be achieved: It may prescribe similar or different goals for all the individuals of a system; according to Merton, American society almost universally prescribes for its members the goal and the myth of success, mainly under the economic point of view.

This goal involves a wider sensibility and frustration for members of the lower classes, which have reduced access to institutionally approved means. According to Merton, it is just in the opening between means and goals (with the resulting tension that arises) that we may see a weakening of commitment in people toward both the goals that result from the values prevailing in a certain social system and the institutionally accepted means: You can assist at various degrees of anomie that produce

various forms of deviant behavior. The consequence can be acceptance or rejection, again depending on the circumstances, on cultural goals (finalities), or on means (institutionalized on norms as for analytical convenience “institutionalized means” and “norms” are inserted in a single category; the “means” category which refers to the social structure of the analyzed system).

Merton elaborates his famous synoptic mirror that refers to “an example of individual ways of adaptation.” Depending on the attitude toward the two variables (means and goals), we can have the positive values of “acceptance,” which are indicated by the symbol (+), or “rejection” that are listed with the symbol (–) or even the rejection of current values (the “status quo” values) and the substitution with new ones, which is indicated by the symbol (+/–). The scheme is described in the table below:

Ways of adaptation	Cultural goals	Institutional means
Compliance	+	+
Innovation	+	–
Ritualism	–	+
Refusal	–	–
Rebellion	+/–	+/–

- Compliance: when you accept both cultural goals and institutional norms.
- Innovation: when you give more importance to goals than to norms.
- Ritual: when you accept institutional norms to achieve certain goals, but you do not bother if you actually reach them or not.
- Refusal: when neither norms nor goals are accepted (artists, psychotics, homeless, alcoholics, drug addicts).
- Rebellion: when you refuse both cultural goals and institutional norms and you try to establish new goals and norms considering them most fair and valid.

Merton goes from his considerations on anomie to a wider analysis of the deviant behavior. He criticizes the psychoanalytic approach that explains it as an expulsion of too long repressed by the society biological impulses (Freud) and

asserts instead that it is related to certain socio-cultural structures: For example, the conflict between social and cultural structures is one of the common causes of deviance.

Merton therefore assumes that originally, there always is some correlation on cultural goals and on finalities that culture considers worthy of being achieved; he considers anomie a consequence of the impossibility imposed from the social structure to reach all the cultural goals, if not in violation of institutional norms. Thus, anomie is equal to lack of the above-mentioned norms. However, Merton fails to criticize the cultural norms proposed by society that are considered as uncritically given and accepted.

Talking about sociology of knowledge, Merton does not accept the European approach with all its great ideas of the world, of political theories, of philosophical guidelines, etc., and prefers to join, even if with some doubts, to his North American tradition, more thin and poor, that aims to study public opinion relating it to the mass media conditioning.

Merton’s choice to follow empiricism originates C. Wright Mills’s critique to “abstract empiricism” in general, where the word *abstract* means the poor consideration for the wider historical and social context of problems and the focus of attention beyond this context. Hence the risk of an empiricism which falls into ideology is generated.

Critiques to the Functional Analysis in Sociology

The functional analysis in Merton’s and Parsons’s expression, often called “Structural-Functionalism,” is one of the most discussed orientations in contemporary sociology. To be honest, the critique is more focused on Parsons than on Merton.

1. From many parts, Parsons was accused of considering only or mainly the issues of integration and social order rather than on problems of social change and conflict.

2. Dahrendorf criticizes that the emphasis on the internalization of order inside the individual leads Parsons to neglect the repressive and coercive power of society over individuals.
3. The research of a general sociological scheme is at the expense of the analysis of specific social-historical configurations.
4. Parsons sees the conflict as a disintegration factor: This is not always true; indeed, sometimes the conflict may also strengthen integration within the group and make it stronger in the fight with outside groups. In Parsons's defense, it should be noted that he looks for the minimum necessary conditions for the existence of a social system: The conditions that allow its existence although the presence of disintegration factors. Therefore, he cannot emphasize these factors, among which there should be conflict. It is also true that the conflict expresses itself only in the presence of a minimum legitimacy that allows the conflict to be recognized as it is between the opposite positions.
5. Some say that behind Parsons's "Grand Theory," there is an uncritical mirror of the prevailing North American society.
6. Alvin W. Gouldner tries to show how the different phases of Parsons's thought are in line with the changes occurring in American society: At the beginning – when he writes *The Structure of Social Action* – he operates in a political situation still dominated by individualistic and competitive values and is therefore linked to the idea of individual action as a fundamental element of society. When he writes *The Social System*, the emphasis moves from the individual will to the social system mechanisms through which the system maintains itself. With the advent of the Welfare State, Parsons abandons the idea of society as a system that individually regulates and maintains itself balanced and accepts the principle of State intervention: This means admitting that the State is the main source of power and initiative in society and the stabilizing factor of it. This goes against the basic principle of Structural-Functionalism that believes

that society naturally regulates itself not through the political force but through values shared among its members.

7. Parsons's mistakes are due to the conservative orientation of his sociological theory.

Other critiques consider Functionalism from a general point of view and are all designed to invalidate its formal-logic correctness:

- (a) Carl Hempel contests functional analysis's effective explanatory power since it can only dogmatically be assumed that, since a system only works under certain conditions that are satisfied only by certain elements, these elements are actually present in the system.
- (b) Hempel always criticizes the lack of precision in the terms used by functionalists.
- (c) Again, Hempel criticizes the inability of functional analysis to not arbitrarily make specific predictions because the hypothesis of a system that regulates itself is not sufficiently clarified.

The above-mentioned critiques work on a methodological level and could be joined to the ones, which, under a substantial point of view and since Parsons is still alive, stressed the risks of both an ontological hypostatization and an apodictic theoretical model.

Cross-References

- [Critical Theory](#)
- [Cultural Studies](#)
- [Deviance and Social Control, Sociology of](#)
- [Epistemology](#)
- [Ethics](#)
- [Functionalism in Sociology](#)

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Fundamental Theology

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Related Terms

[Foundational theology](#)

Description

Fundamental theology refers to a field within ► [Christian theology](#) in which philosophical, anthropological, scientific, and theological categories are deployed to mediate religious ► [faith](#) and the meaning of faith in culture. Theological reflection becomes a fundamental theology when it proposes a metaphysical or existential way of interpreting reality, including natural reality. In the twentieth century, following the rise of existential philosophy in Europe, fundamental theology became more prominent as a discourse about human history and the way that faith understands history. Since the 1980s, the dialogue between the natural sciences and theology has made an important impact on the character of fundamental theology, with more Christian theology written as a reflection upon nature and the subjects of scientific inquiry.

As a historical development primarily within the Christian tradition, fundamental theology refers to particular categories and concepts that are found on the edge of philosophy and theology. The term emerged as a more explicit form of discourse in the twentieth century. Prior to the mid-twentieth century, the discourse known in Christian theology as apologetics was the more popular approach to describing Christian faith in

terms of categories drawn from other disciplines. One classical source for traditional apologetics written from a Catholic perspective and published in 1910 is the four-volume *Dictionnaire apologétique de la foi catholique*. Fundamental theology is different from apologetics in its methodological clarity, its acknowledgement of cultural and religious pluralism, and its lack of a defensive attitude toward the findings of science.

Also referred to as “foundations” or “► [foundational theology](#),” fundamental theology uses specific interdisciplinary categories to identify and shape the meaning of theological doctrines and systematic theology. The categories of fundamental theology identify conceptual frameworks through which the diverse meanings of religious traditions are expressed, at least heuristically. The practice of fundamental theology nevertheless remains largely a Christian ecclesial and academic enterprise.

Fundamental theology is often equated with systematic theology or doctrinal theology. However, it is important to distinguish certain tasks that are specific to fundamental theology in order to avoid confusion. Philosopher and theologian Bernard Lonergan argues that fundamental theology is a set of tasks that follow from a personal commitment to a theological inquiry. Fundamental theology does not precede personal commitments. In this regard, fundamental theology resembles the more traditional discourse of apologetics. However, as Lonergan and others conceive it, fundamental theology should engage with the history of particular traditions of textual interpretation. There are two basic types of categories available to fundamental theologians, which are distinguished as general and special categories. General categories refer to those that are general in all human experience while special categories refer to those which arise from what Lonergan terms “religiously differentiated consciousness.” Special categories arise from Christian religious, moral, and intellectual conversion by which he means the ways that Christian faith guides and changes human living. Special theological categories are derived from the perspective of one who is converted to a fundamental outlook of love, a religious horizon that nevertheless allows that natural knowledge informs the ground of faith.

Categories are not merely normative objectifications which arise spontaneously. Foundational categories are authentic or worthwhile if they follow from transcendental method, a way of formulating theology on the basis of a normative way of understanding self-consciousness. Lonergan interprets human intentional consciousness as a compound set of four distinct levels: empirical, intellectual, rational, and responsible. ► [Self-aware](#) or self-transcendent intentional ► [consciousness](#) is the basic criterion for a theological method and hence the categories of fundamental theology. Fundamental theology needs to be rooted in the theologian’s own awareness of his/her recurring, dynamic experiences, understandings, judgments, and decisions as these are changed by religious love.

Karl Rahner is another theologian who concurs that fundamental theology is a way of apprehending both faith and the general form of human experience. According to Rahner, general human experience is already an experience and understanding of God because God’s creation of the world and of human beings renders all experience in the world religiously suggestive. He stipulates that “every ground of faith is also an object of faith, although the converse relationship is not true (Rahner 1982).” Rahner, along with Lonergan, shares an outlook that is termed “transcendental” for its resemblance to Kant’s philosophy, which stressed the conceptual frameworks from which all human inquiry (but not Christian conversion) invariably originate.

In contrast, British theologian Aidan Nichols specifies that fundamental theology addresses the question “What is faith based on?” a definition of fundamental theology that resembles apologetics. Leading twentieth-century Reformed, Protestant theologian Karl Barth also claims that all theological categories must be at the service of revelation and be firstly informed by revelation. Contrary to the transcendentalist viewpoint, Barth develops a fundamental theology that does not begin with human conceptual frameworks, whether philosophical or theological. For Barth and most evangelical theologians, God communicates a message which is witnessed by the Bible and identified with the person of Jesus

Christ. This way of understanding fundamental theology is rather different because of its insistence on the divine origin of all theological categories. For instance, the category of personhood cannot be developed apart from the revelation of the personality of God made known in the person, life, and death of Jesus Christ.

The different directions taken by theologians in the mode of fundamental theology suggest a divergence on two related questions – rationality and revelation. On rationality, there is a basic disagreement on whether a fundamental theology draws on a shared epistemology with that of other sciences and those of other religious traditions or whether Christian theology springs from a unique kind of rationality. Taking the former perspective, many twentieth-century theologians hold that critical realism is an epistemological outlook in which theology and the sciences affirm equivalent qualities of objectivity through the use of inference, imagination, metaphor, and judgment. But among those who adopt the latter perspective are those philosophers and theologians who adhere to “► [Reformed epistemology](#),” a view which claims that religious experience is sufficient by itself to justify certain beliefs so long as the believer’s mind is functioning well, a sufficient warrant for those beliefs to be rational and therefore plausible.

The other main issue in fundamental theology is revelation, which, according to Avery Dulles, can be modeled in five ways: as doctrine in itself, as history, as dialectical presence, as inner experience, or as a new form of awareness. Coherent with most of these models of revelation is the experience of conversion, which is at the very least understood to be an experience of oneself confronting a new and urgent reality. This experience of conversion is especially prominent in the famous work by William James, *The Varieties of Religious Experience*. As Barth’s theology shows, however, revelation is taken by theological realists to refer to an objective reality that does not need prior qualification or conceptualization within an originally human perspective.

Regardless of the positions adopted concerning either rationality or revelation, the terms of fundamental theology are not those of the explicit

interdisciplinary outlook of systematic theology, which aims to express an understanding of Christian doctrine in the context of contemporary questions and debates in church and society. Fundamental theology is also distinct from church doctrines since it does not aim to explain God with reference to concepts adapted for use by the Christian church. Fundamental theology is thus seen as a preface to the doctrinal task.

Self-Identification

The idea that theology is a science originates especially with Thomas Aquinas and the medieval scholastics in Western Europe. In the famous first article of his *Summa theologiae*, Aquinas asks whether a theological science ought to be considered in addition to philosophy in making enquiries about God. He answers his own question in the affirmative by saying: “Thus there is nothing to prevent another science from treating in the light of divine revelation what the philosophical disciplines treat as knowable in the light of human reason.” (*Summa theologiae*, Ia, q. 1, a., ad 2). Theology, like the physical sciences, proceeds from a set of principles to discover and express the properties of a certain object or set of objects. In this case, the object of inquiry is God, but unlike the philosopher’s sole resort to reason, Aquinas relies upon the sources contained in revelation, especially the principles he adduces from scripture.

More recently, Thomas Torrance, a theologian in the Reformed tradition, has sketched an epistemology whereby theological inquiry mirrors scientific inquiry by taking place along three levels. As science proceeds according to experience, theory, and an overall worldview, theology resembles this process by proceeding from worship to creedal formulation to theological elaboration. What renders theological science decisively different however is the way this threefold activity correlates with God as a threefold being. God’s revelation, revealed for us in mediated human form, is received and expressed by the church in three ways – proclamation, catechesis, and liturgy. In addition, Alister McGrath, a British theologian and scientist, has completed

a three-volume study of scientific theology that outlines a fundamental theology on the basis of key categories shared by scientists, notably the category of critical realism in epistemology.

Characteristics

Fundamental theology reflects on the fundamental justifications that are offered for interrelating the four sources of theology – scripture, tradition, reason, and (personal) experience. Whereas systematic theology is a subdiscipline that analyzes particular doctrines for their congruence or merit in light of scientific knowledge, fundamental theology reflects on the methodological presuppositions behind such proposals for congruence and the basis for establishing their merit. Whereas doctrinal theology purports to explain a theological reality on the basis of a theoretical explanation, fundamental theology provides the grounds for that explanation, the general horizon of meaning within which those doctrines are claimed.

Relevance to Science and Religion

Fundamental theology bears significant relevance to the field of science and religion inasmuch as fundamental theologians take an active interest in metaphysical and natural or scientific categories that form the basis for further theological reflection. Inasmuch as fundamental theologians are only interested in an interpretation of human history, the science and religion field is not implicated. The reliance upon a metaphysic and a philosophy of nature is often seen as counterintuitive for the theologian. For instance, many Catholic theologians have intentionally avoided metaphysical categories since Vatican II because for them ► [metaphysics](#) is associated strongly with the neoscholastic approach that was taught in seminaries prior to the 1960s. This approach strongly identified the philosophy of Thomas Aquinas with the natural categories of substance, accident, potency, and act, which were employed to determine the

scope and meaning of theological terms, including the Eucharist and moral doctrines. Evangelical Protestants, on the other hand, have avoided a natural metaphysics altogether until recently, out of deference to the principle of *sola scriptura* in theological method. Mainstream Protestant theologians, however, have relied on metaphysical categories, although their preferred categories have remained mainly historically oriented schools of thought, such as Paul Tillich and Rudolf Bultmann's reliance upon existentialist philosophy.

Since 1960 especially, theologians have been increasingly inspired by the work of philosophers of science Stephen Toulmin, Thomas Kuhn, Imre Lakatos and Michael Polanyi. Thinkers such as Ian Barbour, Robert Russell, John Polkinghorne, Arthur Peacocke, Thomas Torrance, Langdon Gilkey, Holmes Rolston, Wolfhart Pannenberg, Ted Peters, John Haught, and Nancey Murphy to provide conceptual frameworks for fundamental theological inquiries based in part on the work of these philosophers of science. As a consequence, more fundamental theologies are taking into consideration both philosophical and scientific perspectives in the orientation of theological concerns. Theology is being undertaken in new ways that place greater emphasis on the scientific significance of categories like “embodiment,” which is an important feature of the Christian doctrine of the incarnation. Embodiment thus mediates a theology of the Incarnation and the neuroscientific research into the relationship between the mind and body. This is a fundamental inquiry that serves the doctrinal task of establishing the difference between divine and human persons. Another category that receives some attention is that of the “research program,” a concept developed by philosopher of science Imre Lakatos and applied by some theologians as a methodological tool to describe how theology proceeds in a scientific manner.

Sources of Authority

The following English language academic journals devote significant space for articles in

the field of fundamental theology: *International Journal for Systematic Theology, Philosophy and Theology: Marquette University Journal, Faith and Philosophy (Society of Christian Philosophers), Modern Theology, Theological Studies, Gregorianum, Scottish Journal of Theology, Journal of the Evangelical Theology Society, and The Journal of Psychology and Theology.*

Ethical Principles

Fundamental theology is not guided by any one particular ethical principle, although it is certainly plausible to think of fundamental theology as a basic discourse of those who are committed to expressing the implied ethics of the Christian faith. Two principles, which stand out in the history of Christian thought and in biblical texts, are the principles of beneficence (aid and compassion directed toward others) and of reciprocity (do unto others as you would have them do unto you). A preethical or metaphysical principle with significant moral implications is the principle that human persons have unique ontological worth and equal value before God. Especially important is the tradition of this principle in the history of the interpretation of the Genesis creation narratives. Yet, personhood is affected by the empirical studies that are cited in the science and religion field on neuroscience and cognitive psychology. These disciplines, in a theological hermeneutic, can contribute to the understanding of persons as made in the image of God (*imago dei*). The moral principles of beneficence and reciprocity are deeply impacted by evolutionary psychology studies in kin selection and altruism.

Key Values

The key values of fundamental theology are unity and coherence. The value of unity is implied through the commitment of fundamental theologians to categories that take into account concepts and historically identifiable priorities from the four theological sources of scripture, tradition, reason, and experience. Reason becomes somewhat more

prominent through the necessarily clarifying role of philosophy in framing fundamental theological discourse. Coherence is a key value for establishing the epistemological horizon and metaphysical grounds for doctrinal explanations and systematic theology, which is dedicated to a correlation or comparison of doctrinal/creedal statements in light of other knowledge of the world.

Conceptualization

Nature/World

Nature is conceptualized by many fundamental theologians as one pole within a dialectical understanding of reality, with God as the being who is the author of nature. Fundamental theology is most interested in categories that deal with God and God's communication to and in the world. Yet, nature is seen as playing a key role in describing what God is like. For fundamental theologians such as Thomas Aquinas, features of nature assist in helping us understand God analogously and through telling us what God is not like (*apophatic* theology). In one of Thomas Aquinas' arguments for the existence of God, the good that is known in nature can help us understand the goodness and perfection of God. However, the finite limits of nature aid us in understanding the infinity of the eternal God.

Beyond analogous language, nature is also understood as having its own structure that fundamental theologians deploy in their efforts to conceptualize God from the standpoint of creation, a genre of fundamental theology that is identified as natural theology. In natural theology that is affected by the science and religion field, the concepts of emergence and creativity, complexity science, and the disciplines of cosmology and mathematics bear more weight in communicating the order and patterns that one would expect to see in the world if there is a God.

Human Being

In order to present a portrait of fundamental anthropology, theologians adopt certain motifs or concepts to account for why human beings are spiritually and religiously oriented. Karl

Rahner developed the idea that human beings are “the hearers of the Word.” That is, human beings are created with the precise relational, communicative, and value-seeking capacity to which God’s revelation is a response. Going on the paleoanthropological record, other thinkers beginning with Teilhard de Chardin and more recently, J. Wentzel van Huyssteen, have shown that human beings are inherently religious beings. Inherent religiosity is linked with symbolic communication and the moral disposition to expand an evolutionary epistemology that does not reduce our cognitive and emotional capacities to being survival mechanisms.

Person

See “[Ethical Principles](#)”

Life and Death

Fundamental theologians see life as a creation of God and the gift that God has given in anticipation of a response. Such a response is solicited from humanity in the form of faith. Death is thus understood not as the end but as the potential passage to eventual new life. Fundamental theology already has recourse to the general category of hope and cognate concepts to initially express what is meant by the traditional doctrine of heaven. This new life is characterized as a corporate reality by most contemporary Christian fundamental theologians. This corporate aspect of new life is seen as a corrective to many historical and contemporary individualistic interpretations of heaven or afterlife.

Reality

Fundamental theologians understand reality to be grasped as a given that exists prior to the human experience of it and as the spatiotemporal work of an eternal God. But in light of the methodological success of the natural sciences since the seventeenth century, fundamental theologians increasingly view the selection of general and special theological categories in critical realist terms. Reality is assumed to be given but known, as the philosopher Immanuel Kant emphasized, through our own categories and conceptual frameworks.

Knowledge

Fundamental theologians view their task as the establishment of grounds for doctrinal and systematic theological affirmations. Knowledge in this view entails the employment of analogies, inferences, metaphors, interpretive tools, allegories, and moral frameworks in order to set out the basic categories for fundamental theology. This diversity of methodological tools differentiates theology from the natural sciences, which rely on a complex set of deductive and inductive inferences, experimental, and verification techniques. While the frameworks constructed by the mind are the only subjective means to knowledge, the authenticity of that subjective mediation is a guarantee of the achievement of objectivity that is, in turn, subject to ongoing revisions at the level of fundamental categories, doctrines, and systematic theology.

Truth

Seen through the prism of Pontius Pilate’s question to Jesus in Matt. 18:38 “What is truth?” Christian theologians have understood truth to be a fundamental category with which the claims of Christian faith are concerned. Following the debates over critical realism and objectivity in theological knowledge, fundamental theologians believe that truth claims are made in doctrinal statements. However, hermeneutical, historical, and linguistic critiques over foundationalism ensue. The problem of foundationalism raises the critical realist debate which is exemplified in the statement: Are we granted some immediate access to the truth of particular states of affairs? Following the tradition of Friedrich Schleiermacher, the answer is no because the truth of any religious claim is a function of personal interiority, of religious emotions, and of self-consciousness. Following the critical realism of fundamental theologians in the Thomist, Reformed, evangelical traditions, and among those influenced by the science-theology dialogue, truth is expressed by Christian beliefs even though the linguistic expressions of Christian faith in beliefs and doctrines undergo developments in tandem with cultural developments.

Time

At issue here is whether we understand temporality as a part of God. Traditional models of God place eternity and time as conceptually dialectical. Karl Barth builds on this opposition in his own “dialectical theology.” Augustine and Thomas Aquinas concur by describing God’s eternity as timeless. On the other hand, beginning with the Cappadocian Fathers in the early church, other traditions in Christian theology have stressed the temporal character of the Christian God, going on the presentation of God as a trinity of persons. On this reading, change, relation, incarnation, and spiration connote a temporal character to God’s being. Thus, some fundamental theologians speak of God’s eternity as the “fullness of time.”

Rationality/Reason

See “[Description](#)”

Mystery

The categories of fundamental theology are intended to help us grasp the mystery of God as an objective reality in its many facets. Mystery is one of the basic fundamental theological categories, and Augustine speaks of it from its basic anthropological perspective when he claims that humans are a mystery unto themselves. With the human analogue as a starting point, fundamental theologians speak of the mystery of God. Mystery is further taken as a conclusion to cognitive psychological studies from which theology may begin its reflection on the human experience of transcendence. Bernard Lonergan approaches the mystery of God by speaking of the mystery that is experienced in our encounter with the realm of transcendence, a conscious experience. Paul Tillich, by virtue of his method of correlation, sees mystery, mystical experience, and transcendence as the ties that relate general human existential categories with special Christian categories, understood as symbolic.

Relevant Themes

Three themes are especially critical for a fundamental theology in the context of the

science-religion discourse. The first is the question of the “*laws of nature*.” For fundamental theology, this question has become intensified ever since philosopher David Hume expressed twin doubts over whether physical phenomena are actually caused and whether miracles exist, preferring to think of miracles as implausible violations of a law of nature. To this day, the question of miracles persists among fundamental theologians as possible events conceptualized as exceptions to the regularities described by the laws of nature. This view lies contrary to the consensus among many western Protestants since Schleiermacher (d. 1834) that a miracle is “simply the religious name for event.” What matters for advocates of this view is neither the objective character of laws of nature nor the grounds for establishing whether those laws have been violated but rather the subjective perspective on nature taken by individuals. Yet, a resolution of interpreting miracles depends, in fact, upon a prior resolution of the meaning of the “laws of nature.”

Throughout most of its history, Christian theologians have contested that the reality of nature’s laws matters as a form of testimony to God’s creation. Beginning in the Middle Ages within Christian theology and among Islamic philosophers as well during this time, the question arose whether it was fitting for God to intervene in the natural processes of creation which God established in the first place. Theological voluntarists have affirmed the distinct possibility of God being one who is able to willingly intervene. William of Ockham (1285 ca. – 1347), through his opposition to Aristotle and Thomas Aquinas’ theology, attacked the idea of things having common essences. Instead, he substituted the natural independence of natural laws with the idea of God’s total omnipotence and freedom. The world, as a created reality, is dependent upon God’s will, not independent natural laws. Today, the theological affirmation of the laws of nature is set against the view that nature and its laws constitute a necessary reality opposed to God’s power. Whether through statistical probabilities, evolutionary chance, or other natural process which depend on lower order physical laws, fundamental

theologians such as Keith Ward see natural laws as the structures within which God's purposes are forged. Miracles are thus allowed because they are seen not as violations but rather as transformations of natural laws, foreshadowing or echoing the spiritual foundations of created reality.

A second theme that characterizes the work of fundamental theology is the issue of *divine action*. Robert J. Russell of the Center for Theology and Natural Sciences (Berkeley, CA., USA) is a leading proponent for the view of God as an objective, noninterventionist actor in nature and history. Divine action is understood to be problematic not in the sense of God's general *providence*, as a creator God, but in the sense of God's special providence, which is a way of speaking about God's ongoing relationship and communication with the creation. The view that God is an objective actor whose action is still noninterventionist is meant to counter the prevailing influence of two older views about God's action in the world: (1) that God's action is objective and therefore intervenes in the laws of nature or (2) that God's action is subjectively felt by humans only and God does not need to intervene in the laws of nature. Both of these older views are discredited to the extent that they each presuppose a mechanical, deterministic portrait of the laws of nature.

Interpreting the laws of nature is widely seen as ultimately important for fundamental theological categories. Implied with regard to whether God acts in the world are the fundamental categories of communication and revelation. If God is communicating with human beings in the world through the biblical witness, the person of Jesus Christ, and so on, does this communication simply bypass biological, chemical, and other laws of nature? Does this communication imply an objective intervention in the laws of nature (option 1), is it merely subjectively felt through the mediation of nature (option 2), or is God's communication made possible by the laws of nature while being both objective and noninterventionist (option 3)?

While no consensus over divine action in or through the laws of nature yet exists, there is general acknowledgement of a related problem concerning divine action, a problem which arises on the assumption of a causal closure within the

world's natural processes. On that assumption, there is a sharp choice to be made between a compatibilist and an incompatibilist view of the relationship between the laws of nature and divine action. A compatibilist view sees God as working through nature, on which science can give an account, provided that this account is understood as pertaining to secondary causes, not the ultimate "primary" cause of the world and everything within it. Thomas Aquinas provides the most significant compatibilist account of divine action based on his inheritance of Aristotle's philosophy of nature. On the other hand, an incompatibilist view stipulates that God's action in the world be given some kind of evidential demonstration. An incompatibilist sees an inherent potential conflict between the claims of divine action in the world and the scientific web of explanations for the world.

A third theme that has appeared in the work of a number of fundamental theologians is the concept of *process*, a category which made its initial important impact through the work of philosopher *Alfred N. Whitehead* and later, theologian John Cobb and then *Ian Barbour*, who is regarded as an early founder of the science-religion dialogue in the United States. Barbour has been a strong advocate of the category of process, conceived as a form of society or network within which God is a cosmic leader. Process is deliberately viewed as an alternative way of modeling God and nature in contrast with the hierarchical and monarchical models that characterized traditional Christian models for God and nature. Accordingly, Whitehead termed God as "the poet of the world" (Whitehead 1978). Charles Hartshorne is another process philosopher whose concept of God has been influential among fundamental theologians, especially in light of his analogy for the God-World relationship as like that which exists between the human mind and the body. The basic intuition of process theology in this regard is that God is internal to the natural process of the universe, an idea which provides science and religion with a means for articulating the overall coherence of nature, history, and God's personal revelation. Critics on the other hand claim that process is neither amenable

to science nor to theology, or at least classical theology, and so it is a category that cannot be verified or falsified according to either scientific practice or theological tradition.

Cross-References

- [Concept of God in Contemporary Philosophy of Religion](#)
- [Hermeneutics, Theological](#)
- [Historical Theology](#)
- [Meaning, the Concept of](#)
- [Natural Theology](#)
- [Philosophy of Religion](#)
- [Practical Theology](#)
- [Revelation](#)
- [Systematic Theology](#)

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Fundamentalism

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This concept received its name from the American journal *The Fundamentals* which

appeared between the years 1910 and 1915, The fundamentals were branch of American Protestantism but took the scripture literary. In other words, whatever is written in the Bible is true, for example, that God created heaven and Earth in 6 days. The term fundamentalism is now used in different ways. Closed to the original meaning is ► [Creationism](#) (Ewald 1999; Beskow 1999). There are different forms of religious fundamentalism, Flat-Earthism, Geocentrism, Young Earth creationism, Old Earth creationism,

Gap-creationism, Day-Age creationism, Progressive creationism, Evolutional creationism and Scientific creationism.

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G

Game Theory

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Related Terms

[Theory of games](#)

Description

Game theory is a set of mathematical models and techniques developed to analyze interactive decision processes, to identify optimal strategies, and to predict the outcomes of these interactions. From the beginning, game theory found interesting applications in the social sciences, especially in economics, but in the warfare too. The seminal work in this field is debt to John von Neumann and Oskar Morgenstern. In 1944, their book *Theory of Games and Economic Behavior* established game theory as a field. During the last two decades, the advances in this discipline have been recognized with several Nobel Prizes in Economic Sciences. In 1994, Nobel Prize was awarded to Nash (Nash equilibrium), Harsanyi (Bayesian games), and Selten (subgame perfect equilibrium). Aumann and Schelling got the 2005 Prize for having enhanced our understanding of

cooperation and conflict through game theory, and in 2007, Hurwicz, Maskin and Myerson obtained the Prize for their contributions to the mechanism design theory and, in 2012, Shapley and Roth were awarded for his work, theoretical and empirical, respectively, explaining the market behaviour.

Self-Identification

Science

Game theory is an area of mathematics and thus has self-identified as a formal science. This classification is a consequence of the debate under which some thinkers admit mathematicians are scientists for whom the experiments are the mathematical proofs while others do not see mathematics as a science since it is not necessary to experimentally test the theories, as formulas and theorems are logically obtained from a set of axioms. The knowledge of the theory of games is similar to empirical sciences in that it involves a systematic study of a discipline: the interactive decision process, in this case. But it differs because it uses a priori rather than empirical methods. Nevertheless as a formal science, it is vital to empirical sciences. The advances in game theory have lead to major advances in natural and social sciences: economics, sociology, politics, biology, philosophy, and psychology and even in how people think and act.

As it is said, game theory was initially developed to understand firms, markets, and

consumers' behavior, but its use has expanded. Now it is applied too in political science (social or public choice, fair division, war bargaining, political economy), biology (evolutionary game theory, fighting behavior, biological altruism), philosophy (interactive epistemology, ethics, psychological egoism), computer science (interactive computations, multiagent systems, online algorithms, computational complexity), and logic (game semantics).

Religion

This discipline is, within mathematics, a formal science devoted to analyze the conflicts in which each actor's success depends on the choices of the others. The aim of game theory is to tell us what the best strategies are to produce a positive outcome in a conflict situation. For many individuals, religion is useful in the sense that they follow the religious norms to conduct themselves in order to live positive lives. In recent years some scholars have thought that, if game theory is really valid, it must necessarily have some connections between the solutions proposed by the theory and the moral behavior derived from trusting in God.

Characteristics

Game theory differs from the other areas of mathematics in several aspects.

First, game theory has a significant role to play in almost every branch of science and for many scholars can be considered the language for social sciences. Moreover, scientists have two different points of view using game theory. Those (specially economists) who interpret game theory in terms of revealed preference theory regard game theory as the part of mathematics that permits to model process with the objective of maximizing a utility function. Other scholars look at normative aspects of game theory which, for them, provide an explanatory account of strategic reasoning. In this case, the game theory logic is used to recommend several actions as the rational ones.

Second, game theory is a way of thinking that is distinct from the modes of thought in other

areas of mathematics. Just as understanding spatial relations motivated geometry or to understand the uncertainty motivated probability, the theory of games is born to understand the complexity of the interactions among individuals and the economic behavior. Nevertheless, its use nowadays has expanded. Moreover, game theory is a distinct way of thinking within mathematics and economics. Compare the intuition of game theory in the optimization process with the traditional approaches. Because of this special intuition, it generates tools and techniques that are relevant to other areas of mathematics, economics, and sociology or philosophy.

Relevance to Science and Religion

From Pascal's wager, game theory is interested in science and religion. The Pascal's wager belongs to decision theory, a branch of game theory, and gives the different outcomes of the strategies of the atheist and the believer in mathematical terms. It is the most famous Christian apologetic game. But game theory is a powerful way of thinking to be used by religion apologetics:

- Prisoner's dilemma has an outcome that agrees with the traditional Christian morality.
- Religion responses to reality and morality can be explained by game theory and evolutionary psychology in terms of strategic behavior.
- There are many scholars that use the rational choice in economics to understand religious behavior.
- The mathematics of evolutionary game theory helps us to study the emergence of altruistic behavior, forgiveness, and unselfish love.

Sources of Authority

The sources of authority in this discipline are mathematicians and economists interested in developing a rationality useful for the analysis of interactive behavior. In 1838, Cournot in his book *Recherches sur les Principes mathématiques de la Théorie des Richesses* (*Researches into the Mathematical Principles of*

the Theory of Wealth) considered the problem of duopoly and introduced a solution that is a particular case of the concept of equilibrium defined by Nash a century after. In 1938, Borel in *Applications aux Jeux de Hasard* (*Applications to Hazard Games*) proved the minimax theorem for two-person zero-sum matrix games (only for the case of symmetric payoffs). Nevertheless, it is considered that the foundational work in game theory is debt to the mathematician John von Neumann. This work culminated in the book that he wrote with the economist Oskar Morgenstern, *Theory of Games and Economic Behavior* (1944).

The 1950s was ages in which game theorists developed many interesting contributions: the prisoner's dilemma (this game has fascinated them and scholars of different disciplines from its definition), the Nash equilibrium, the concept solution for cooperative games or TU games known as the core, the extensive form of the games, the repeated games, and the Shapley value (the most famous point solution for TU games). Moreover, the first applications to political science and philosophy appeared.

In 1965, Selten introduced a refinement of the Nash equilibrium concept, the subgame perfect equilibrium.

Later, he refined this new idea introducing the trembling-hand perfect equilibrium as well.

Harsanyi, in 1967, introduced the concepts of complete information and Bayesian games. Nash, Harsanyi, and Selten obtained the 1994 Nobel Prize.

Another great step was done in the 1970s when Maynard Smith applied game theory to biology introducing the evolutionary games and the concept of evolutionary stable strategies. At this time, the ideas of common knowledge and correlated equilibrium appeared.

In 2005, Schelling and Aumann became Economics Nobel laureates: Schelling, because of his work in dynamic models, and Aumann, because of his contributions to the equilibrium theory.

In 2007, Myerson, Hurwicz and Maskin obtained the Economics Nobel Prize *for having lead the foundation of mechanism design theory* and, finally, in 2012, Roth and Shapley were

awarded for their contributions to explain the market behavior from a game theoretical approach.

Ethical Principles

Even in its origins, game theory was based on individualist ideas, especially in the environ of zero-sum games but also in the definition of the value for cooperative coalitions in a TU game; today *Game Theory has already contributed to the study of collective choice and of certain kind of "fairness" ; it may be helpful in clarifying those ethical constrains that affect people's expectations about each other and in working out the social-behavioral implications of different ethical systems. Examples are lying, breaking promises, coercive threats and the possible social inefficiency of selfishness or altruism* (Shelling 1968, page 34).

Considering the influence and use of game theory in ethics, it is possible to distinguish three types of contributions in the literature:

- (a) The contribution functionalist under which the function of morality is analyzed. The consequences (problems, paradoxes, and dilemmas) that would occur in the absence of morality are described and, simultaneously remedial to avoid them, are prescribed.
- (b) The second one comes from the evolutionary game theory and concludes that morality is the unintended side effect of the interaction of agents, emerging as an evolutionary stable strategy from a series of repeated interactions between small groups of actors.
- (c) The so-called contractarianism that uses bargaining theory to establish the social contract theory under which rational agents agree with norms and political institutions under suitable conditions.

We cannot avoid mentioning the implications that the results of game theory have on the behavioral recommendations of moral theorists. As there exist in many models and especially in repeated games a great variety of equilibria, game theory has reason to contradict moral theorists that claim generality, universality, and

uniqueness for their specific recommendations. Moreover, in any population we can assume and accept determinate mixes of individuals with different behavioral dispositions. This is the framework in which strategies (and particularly the ethic ones) evolve.

Finally, a classical criticism to the relation between game theory and ethics is that the man proposed by game theory is completely characterized in his decisions by his ranking of preferences over outcomes, and thus, moral distinctions have no place in this portrait.

Key Values

The key of game theory is to analyze the behavior of actors in conflict situations, helping them to adopt useful strategies. The normative point of game theory prescribes efficient strategies that in many situations lead to an ethical behavior. It is possible to say with confidence that game theory is the most important tool whenever analyzing situations in which the best action of each actor depends on the best actions of the rest.

Besides its initial conception as a method to thinking of conflict situations, today its applicability has spread to a wide set of areas as political science, philosophy, logic, or biology and including models not only for human behavior but also for nonhumans as computers or irrational animals.

Conceptualization

Nature/World

Nature is conceptualized as the biological foundation of our planet in which all processes occur. World compresses the material space where all interactions take place, and thus, it is the framework in which actors interact and in which theory of game models can serve to explain or to prescribe player's behavior.

Human Being

The human being is considered individually rational and having the capacity to take decisions

that can involve to distinguish between the outcomes of individual and collective rationality, selfishness, and altruism.

Life and Death

Life is conceptualized as the presence of physical functions. These functions appear as an optimizing process based on the fitness. Death is not conceptualized in game theory.

Reality

Reality is considered as the environment in which interactions occur and actors develop their strategies and obtain their outcomes. The reality is then viewed as something strategic where all players involved try to optimize its rewards.

Knowledge

Knowledge is the amount of information the actors can retrieve as a consequence of their participation in the interactive conflicts. It is identified with information and can be partial or complete. The concept of information, the different possibilities that are given to actors, and the changes that are introduced in games are of extreme importance in the description and prescription of behavior in game theory.

Truth

Truth is not seen in game theory as a supreme concept but as a relative one. Truth is the reality of each interaction, the mathematical model used to describe it. But this model changes if the environment changes too. Nevertheless, in all cases it used the truth of mathematics to obtain the solution or solutions that are considered rational.

Perception

Perception is conceptualized as the information that actors receive from the actions taken by other actors. Sometimes players can know the strategy of the others, and sometimes they only perceive the outcome corresponding to the use of this strategy. Of course, the perception is related to the information that players have, and as a consequence, the reality is assumed to change completely as a function of the perception and information. Some optimal behavior with certain

type of perception can be a disaster if the information differs. Recently, different game theoretical models, in which misperception is considered, are developed to analyze the behavioral implications and even the possibility of evolutionary advantage.

Time

Time too plays a central role in game theory. Interactive processes change deeply on the basis of the conceptualization of time. Things can be very different if players take their decisions simultaneously or sequentially or when the game is a static one instead of a repeated-in-time one. Also different models are developed in which time is discrete, but others are considering continuous time.

Consciousness

The consciousness in this discipline coincides with the perception and information that players have of the others and others' actions.

Rationality

At its origins, game theory was created assuming a very high rationality of the actors involved in conflicts of interests. Agents then act with the aim of maximizing their outcomes. As in the real world, sometimes this behavior leads to conflicts with the collective behavior (rationality) appearing paradoxes or dilemmas such as the prisoner's one. On the other hand, experimental results in applied sciences have shown that the behavior of real human subjects cannot be described under this strong rationality. In experimental situations, the lack of transitivity of preferences and some behavior that ignores the typical assumptions involved in the solution of games is relatively frequent.

From the 1970s, the evolutionary game theory developed by Maynard Smith successfully explains the stability of certain behavior of irrational animals. Moreover, this evolutionary game theory has expanded its applicability to topics that include altruism, moral and social behavior or signaling systems, and private property conflicts, to name only a few. So we can conclude that the original assumption of actors'

hyperrationality is not now as central in game theory as in the past.

Finally, different models assuming subjective rationality are considered in game theory. Under subjective rationality, agents are assumed to choose the behavior that maximizes their perceived payoffs.

Mystery

Mystery in game theory is this type of dilemma or paradox that can describe problems in conflicts but for which a normative prescription is of very difficult implementation. Typical examples are the prisoner's dilemma (individual vs. collective rationality), the mystery of Talmud (division of insufficient funds of a dead man among his creditors), and the battle of the sexes (how a man and a woman can agree in the case of opposite interests).

Relevant Themes

A critical aspect of game theory regarding "science and religion" is to explain the religious responses to reality. Science and religion have often been placed in the opposite sides of rationality spectrum. Nevertheless, in recent years the former tries to approach the latter, explaining its existence. So, some scholars are interested in taking into account the hypothesis of God refusing the very famous answer of Laplace to Napoleon when this one showed his surprise by the fact that a large book on the system of the universe was written by Laplace having never mentioned its creator: "I have no need of that hypothesis." Experiments are done to prove that, in general, people trust more in those who believe in God, to establish the links among different religions and the relation between the level of cooperation and whether such cooperation brings collective benefits not only to the religious community but to those outside it. Based on the results of these studies, many scholars argue that religion promotes fitness as a consequence of within-group collaboration, a typical idea of evolutionary games.

Wright (2009), using a game theoretical point of view, argues that religion is a rational response to nonzero encounters, those in which all actors can win. Primitive men tended to view worthy of moral

consideration only the members of their tribe. As the cooperative interactions expanded to other clans, the moral considerations affect different ethnic groups, then nations, and finally all human beings.

In sum, the use of game theory, in this context, tries to emphasize an economic interpretation of the religious behavior: people want rewards from low costs.

Cross-References

- [Collective Behavior](#)
- [Graph Theory](#)
- [Mathematics, Modern](#)
- [Political Theory](#)
- [Utilitarianism](#)

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Games, Computer

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Related Terms

[Computer science](#); [Console games](#); [PC games](#); [Video games](#)

Description

Computer games are art forms, which encompass nearly all forms of interactive

entertainment using a computing device as a medium. Most recent developments are centered around the introduction of new genres and new forms of play made possible by advancing technology. Relatively new genres include *first person shooters*, *simulation games*, and *serious games*. The most significant recent development has been the introduction of motion sensing game controllers, which have made new forms of game play possible by allowing the game to act using the player's movements.

Self-identification

Science

Computer games are art forms – they are designed to trigger emotions such as happiness, anger, and fear – and therefore, do not identify with science. Computer games do utilize science from computer programming, psychology, and economics, among other disciplines, in their development.

Religion

There is some relationship between computer games and religion. Many computer games – role-playing games, in particular – include references to religion. Computer games occasionally feature religion in a central role; the active subdiscipline of *Christian video games* is a product of the intersection of computer games with religion.

Characteristics

As art forms, computer games are inherently distinct from the majority of other disciplines in Computer Science; *Fractal Art* (i.e., creating fractal artwork with computers) is a similar distinctive discipline that combines art with Computer Science. Computer games are also interactive by nature (unlike Fractal Art), and nearly universally contain components for fun, learning, or both.

Relevance to Science and Religion

Computer games may see itself relevant to the interaction between science and religion when a computer game incorporates this theme into the play. A recent game that includes this theme is *Spore*.

Sources of Authority

Computer game development is a relatively new phenomenon. There are, as of yet, no authoritative journals dedicated to computer game development. However, the Game Developer's Conference (which concentrates solely on video games) presents advanced techniques used to create the latest games. This conference, which is recognized as the largest annual gathering of video game developers, was first held in 1988. A European version of this conference – Game Developer's Conference Europe – was formed in 2001.

Several trade publications also provide information for game developers. The most prominent print and online publications in this area are *Game Developer Magazine*, *Gamasutra*, *MCV*, and *GamesIndustry.biz*. The oldest periodical in this area, *Play Meter*, focuses on the coin-operating gaming industry, but also contains news of interest to game developers.

Video game universities also serve as an authority for video game development. Such “universities” consist of both dedicated institutions (e.g., DigiPen Institute of Technology, Full Sail University) and schools within traditional universities (e.g., “The Guildhall” at Southern Methodist University, the Interactive Media Division at the University of Southern California).

For consumers, periodicals and websites are the sources of authority on this discipline and typically contain reviews of video games, rumors of impending video game releases, and publicity for games that are soon to be released. The consumer-oriented websites

can be grouped into blogs and online-only periodicals.

Ethical Principles

Computer games require significant production effort, and their development is typically restricted to commercial entertainment studios, large academic laboratories, and government institutions. Adherence to ethical guidelines is generally not of interest to the institution that develops the game; financial and public relations interests are dominant. The lack of ethical guidelines occasionally results in games like *Muslim Massacre* (Clarke 2008) and *RapeLay* (Alexander 2009), which feature themes that are distasteful to the general public. The issue of ethics within computer games is being studied by some scientists (Sicart 2009).

Key Values

As art forms, computer games are capable of representing the most magnanimous and also most base human behavior; as such, there are no values intrinsic to the discipline.

Conceptualization

Nature/World

Nature has no discipline-specific definition, so the definition remains “the non-man-made world around us, including plants, animals, and geography.” A *world* is the player's environment within a video game (in the context of many adventure and role-playing games), a planet (in the context of space-faring games), or both.

Human Being

Within computer games, the term *human beings* is typically used to distinguish players of the species *Homo Sapiens* from other – typically mythical – anthropomorphic creatures, including dwarves, elves, and giants.

Life and Death

Life may be a commodity in the genres of action and shooter games; three to five “lives” – which are expended when a player “dies” by taking too much damage from enemies, traps, falls, etc. – are typically allocated to the player in games that use this system. Origins of life are not considered, unless this component is made a theme of the game (as in the game *Spore*).

Reality

Reality, in the context of computer games, is typically the player’s real environment (external to the game).

Knowledge

The sum of what is known (no discipline-specific definition).

Truth

Accuracy, a verified fact, or conformance to reality (no discipline-specific definition).

Perception

Perception is the understanding of sensory information by humans; the computer game acts as a medium between the virtual environment and the human, so the game is able to skew the human’s perception of this environment.

Time

Time is the measurement of the number of repetitions of a cyclical event (e.g., the oscillations of a crystal). In the natural world, units of time and time of day are typically determined using the speed of the rotation of the Earth as a standard reference. Within computer games, time is generally not synchronized to the actual time of day (flight simulation games can be an exception); time within computer games may be scaled such that more or fewer units of time pass within the same period as passed in the external world.

Consciousness

In the context of some action and shooter computer game genres, a player’s human character may lose consciousness (illustrated

by an inability of the player to perceive the environment) if the character is injured too heavily (e.g., the recent shooter game *Killstrike*).

Rationality/Reason

Good sense and sound reason, a sound motive (no discipline-specific definition).

Mystery

In the context of computer games, *mystery* is a component of some adventure games (e.g., *Myst*).

Relevant Themes

Computer games have the ability to engage religion, in both positive and negative ways, via religion’s portrayal within the game (e.g., Clarke 2008). Respect for religious beliefs has generally been treated carefully by computer game developers in the relatively short history of computer games.

Cross-References

- Brains, Artificial and Computational
- Collective Behavior
- Control Theory
- Cyborgs
- Game Theory
- Robot Programming

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Gautama Buddha

► [Buddha \(Historical\)](#)

Gene

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Commonly defined as the basic unit of heredity. Also, a stretch of DNA that encodes a sequence of amino acids for a protein.

Gene Flow

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A DNA sequence coding for an RNA molecule which may or may not code for a polypeptide chain, a protein. The genetic information is stored in the genes and corresponds to the specific alignment, the ordered succession of nucleotides along a DNA chain.

The exchange of genetic factors between populations through migration of individuals from one population to another.

General Divine Action

► [Divine Action](#)

Geodesy

► [Geography in Islam](#)

Geography in Islam

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Related Terms

[Astronomy](#); [Cartography](#); [Chorography](#);
[Cosmography](#); [Geodesy](#)

Description

The textual consolidation of Muslim geographical knowledge began in the ninth century (under the patronage of the Abbasid dynasty, r. 750–1258) and persisted until the demise of the Ottoman Empire. This fluid and compendious body of knowledge, which included geodesy (al-Biruni [d. ca. 1050] measured the length of a degree of latitude); cartography, including an early map of the Earth made for the caliph al-Ma’mun (r. 813–833) considered superior to those of Ptolemy and Marinus of Tyre; astronomy; topography; and chorography, came to be known in Arabic as *Jughrafiya*, a calque from Greek. The verbal description of regions proved a perennial genre, concentrating on either the provision of global accounts or confining itself to the dominions under Muslim sovereignty. Its origins were, as the textual commentary to the world maps, the nucleus of the Islamic geographical tradition, and its appeal was due to the importance to Muslims of the annual pilgrimage to Mecca, accounts of which by the twelfth century developed as a recognized genre (*rihla*). The importance of accurately determining the direction of prayer to Mecca (*qibla*) and the times or prayer created maps which were centered on Mecca, the most significant being two brass seventeenth-century (Safavid) dials which use a cartographic grid of latitude and longitude to enable their user to determine the distance to Mecca from anywhere in the then Muslim world. This aspect of geographical thinking is still practiced in the Muslim world today.

Self-Identification

Science

In Islam, the geographical tradition did not develop into a distinct science in its own right so as to be formally taught as such in the Islamic educational system. It remained a loose conglomeration of systems of knowledge, some of which were discrete but most of which overlapped. Thus, al-Biruni (d. ca. 1050) combined descriptive geography with geodesy and astronomy, while Ewliya' Celebi compiled a ten-volume travel account compiled over some 40 years (1631–1670) of travel through the Ottoman lands, in the employ of ambassadors and governors or with the armies, and the maker of one of the Safavid *qibla*-disks seems to have learned his mathematics from his father.

Relevance to Science and Religion

The distinction between “science” and “religion” would not have presented itself to those working in the Muslim geographical tradition, for whom all science was essentially a response to God’s gift of creation and to the Qur’anic injunction to study creation. This led on occasion to the composition of books of *mirabilia*, marvels of creation.

Sources of Authority

The most important source of authority is the Qur’an, the word of God as revealed to man by His messenger Muhammad. The Qur’an sketches a basic geography of sacred and non-sacred space and a cosmology of seven heavens, and equal number of layers of earth, with earth being surrounded and covered by two oceans, which informed all geographical thinking in Islam. Translations of the works of Ptolemy and Marinus provided thinkers with the terrestrial division into climes (though this was not the only division they employed: they also used the Persian division into seven, equal, concentric circles). Central to astronomy were the Indian computational tables translated from Sanskrit.

Relevant Themes

For many moderns, any form of “religion” necessarily delimits any form of “science.” The tradition of geography in Islam allows us the opportunity to study a discipline in which scientific accuracy and discovery remained consistent with the belief system of Islam while also constituting a reaction to how the system interpreted its sacred scripture.

Cross-References

- [Anthropology in Islam](#)
- [Architecture in Islam](#)
- [Astronomy in Islam](#)
- [Geometry in Islam](#)
- [Physics, Science in Islam](#)

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Geometry in Islam

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Related Terms

[Mensuration](#)

Description

Mensuration in any premodern culture was a fundamental part of the training of surveyors, architects, and other professionals. By representing lines, areas, and bodies by their numerical measures, geometrical problem solving becomes a part of calculation, or *ḥisāb* in the Arabic tradition. We first encounter practical geometry in a chapter of al-Khwārizmī's *Algebra* (early ninth century) and in later texts it appears both in stand-alone treatises as well as in chapters in books on calculation. One example of the latter is al-Karājī's seminal *Sufficient [Book] on Calculating* (early eleventh century). These books provide the basic rules of calculating sides, areas, and volumes, utilizing quadratic methods like the Pythagorean theorem as well as approximations.

Most practical books are devoid of proof, but by the latter tenth century the Greek tradition is found integrated into some texts. In his important *Book on What is Necessary from Geometric Construction for the Artisan* (ca. 990) Abū al-Wafā' relies on Euclidean geometry as a foundation for the techniques useful in the trades. One notable application of geometry to architecture is the construction of domes in Islamic architecture.

Geometers working in the scientific direction adopted the philosophical and logical framework of Greek geometry. The first translation of Euclid's *Elements* was made sometime before 805. This was followed by translations of the more advanced works of Archimedes, Apollonius, Theodosius, Menelaus, and others. The Banū Mūsā (ninth century) in particular were eager to read and understand Apollonius' *Conics*. They could not make sense of their corrupt copy of the Greek text, so al-Ḥasan ibn Mūsā derived the basics of the theory of conic sections on his own. After his death his brother Aḥmad traveled to Syria, where he found Eutocius' commentary on the first four books. From this he was able to understand Apollonius' treatise, which allowed him to supervise the translation of all seven extant books.

Inspired by Archimedes' *Measurement of the Circle* (tr. Thābit ibn Qurra) and *On the Sphere and Cylinder* (tr. Ishāq ibn Ḥunayn, revised by Thābit), the Banū Mūsā and others in their circle found areas and volumes of curved regions and solids. The Banū Mūsā derived formulae differently from Archimedes, by expressing their results as products of given magnitudes. Thābit, in his *Book on the Measurement of the Conic Section called Parabola*, proved Archimedes' formula for the area of a segment of a parabola, and he gave the volumes of several regions obtained by rotating such segments around particular lines. These proofs were later improved by Ibrāhīm ibn Sīnān, al-Kūhī, and Ibn al-Haytham (Rosenfeld and Youschkevitch 1996).

This high level of work with conic sections was continued in the tenth century by geometers including al-Sijzī and al-Qūhī. One of al-Qūhī's more remarkable results was to "construct a spherical segment whose [spherical] surface is equal to that of one segment and whose volume is equal to that of another" (Berggren 1996, 140). He also wrote a treatise on the "perfect compass," an instrument he designed for drawing conic sections. Other problems, such as trisecting the angle and constructing the regular heptagon, were solved using conic sections.

Ibn al-Haytham (965-ca. 1041, known as Alhazen in the Latin west) is best known for his work in optics, but he also made significant contributions to geometry and astronomy. His most famous result in geometry is his solution to "Alhazen's problem": given a reflective surface (which can be planar, spherical, cylindrical, or conical) and two points off the surface, to find the point(s) on the surface such that light shined from one of the two points will reflect to the other. The six lemmas which form the foundation for his solution exhibit a mastery of conic sections. Ibn al-Haytham also wrote *Completion of the Conics*, his reconstruction of the lost eight book of Apollonius' treatise (al-Haytham 1985).

Various criticisms of the foundations of Euclidean geometry were challenged by Arabic geometers. One important debate concerned

Euclid's parallel postulate. Briefly, Greek postulates were ideally simple, self-evident truths which require no proof. But the fifth postulate in the *Elements* reads like a proposition: "That, if a straight line falling on two straight lines make the interior angles on the same side less than two right angles, the two straight lines, if produced indefinitely, meet on that side on which are the angles less than the two right angles" (Euclid 1956, 202). It was only in the early nineteenth century that mathematicians showed that this postulate is in fact independent of the others, and cannot be proven.

Criticism of the parallel postulate began in ancient Greece, and continued in the Islamic world. Three approaches were taken to address the problem: Some geometers tried to prove it outright, others redefined the word "parallel," while still others came up with a more intuitively appealing alternative (Jaouiche 1986).

Euclid defined two lines to be parallel if, when produced indefinitely, do not meet in either direction. Thābit ibn Qurra and Ibn al-Haytham both substituted Euclid's definition with one which defines two lines to be parallel if they are equidistant, and from this they were able to prove the fifth postulate. But in their proofs both mathematicians generated a second line parallel to a given line by the motion of a point. Euclid, following Aristotle, had banned motion from geometry, and on this ground al-Khayyām rejected Ibn al-Haytham's solution.

In another proof Ibn al-Haytham proposed a postulate to replace Euclid's fifth: that two intersecting lines cannot both be parallel to a third line. This became known as Playfair's postulate when it was reinvented by European mathematicians. Al-Khayyām also replaced Euclid's postulate by one equivalent, which asserts that two converging lines must intersect.

Arabic geometers also criticized and reworked Euclid's definition of proportional magnitudes (Book V, def. 5), rearranged the definitions and the propositions in Book I, and composed new books 14 and 15 to be appended to Euclid's treatise.

The roles of analysis and synthesis in proofs, and even the definition of the former, were

discussed briefly by a few Greek mathematicians (Pappus in particular). Arabic authors devoted considerably more attention to the problems. The first treatise devoted to this topic in any language is Ibrāhīm ibn Sinān's tenth century *Treatise on the Method of Analysis and Synthesis* (Bellosta 1991).

Beginning with al-Khwārizmī, we frequently find geometric problems solved numerically by algebra. For example, Abū Kāmil's *On the Pentagon and Decagon* (latter ninth century) gives algebraic solutions by naming an unknown line "thing" and setting up and solving a quadratic equation. Also in the ninth century al-Māhānī used algebra to analyze a problem of Archimedes which yielded a cubic equation. This led ultimately to al-Khayyām's geometric treatment of algebra (See the entry "► [Algebra in Islam](#)").

Most geometers were also astronomers. Ptolemy's geometric models were adopted and adjusted, plane and spherical trigonometry were developed from both Greek and Indian ideas, and the construction of instruments relied on stereographic projection (astrolabes) and conic sections (sundials) (See the entries "► [Astronomy in Islam](#)" and "► [Mathematics in Islam General](#)").

Cross-References

- [Algebra in Islam](#)
- [Arithmetic in Islam](#)
- [Astronomy in Islam](#)
- [Mathematics in Islam General](#)
- [Mathematics, Ancient and Medieval](#)
- [Science in Islam, Classification](#)
- [Science in Islam, Transmission](#)

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Geriatrics

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Description

According to the definitions of the EUGMS (European Union Geriatric Medicine Society), geriatrics is the medical discipline that is particularly concerned with physical, mental, functional, and social aspects of disease as well as its acute, chronic, rehabilitative, or preventive treatment and care in patients with old or older age, including the end of life period. These patients are characterized by their high degree of frailty and multimorbidity needing a holistic approach of treatment. The presentation of disease in elderly patients can be different from that in younger age because of changing physiology with older age. Therefore, diseases in the elderly can be difficult to diagnose and sometimes difficult to treat properly. In addition, it often demands for social support measures. Geriatric medicine follows the principles of the international classification of impairments, disabilities, and handicaps and provides additional treatment offers in a multidisciplinary team setting. The main goal of geriatric medicine is to promote health by preventing and treating diseases and disabilities in older adults. It attempts to optimize the functional status in elderly patients, to improve their quality of life as well as their autonomy. Geriatric medicine is not specifically

defined by age, but primarily deals with the typical multimorbidity in elderly patients. Most patients in geriatrics are beyond 65 years of age; however, the typical geriatric conditions of disease mostly develop in the age range of the eighties and even beyond.

There is a broad range of diseases associated with older age, particularly stroke, heart disease and syncopes, infections, diabetes, mobility disorders like parkinsonism, as well as delirium and dementias. With the sociodemographic development and longevity, the importance of neurogeriatric diseases is becoming more and more obvious. However, geriatric medicine not only focuses on particular diseases but also on complex functional syndromes like immobility, instability, incontinence, and impaired intellect.

The term “geriatrics” was proposed for the first time in 1909 by Dr. Ignatz L. Nascher from Vienna, the “father” of modern geriatrics, who later on became the Chief of Clinic in the Mount Sinai Hospital Outpatient Department in New York. In 1914, he wrote the first modern geriatric textbook with the title “*The diseases of old age and their treatment*.” In the United Kingdom, modern geriatrics started with Dr. Marjorie Warren, the “mother” of geriatrics who emphasized that also rehabilitation was essential to the care of older people. In Germany, Geriatrics was promoted by the internist Max Buerger who founded the “German Society for Geriatric Research” in 1938 in Leipzig. However, it lasted over 30 years, until the first chair for geriatric medicine in Germany was established at the University of Erlangen-Nürnberg.

Thus, in Germany, geriatric medicine started to be established only after World War II. The development of Geriatrics, however, was different in different European countries, including the modalities and forms of organization of geriatric medicine. In some countries, geriatric medicine became a discipline by its own, whereas in other countries, it is still a subdiscipline of internal medicine, even if geriatric medicine asks for a multidisciplinary approach and competence.

Today, in most countries, geriatric care is represented on the level of community hospitals, whereas the representation of geriatrics on

an university level is not the same in every country. In most countries, geriatrics at an university level still has to be developed further. In recent years, research in geriatrics has primarily focused on care. Furthermore, in several countries, special centers for age research have been founded, integrating clinical geriatrics, but primarily being devoted to molecular biology.

In the future, the importance of geriatrics will increase continually as the population ages and the aging population lives longer.

Self-Identification

Science

Geriatrics is related to the science of Gerontology, which is the study of the aging process in all its aspects, social as well as biologic. Thus, it is the medical branch of health care dealing with the problems of aging and particularly with the diseases of the aged and has its origin from internal medicine. According to these roots, geriatrics has always self-identified, from the very beginning, as an integral part of natural science. Even if geriatrics primarily focuses on care research and has certain religious as well as philosophical implications at the end of life period, it sees itself as a scientific endeavor with the aim to enhance the knowledge about the organization and function of the human body in older age as well as their disease-related abnormalities. This also means that geriatrics knows to integrate scientific evidences from neighboring disciplines into its own concepts of multidisciplinary approach, diagnosis, and treatment of diseases in the elderly. These evidences are derived from traditional scientific methods of the natural sciences for clinical and basic research, applied in the classical medical subdisciplines of anatomy, pathology, pathophysiology, and physiology. In general, the disease concepts and practices of clinical investigation were developed in the twentieth century and continuously substantiated by clinical research. Over the recent decades, the methodological repertoire was extended to chemistry, immunology, radiology, pharmacology, and molecular biology. Thus, the medical

concepts in geriatrics are based on insights from a broad range of science specialties in basic research fields.

However, particular research fields in geriatrics focus on health care as well as on specific conditions. An important issue in clinical geriatric research is the treatment and prevention of "delirium," the investigation of the different aspects of frailty as well as the fact of different pharmacological constitutions with older age. Further important topics are mobility and the risk of falls in older age as well as the management of cognitive disturbances and other neurogeriatric issues.

The scientific basis of geriatrics is reflected by different national as well as European scientific societies, which run their regular scientific meetings and in the majority have their own scientific journals. These societies show an increasing number of members over the recent years.

Religion

There are close relationships of geriatrics to ethical and/or religious questions, particularly in very old age and in the end of life period.

Elderly persons often cannot make decisions for themselves. Therefore, they need people around them, who take care for them in a very responsible way. In this context, the geriatrician plays an important role providing guidance for the patients as well as for their relatives in a situation where they do not understand what happens to them or do not have the competence to understand the facts and make the right decisions. Furthermore, it is very well known that for most of the elderly, religion plays an important role in their life. In addition, there is evidence that religion correlates with improved physical and mental health. If religion by itself is helpful or if concomitant psychological benefits and social support or encouragement of healthful practices may be relevant is not yet clear until today.

In any case, the geriatrician ought to support the patient and his relatives in the best interest of the patient according to medical guidelines, but also to legal, social, ethical, or religious aspects. Particularly, in the end of life period, social, remedial, palliative, ethical, or religious issues

are becoming more and more important. Therefore, in this specific period of life, geriatrics tries very much to integrate the personal ethical or religious views of a patient into the medical treatment concept. This means indeed that geriatrics is more often influenced by ethical and religious questions than any other medical discipline.

Characteristics

Geriatrics differs from standard adult medicine and the other medical disciplines because it focuses on the particular and complex needs of the patients in older age and emphasizes maintaining functional independence. However, the presentations of illness in old age are often nonspecific, because the aged body is different physiologically from the younger adult body, and the clinical characteristics of diseases are contaminated by the decline of various organ systems with age. This means, that older persons react to illness and diseases differently than younger adults. Furthermore, previous health issues and lifestyle choices produce a different constellation of diseases and symptoms in different people. In addition, functional abilities, independence, and quality of life issues are of great concern to geriatricians and their patients. Therefore and different from other medical disciplines, geriatrics focuses not only on single disease entities but also on functional syndromes, mostly caused by several different diseases. The major categories of these impairments in the elderly are immobility, instability, incontinence, and impaired memory. They are also known as the “four geriatric giants.” Furthermore, geriatrics takes care of not only acute illnesses in later age but also of chronic diseases, as well as health promotion and disease prevention in later life.

Different from other medical disciplines, geriatrics chooses a holistic approach to medical questions in the elderly and therefore is simultaneously concerned with clinical, preventive, remedial, palliative, social, and ethical or religious aspects of illness in old age. The various challenges of frailty, complex comorbidity, different patterns of disease presentation, slower

response to treatment, and requirements for social and spiritual support call for special medical skills.

A geriatrician should have profound knowledge in the wide range of diseases in older age and their social implications as well as specific skills to treat older patients with sensitivity and dignity. Furthermore, the complex aspects of geriatric medicine require a comprehensive assessment of illness and disability and therefore an interdisciplinary approach, meaning that the geriatrician will work with other physicians, nurses, social workers, dieticians, physical therapists, occupational therapists, and other health professionals as well as family members, in order to provide comprehensive care for these patients with multiple needs. Thus, geriatric medicine is by its very nature a discipline that is multidisciplinary, community oriented, and particularly family centered.

According to its holistic views, geriatric medicine is not only interested in the treatment of acute or chronic diseases by pharmacological or interventional approaches but also in the patients’ physical and cognitive training as well as their psychological and social well-being. Furthermore, the primary or secondary prevention of disease is also an important issue in geriatrics, focusing on suitable exercise, rest, adequate nutrition, and maintenance of proper body weight. In addition, regular and thorough medical examinations are another essential factor in the control of illness in older age.

Thus, geriatrics includes medical, rehabilitative, preventive, social, and ethical or religious aspects.

Relevance to Science and Religion

Geriatrics understands itself as natural science; however, there are many ethical or religious implications, particularly concerning with loss of autonomy, aspects of beneficence, and non-maleficence, as well as justice. Particularly in geriatrics, questions like decisional capacity and competence, identification of decision makers, decisions about long-term care, resolution of

conflicts about care, or the termination of treatment at the end of life are of special ethical importance. Furthermore, aging by itself as well as the end of life period with questions like quality of life, palliative care, euthanasia, death, and dying, as well as beliefs in postmortem life are highly relevant in geriatric medicine.

Thus, more than any other medical discipline, geriatrics is involved in ethical, religious, philosophical, psychological, and social questions. Therefore, the geriatrician should be prepared to answer his patients' questions of this kind and to integrate their views and those of their families into his medical treatment strategies. Furthermore, the geriatrician must have high ethical or religious standards, because the elderly, more than patients of younger age, are often physically or psychologically dependent and require professional guidance or assistance for the management of their personal needs in their own best interest.

Sources of Authority

The authorities in geriatrics are those scientifically interested physicians who are also instrumental for the establishment of dedicated clinical as well as academic institutions. The first modern geriatric hospital was founded in Belgrade, Serbia, in 1881 by Dr. Laza Lazarevic, whereas the term "geriatrics" was coined for the first time by Dr. Ignatz Leo Nascher in 1909 who edited the first textbook in geriatrics in 1914. He is considered to be the father of modern geriatrics. Later, he became Chief of Clinic in the Mount Sinai Hospital Outpatient Department in New York. Other important geriatricians are Max Buerger, who founded the German Society for Geriatric Research in 1938, Dr. Marjorie Warren, who emphasized on rehabilitation in older patients, and Dr. Bernard Isaacs, who described for the first time the syndrome character of geriatrics with the so-called four geriatric giants (immobility, instability, incontinence, and impaired intellect).

With the advent of the internet, electronic publishing, and electronic libraries, original publications in scientific journals have become

increasingly important. Based on this rapidly growing body of knowledge, the geriatric scientific organizations have established guidelines for good clinical practice and evidence-based guidelines, often together with the scientific organizations of the neighboring disciplines. They are constantly updated for therapeutic protocols of the major geriatric disease entities.

Ethical Principles

As for every medical subdiscipline, geriatrics is guided by the oath and law of the ancient Greek physician Hippocrates, who is considered to be the father of medicine. The oath is considered all over the world to be the rite of passage for all practitioners of medicine. This Hippocratic Oath has been supplemented by the Declaration of Geneva in 1948 and later on by the rules of the Declaration of Helsinki. Thus, the basic ethical principles, which also guide the discipline of geriatrics, are autonomy, beneficence, non-maleficence, and justice.

Key Values

The key values in geriatrics are the same as in other medical subdisciplines. The primary intention of geriatric activities is to alleviate human sufferings in older age, resulting from acute and/or chronic diseases as well as from end of life problems and even death. These sufferings usually result from different diseases (multimorbidity) and implicate multiple functional impairments of different kind. Therefore, the geriatric approach is multidisciplinary and includes medical, rehabilitative, preventive, palliative, and social aspects. Usually the geriatrician employs and seeks to refine science-based therapies that are able to alleviate or even cure the underlying diseases and syndromes. Furthermore, geriatrics is very much involved in the counseling and guidance of patients and their relatives during and after acute disease as well as during the course of chronic impairments. Particular responsibilities are requested in

patients with physical and mental handicaps, personal dependence, and with very individual aspects in the end of life period.

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German Philology

- [Language and Literature, German](#)

German Studies

- [Language and Literature, German](#)

Germanistik

- [Language and Literature, German](#)

Geropsychology

- [Aging, Psychology of](#)

Gibbs Energy

- [Chemical Thermodynamics](#)

Gifford Lectures

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This series of lectures, unquestionably the world's most highly regarded in their field, was initiated in 1888 under the bequest of Adam, Lord Gifford, a judge of Scotland's Court of Session, who had died the previous year. The bequest was distributed (not quite evenly) between the four Scottish universities of the time: Aberdeen, Edinburgh, Glasgow and St Andrews, and the academic governing bodies (Senates) of the four universities have operated their own series of Gifford Lectures independently and usually biennially ever since, except during the Second World War. Thus, to represent a volume as "The Gifford Lectures for" a particular year is never correct: one should always add "in the University of. . ."

The Will

Lord Gifford defined natural theology in the widest terms: "The Knowledge of God, the Infinite, the All, the First and Only Cause . . . and the Knowledge of . . . the Relations which men and

the whole universe bear to Him, the Knowledge of the Nature and Foundations of Ethics or Morals, and of the Obligations and Duties thence arising.” Even wider, and strikingly liberal, was the specification as to who might be invited to take up this challenge: “The Lecturers appointed . . . shall not be required to . . . subscribe any declaration of belief . . . they may be of any religion or way of thinking, or . . . of no religion . . . provided only that they be able and reverent men, true thinkers . . . and earnest enquirers after truth,” for “nothing but good can result from free discussion.” Nevertheless, there was a constraint: “I wish the lecturers to treat their subject as a strictly natural science, the greatest of all possible sciences, . . . that of Infinite Being, without reference to or reliance upon any supposed special exceptional or so-called miraculous revelation.” Tall order though this was, he finally required that the lectures be “public and popular . . . open not only to students of the Universities, but to the whole community without matriculation.”

Early Lecturers

The first series of Gifford Lectures was given in Edinburgh by a freelance philosophical writer, James Hutchison Stirling. He was a popularizer, and his lectures met the last of Lord Gifford’s conditions better than almost any since – probably only Carl Sagan (Glasgow 1985), who filled three lecture theaters by video link, matched him in this respect, and regrettably Sagan’s lectures were never published. Of the opening group of lecturers, however, the great philologist and Vedic scholar, Max Müller (Glasgow, 1888–1892), German by birth and training but by then an eminent Oxford professor, made the most lasting mark with his 4-volume series on *Natural Religion* (the first volume’s title). Much the same theme recurred frequently till 1911–1913 (Sir James Frazer, St Andrews), after which Senates (or their lecturers) faced up to the difference between natural religion and natural theology, and adhered more consistently to Lord Gifford’s intention. Nevertheless, one of the greatest series ever, by the American William

James (Edinburgh, 1900–1902), on *The Varieties of Religious Experience*, had broadly such subject matter; James, however, built upon it an edifice of psychological and philosophical insight unmatched by any other lecturer of the period.

The other main groups of early lecturers were philosophers, more or less heavily influenced by Hegel. Edinburgh’s second lecturer, however, was the physicist Sir George Stokes, a latter-day Paley, who elegantly restated the argument from design (1890–1892). This certainly was natural theology, but it was to be the next century before another scientist was invited.

Scientists in the Twentieth Century

The German biologist Hans Driesch, the last great exponent of vitalism, opened this account (Aberdeen, 1907–1909). The next biologist was Lloyd Morgan, presenting a philosophy of evolution and emergent mind in St Andrews (1921–1922). The greatest biological lectures, however, were surely those of Sir Charles Sherrington, whose *Man on His Nature* (Edinburgh, 1937–1938) was a towering account of mind and brain, and their interactions with the environment, as understood at the time. Later biologically trained lecturers included an Anglican churchman, Charles Raven (Edinburgh, 1950–1952), with an admirable overview of science and religion, and Sir Alister Hardy (Aberdeen, 1963–1965) who was researching religious mysticism as objectively as he had previously researched marine organisms. In Edinburgh again, the Australian neuroscientist, Sir John Eccles (1977–1979), was more dualist (and therefore anachronistic?) than his teacher Sherrington. Far better neurophilosophy was presented by Donald Mackay (Glasgow 1985–1986), whose memorable *Behind the Eye* presents “I-story” and “brain-story” as accounts of the same system from opposite sides. Equally notable, as the century neared its close, was the biochemist-theologian Arthur Peacocke (St Andrews, 1992–1992), whose lectures became part of an enlarged edition of *Theology for a Scientific Age*.

One of the greatest physical scientists was Sir Arthur Eddington (Edinburgh, 1926–1927), whose *Nature of the Physical World* tinged quantum physics with mysticism in limpid prose. Neils Bohr (Edinburgh, 1949–1950) did not publish, but Werner Heisenberg (St Andrews, 1955–1956) did so with both lucidity and depth, while his fellow German, Carl von Weizsäcker, a Kantian and theistic cosmologist, presented perhaps an even more rounded viewpoint to his audience in Glasgow (1959–1961). The next physicist to deliver a full series was the last of the century, Sir John Polkinghorne (Edinburgh, 1992–1993) in the well-known *Science and Christian Belief*.

Philosophy and Theology

There was, as already implied, much philosophy in the great scientific series. Reciprocally, at least two mainstream philosophers drew strongly upon science. Samuel Alexander's account of a still-unfolding *Space, Time and Deity* (Glasgow, 1916–1918) provides an archetypal Gifford title! Yet more lastingly influential has been A.N. Whitehead's *Process and Reality* (Edinburgh, 1927–1928) – not an easy read, despite Lord Gifford's wishes, but the central text of process thinkers ever since. Still more extensively quoted has been the ex-scientist, Michael Polanyi's, exposition of the tacit and prerational dimensions of all *Personal Knowledge* (Aberdeen, 1951–1952). Less widely known, yet to its admirers one of the most systematic natural theologies the benefaction has ever elicited, was John Macmurray's assertion of the primacy, first of *The Self as Agent* over the self as thinker, and then of *Persons in Relation* over persons as individuals (Glasgow 1952–1954). The first woman lecturer, Hannah Arendt, considered *The Life of the Mind* in Aberdeen (1972–1974); simultaneously in Edinburgh, A.J. Ayer's *Central Questions of Philosophy* excluded the possibility of theology, but in counterpoint Richard Swinburne (Aberdeen, 1982–1984) offered a closely argued, modern-traditionalist account of *The Evolution of the Soul*.

The borderline between philosophy and theology is no firmer than that between philosophy and science – witness Alvin Plantinga's two volumes on the warrants of belief (Aberdeen, 1986–1987). Only in the 1920s did the Senates begin frequently to invite theologians to lecture, and among the most notable in the early group was the Anglican Archbishop William Temple's *Nature, Man and God*, a commanding attempt at an overall natural theology (Glasgow, 1932–1934). Even more prominent was the Swiss theologian Karl Barth's attack on the very possibility of natural theology (*The Knowledge of God and the Service of God*: Aberdeen, 1937–1938) – another volume which spurned the benefactor's last requirement yet has attained an influence inversely proportional to its accessibility. The Swedish Archbishop Nathan Söderblom (Edinburgh, 1930–1931) had been immensely more liberal, while Edwyn Bevan's *Symbolism and Belief* (Edinburgh, 1932–1934) was among the most elegant individual contributions to the series. Albert Schweitzer also lectured during this period but did not publish.

Replies to Barth came after the Second World War, the most direct being from a fellow Swiss, Emil Brunner, in the two volumes of *Christianity and Civilization* (St Andrews, 1946–1948). From the USA Paul Tillich (Aberdeen, 1952–1954) and from Germany Rudolph Bultmann (Edinburgh, 1954–1955) also stand out at this time, while a little later *The Openness of Being*, by the Anglican Thomist E.L. Mascall (Edinburgh, 1970–1971), was a notable theological edifice. In the latter part of this period, several lecturers considered non-Christian religious thought. Notable among these were R.C. Zaehner (*Concordant Discord*: St Andrews, 1967–1969), Ninian Smart (*Beyond Ideology*: Edinburgh, 1979–1980), and Seyed Nasr, the first Muslim lecturer (*Knowledge and the Sacred*: Edinburgh, 1980–1981).

Then and Now

The above account is a condensation of that by Spurway (1993). More detail, up to the mid 1990s, is provided by Jaki (1995).

The Gifford Lectures continue undiminished in all four universities. To give selective prominence to any very recent ones would be invidious, but they are listed and in most instances summarised at www.giffordlectures.org. Instead, let this article end with two quotes from Max Müller to which Lord Gifford would surely have assented:

It is truth which makes revelation, not revelation which makes truth. (*Physical Religion*, p. 361)

What is natural is divine, what is supernatural is human. (Preface to *Collected Works*, p.xv)

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Gift

► [Grace](#)

Glia

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(Also called neuroglia) Non-neuronal elements of the nervous system that are involved in nutrition, homeostasis, and signal transmission in the brain. While once thought to be involved only in support of the neuronal network (glia means glue), glia are now recognized as playing a varied and sophisticated role in brain function.

Global Christianity

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Related Terms

[Globalized Christianity](#); [Christianity](#); [Transnational Christianity](#)

Description

The study of Christianity as a global religion has in recent years occupied a number of scholars in contemporary Christian systematic theology (Kim and Kim 2008; Schreiter 1997), historical studies (Stackhouse 2000; Jenkins 2002a; 2002b), as well as sociology of religion (Robertson 1992; Kurtz 1995; Beckford 2003; Beyer 1994, 2003, 2006). During the last century, Christianity has undergone a number of fundamental shifts demographically, socially, and culturally: whereas a typical Christian in the year 1908 was a white, European, literate, middle-class man from an industrial city, the typical Christian in year 2008 is a colored, African, illiterate, poor woman from a village in Nigeria. In this situation, the main scholarly question has been what kind of changes Christianity's globalization brings about – that is, by its changing geographical, cultural, and social parameters – and how these changes affect the very nature and theology of Christianity itself. This is a complex question and has been discussed mainly within three major theoretical concepts, namely, “globalization,” “postcolonial theory,” and “pluralism.”

Fundamental Shifts Accompanying the Globalization of Christianity

The transformation within Christianity during the last century has resulted in its globalization and caused a fundamental shift in two areas.

First, even if the historical spread of Christianity has been eastward and southward as well as westward, Christianity was to a large degree a European and subsequently American religion until the start of the twentieth century. In the course of the last century, Christianity has gained a new presence across the globe in countless local expressions which are linked by crisscrossing networks. Christianity outside of Europe and North America is not uniform or united but is made up by a number of Christianities, ranging from Orthodox churches over Roman Catholic and various Protestant churches to a plurality of Pentecostal and charismatic churches. At present, there are many global networks bringing churches and leaders together, but the prospect of a single world Christianity seems very remote. Global Christianity is in fact a plurality of Christianities.

Second, while European and to a lesser degree American Christianity has been declining in the last century, there has been a marked growth in Christianity, especially in sub-Saharan Africa and in Asia. This simultaneous decline in European Christianity and growth in African and Asian Christianity has caused a historical shift which means that there are now more Christians living outside of Europe and North America than within these regions. Consequently, the strength of Christianity now lies outside the old strongholds of Christendom. Outside of Europe and North America, Christianity has been spread by Roman Catholic missions since the sixteenth century and by Protestant missions since the eighteenth century. However, the present spread of Christianity is primarily caused by local believers and in forms developed by them in local ways; thus, Christianity's globalization has also meant its indigenization. Attention to the activities of foreign missionaries has tended to obscure this fact, but the present diversity of global Christianity is a testimony of it.

Statistics on the Globalization of Christianity

Statistics confirm these two fundamental shifts: The total number of Christians of all

denominations in year 1900 was approximately 560 million or 33% of the world's population. Within the last 30 years, developments in Africa and Asia show a dramatic increase in numbers of Christians. African Christians were 63 million in 1970, but in 1995 they numbered 151 million (Barret et al. 2001, p. 4). If the same rate of growth is projected to 2025, the total number of Christians in Africa will then be 600 million. This would in other words be a tenfold increase in the number of Christians in Africa in merely 55 years. Also in Asia does Christianity show high growth: from 52 million in 1975 to 148 million in 1995. Projected to 2025, this growth would mean an increase to 460 million. Again, this would be a tenfold increase in the numbers of believers (Barret et al. 2001, p. 4). Turning back to Europe, the number of Christians is by large unchanged: from 326 million in 1975 to 370 million in 1995, but the percentage of Christians has clearly gone down in Europe over the last 60 years from more than 75 % self-declared Christians in Western European countries to merely 40 %. However, because of general growth in population during the same period of time, this means that the total number of Christians has remained somewhat stable, around 32–34 % of the world's population.

Themes Arising in Globalized Christianity

The expansion of Christianity has brought up different themes in various social and cultural settings. Whereas the historical European Christianity has emphasized certain themes, new points have emerged according to the spread of Christianity. Even if it is impossible to give a comprehensive overview of these themes in a single entry, a few keywords and regional concerns might be mentioned.

Historically, European Christianity has mainly been made up by Roman Catholicism and various Protestant forms of Christianity and only to a lesser degree by the presence of Orthodox Christianity. Each of these forms of Christianity emphasizes their own aspect of the

Christian tradition: While Orthodox forms theologically emphasize the Trinitarian theology and the fundamental unity of faith, Roman Catholic forms focus on Jesus as Christ and the Church as his body and bride, and Protestant forms on the contemporary significance of the Bible for society and life.

Somewhat in contrast to these focal points, African Christianity seems to have been especially concerned with the relationship between indigenous African traditions and Christian religion, and especially the large revivals in East and Central Africa has brought out the question of the relationship between ancestors and Christ. All over Africa, a large number of independent African churches have arisen, the so-called AICs, African independent churches. These are interesting especially in the light of globalization because they in their practice and theology formulate a conscious alternative to European forms of Christianity. Recently, the experiences of apartheid and reconciliation in South Africa have given rise to new forms of indigenous theologies, especially focusing on reconciliation.

North American Christianity has always been popular and multiple. In the twentieth century, especially the Evangelical consensus, the influence from black churches on spirituality and entrepreneurial forms of church life has formed a large part of popular Christianity, resulting in fundamentalism on the one hand and the Social Gospel movement on the other. Furthermore and of utmost importance is the emergence of Pentecostalism on the West Coast of America in the very start of the century, a form of Christianity which now has a global following of more than 350 million peoples (Barret et al. 2001).

The spread of Pentecostalism in Latin American Christianity has shifted the church demographics from a large Roman Catholic majority and a small Protestant minority to a more complex picture. Whereas Spanish-Portuguese Catholicism and indigenous forms of religions have coexisted since the Christianization of the Americas in the sixteenth century, the Pentecostal and charismatic forms of Christianity have caused a new awareness of the mix between cultural and religious elements in Latin American Catholic Christianity. A second

major impulse in and from the Latin American Christianity has been in political forms of theology, most notably in the so-called liberation theology and in its formation of base communities, opposing the alliance between conservative military dictatorships and the Roman Catholic Church and calling for political as well as spiritual liberation.

In Asia, Christianity has long been present and one might distinguish between a Nestorian, Syrian, Catholic, and Protestant period in Asian Christianity. The diversity and struggle in South Asia between ethnic and religious groups has also involved Christianity. Especially in the Indian subcontinent has Christianity been used also politically by so-called dalits (outcasts) who through mass conversions from Hinduism try to overcome what they experience as the oppressive features of caste society. More than any other single Christian group, the churches emerging from this type of Christianity have put poverty as a theme on the agenda. In China, Christianity finds itself between Cultural Revolution and neoliberal capitalism, and the developments there seems to bring out new relations between Asian cultures and the Christian Gospel, and therefore, Chinese Christianity seems destined to become a dominant form in the future.

The Middle East needs special mentioning because it is an exception in the history of Christianity as a global religion in the twentieth century. The Muslim countries in the Middle East are the major exception because although Christianity was born in this region, its globalization has not brought about significant number of conversions to Christianity. For centuries, Christians lived as a minority under the protection of Islamic rulers, but during the last century, these minorities have experienced increasing discrimination along with the resurgence of militant Islam. The future of Christianity in the region is uncertain, and the number of Christians is decreasing each year mostly because of emigration.

The variety of themes arising in the globalization of Christianity shows that Christianity is not a monolithic extension of a single Western form of Christianity but that it is a plurality of forms which each has their own political, economical, and cultural agendas. What is common in all

these forms of Christianity is only their commitment to Jesus as Christ.

Interpretation of Christianity's Globalization

The globalization of Christianity as witnessed in statistics and themes arising in global Christianity has been interpreted according to three different approaches, each tied up with one of the three theoretical frameworks mentioned initially, namely, "globalization," "postcolonial theory," and "pluralism."

First, a number of scholars have interpreted the globalization of Christianity according to theories of globalization. At a minimum, "globalization" describes the awareness of interconnectedness and interaction between peoples and societies and the simultaneous perception of the world as a whole (Robertson 1992, pp. 8–18; Beckford 2003, pp. 118–119). It has been argued that in the case of Christianity, globalization theory is especially appropriate because Christians consciously have been trying to globalize Christianity as part of their mission strategy (Beyer 2003, 2006). Therefore, through application of globalization theory, a deeper understanding of the changes which accompany globalization of Christianity might be reached.

However, a deeper understanding depends upon the model of globalization applied to the data, and here, one must distinguish between three basic types of models: (a) the core-periphery models, (b) the multiple-center models, and (c) the system-theoretical models (cf. Beyer 1994). The core-periphery models focus on dependence, exploitation, and hegemony between the periphery and core in the process of globalization. According to this model, the relation between the core and the periphery is fundamentally unjust and consists in economic or material exploitation and mental colonization. Applied on the globalization of Christianity, this model would lead to a critique of the mental colonization and hegemony involved in conversion to Christianity. The multiple-center models focus on the interrelatedness and particularization of universals. According to this model,

the tension is not between core and periphery but rather between traditional and modern forms of social organization ("community" versus "society"). This model does not focus so much on economical or material conditions as upon symbolic forms and cultural processes such as modernization. According to this model, the globalization of Christianity is facilitated by a shift from community forms to society forms of social organization, and conversion to Christianity might be viewed as part of a continuity of modernization on a global level. The system-theoretical model views global society as a large number of social systems related to each other. Each system develops independently and refers to itself through special "codes," which in Christianity's case is the binary code "immanence/transcendence." Even if any social system develops independently, any system is in constant interaction with other (equally closed) systems. From this somewhat complex viewpoint, the global society is the system which encompasses all communication between systems. The contribution from this model toward an understanding of Christianity as a globalized religion consists mainly in reminding us about the complexity of the task of understanding any system.

Second, many scholars – mainly from the global North – refer to postcolonial theory in order to explain Christianity's globalization. On a basic level, "postcolonial theory" refers to the analysis of the predicaments involved in formation of identities in postcolonial societies. These scholars point out factors such as economic poverty, disempowerment, or crises of modernity as main motivations for conversion to Christianity and the consequent globalization of Christianity as a religion (e.g., Asad 1993; Veer 1996). Although this approach seldom simply leads to a materialistic critique of religion, it is often accompanied by a core-periphery model of globalization, leading to a critique of Christianity in its globalization as an expression of spiritual colonization.

Third and somewhat related to both globalization theory approaches as well as to postcolonial theory, a number of scholars – many from the

global South – have pointed about the pluralism as the most appropriate theoretical framework for interpretation of the effect of Christianity’s globalization (Schreiter 1997; Hedlund 2000; Bevans and Schroeder 2003). In this connection, “pluralism” contrasts certain aspects of identity, most clearly to the continuity aspect of identity. Even if pluralism often seems to remain a rather abstract concept, it seems to imply the notion that the cultural, moral, and religious conditions in the global era are best described as “pluralistic.” Without denying that material conditions have effect on spiritual experiences and conversion, scholars arguing for this approach point out that as the earlier universalism of Christian theology has been replaced by a plurality of Christianities and theologies, the nature of Christianity itself must be plural and contextual, determined within particular historical, social, and cultural contexts. This approach often goes together with the second type of globalization models mentioned above, the multiple-center model.

From my point of view, the second type of globalization models – the multiple-center model – is better suited for analyzing the globalization of Christianity for three reasons: (a) because Christianity seems to be more than social and cultural epiphenomenon of material conditions, (b) because global Christianity does not have a core and a periphery in the economic or material sense of the word, and (c) because viewing the globalization of Christianity in terms of cultural processes such as modernization makes more sense than in terms of economic dependency, political oppression, deprivation, or development. Furthermore, this third type of globalization theory – the pluralism type – goes well together with the multiple-center model, which emphasizes the contextual particularization of globally accessible ideals, something which might help express the relative success of Christianity as a global religion in the twentieth century.

Effect of Globalization on Christianity

A much debated question is how exactly globalization affects Christianity and what the full

consequences of globalization are for Christianity (Robertson 1993; Beyer 1994; Riis 1999; Luke 1999). A central feature of this discussion is whether globalization of Christianity increases or decreases the homogeneity and plurality of Christianity. According to the most recent contributions in this discussion, the answer seems to be somewhat counterintuitive: globalization causes a “globalization” of religion, it is argued, in the sense that in globalization both universalization of particulars and particularization of universals take place (Robertson 2000). According to this interpretation of globalization, the globalization of Christianity might be seen as implying an understanding of Christianity as a universally accessible form particularized in various geographical, social, and cultural settings. Each manifestation of Christianity alters it a little bit and over the course of time; Christianity’s nature and theology is itself changed through its globalization.

Effects of Christianity’s Globalization on Christian Self-understanding

On the basis of this condensed presentation, there seem to be three interrelated effects of Christianity’s globalization on Christian self-understanding.

First, there is a clear change from Eurocentric to a polycentric self-understanding. If one view utilizes the multiple-center perspective on Christianity’s globalization, the Eurocentric attempts to understand what real Christianity is have to give away to a polycentric view on present Christianities in its variety of forms and emphases.

Second, according to Christianity’s globalization, there is a significant change in sociopolitical relationship. The European models of historical interrelatedness between churches and states have to give away to new forms of relationship. If modern and traditional forms of social organization clash with each other in modernizing states, Christianity might serve new functions in bringing about new relations between individuals, just as modernity brought about new relations between states, religions, collectives, and individuals.

Third, and on the most fundamental level, globalization of Christianity changes Christian identity. The changing center of Christianity and the changing sociopolitical relationship pose a question of identity for global Christianity. The question is what types of Christianities will we see in the future, and at this point, more empirical research into forms of globalized Christianity is needed.

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Global Governance

► Globalization, Sociology of

Global Psychology

► Cross-Cultural Psychology

Globalization, Sociology of

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Related Terms

Global governance; Production and distribution of goods and finances; World economy

Description

Globalization was initially a financial and economic phenomenon, and then became social, cultural, political, and philosophical. A true multidisciplinary system which, as a result of technology and the development of mass

communications (Technologies of Information and Communication, or TIC), has reshaped social relations through a model of global interdependence. All this could be verified thanks to the clearing of barriers, which has allowed, day by day, an easier and free movement of people, knowledge, information, and ideas.

Marshall McLuhan, referring to this communicative environment, defines “global village” as the world which is the size of a village easily explored, in which physical and cultural distances fall and new lifestyles are born. In such an environment new patterns of thinking; consumption and production emerge and become more uniform, converging toward a single model in the global village.

According to the semantic magnitude of the term that involves various disciplines, from economics, philosophy, geography, religion, social sciences in general, it is necessary, testing an acceptable definition, to limit the range of interest and refer to the meaning that more commonly is given to the term. For the purpose of this article, “globalization” refers primarily to the business sector and how the production and distribution of goods and finances goes beyond the borders of nation-states.

Production and distribution have to do with the interests of different sectors that pass through material goods and, so, tied to agriculture, mineral and forest resources, craft industry, and intangible assets related to education, health, public administration, justice, tourism, information, and finance. They are all linked by the possibility of trade and commerce, indeed, globally, in the sense that there is a new model of accumulation of capital mainly by the USA, Japan, and the European Union. This model tends to control the market and resources available to make a profit on a global scale and is the result of what is known as global development.

What is certain is that globalization, in the words of Gianmaria Ajani, focuses on the question of the world economy and consequently triggers other issues about the lack of a Global Governance with respect to the formation of rules, fearing also new forms of democracy and participation.

If in the past, the combination of “social consensus state-compulsion” (Ajani 2007) held for the legitimacy of the rules of law, now this legitimation is found in *functionalism*: the old procedures based on the *political utility* and, therefore, on a legitimation that, according to this principle, established its majority consensus to legitimize its action, are replaced by a functional approach, that is, the fact that the usefulness of the rule must be determined by assessment of its validity and necessity for the proper functioning of the market.

Always Ajani observes how lawmakers become guarantors of the proper functioning of their economies both to the citizens and to those organizations like the International Monetary Fund, World Bank, the European Central Bank, the World Trade Organization, which, precisely, aim the exercise of the powers’ comprehensive review on the action of regional markets.

There is in a sense, as Ulrich Beck would say, the crisis of the principle nation-state. You could say that what was for the workers of the nineteenth century the question of class, today is for companies that act at transnational level the issue of globalization with this difference, however, that while the former operated by “countervailing power”, now the global companies act, “*without a counterpower (transnational)*” (Beck 1999). It is interesting how Beck, from the analysis of the *Communist Manifesto* by Marx and Engels, shows that in fact class-based debate is more current than it seems, in particular as regards the role of the revolutionary bourgeoisie, exploitation of the world market, the similarity of the basic assumptions of the neoliberal and Marxist and, finally, the questioning of the nation-state perspective, guilty, according to the sociologist, of the trappings of the social sciences until today. Beck’s analysis stresses on this latter point, that is to say globalization is understood as a breaking of the unity between the nation-state and national society, which means, on the one hand, the creation of new competitive relationships and power “conflicts and intersections between unity and national-state actors” and the other “actors, identities, social spaces, transnational processes and conditions” (Beck 1999).

The problem is that a world society takes shape without a World State, which would mean to have no politically organized community so to create new opportunities for transnational action and power without any democratic legitimacy.

In a way it would require a synthesis, based on a “re-localization” that would not be a return to tradition, but rather a necessary synthesis between global and local. This is called “glocalization” a term borrowed from Roland Robertson and which means, at the same time, de-localization and re-localization.

This line of interpretation gives rise to the possibility of forming a transnational state with an “inclusive sovereignty,” a state, which, even if it does not set the elimination of the national state, it would be beyond it. This is achieved through a policy organized on several levels: in a position to interpret and redefine both the general and the particular, and according to a worldwide point of view, a policy of coordination of a plurality of transnational states.

A crucial role in this sense is attributed to civil society that, even before the political institutions, is already projected in a global context: the world society is not the annulment of the national societies, but in fact a new horizon, that distinguishes the global from globalization. Globalization, as a dynamic process, finally takes on the character of the reciprocity of global-regional relations, including the further report and self-defined by the mass media. They redefine the social spaces and their understanding and representation at all levels: cultural, political, financial, military, and economic.

In this way, Martell summarizing the different positions of sociologists such as Waters, Giddens, Holton, Held and historians as Osterhammel and Petersson, poses, as a condition of globalization, the understanding of space and the development of international relations.

So, if it is true that globalization should have a *global extension*, it is necessary to reflect the extent to which an economy, a policy, or a regional culture with transnational extension should be considered global. It means that maybe an exaggeration to say that, to talk about globalization, it must necessarily reach the whole

world; rather, it may suffice if it reaches all continents and most regions of those continents.

On the other hand, even Westernization realizes the inclusive action at the global level of globalization, that is, a phenomenon which exports ideas and products from one side of the world to another and that causes a real expansion of a part of it. Again, no one can pretend that all parts of the world give a contribution of equal size, but it is necessary however, Luke Martell says, that globalization, to be global, must not be a discriminatory process in any way to predict the inputs from the all continents and countries that constitute them. Another point that defines globalization is the interdependence and not only the interconnection.

This means to assess the relationships and trade between countries: to achieve interdependence, is necessary, in case of trade crisis between two countries, to assess the real consequences on workers and on the economy of the exporting and importing company. So, the reports must “create a structure or a system,” that is to have some stability and regularity. Finally, globalization must involve not only the elite but also the masses. This is because a global consciousness can only rise when people have the perception of the world as one place. However, these criteria are too strict because a phenomenon can completely fall, giving historians and skeptics of globalization the opportunity to say that today the phenomenon internationally widespread is not *real* globalization. Actually Martell asserts again, that one must consider globalization not as an aim, but as a process that comes close to these criteria in order to understand it and, especially, to say that it is really taking place. But it is even more necessary to talk about globalization because, from a sociological point of view, this notion, is able to underline aspects as power, inequality, and conflict inherent in the phenomenon itself. While the optimists argue that globalization is a positive, democratic, and profitable process that, thanks to the cultural contamination gives rise to a new form of cosmopolitanism, through which is also possible to spread positive values such as fundamental and universal rights of man, it is also true that, in

analyzing this phenomenon, there are striking themes of power, inequality, and conflict in world relations. In this sense, you can think how some actors play a greater role than others, some are more integrated than others who, sometimes, are even excluded.

Saskia Sassen, for her part, offers a perspective according to which globalization would not erase all of the nation-states, but rather change their work at best. That's because the states would emerge in a position of "strategic dominance" for the development of globalization. So, the concept of sovereignty is changing, not the state, which is structured on the relationship between global and local; in this relationship based on hierarchies, streams, links, the national state not only favors globalization, but also creates its geography composed of networks of global cities, regions specializing in the production of certain goods, interstate relations based on continental flows of capital and information through the Internet.

The question is how far a nation-state is willing to cede some of its prerogatives, especially in matters of law, so that the metamorphosis of sovereignty takes place marked by mutable exchange between the local-global and vice versa. Finally, one can't not touch the relationship between religion and globalization, in particular in their relationship, in the words of Ignazio Sanna, including planetary Company and assertion of identity. So there is a phenomenon of cosmopolitanism, a phenomenon more virtual than substantial, as it is dominated by the tyranny of finance capital, in which you witness the progressive monetization of human relationships, the banning of the subjectivity and of the person. This cosmopolitanism appeared not only in the social and cultural, but also in the more specific case of law, in which you can see a fundamental ambiguity of the concept of "universal law," where it refers to a sort of cosmopolitan legal unit that, in contrast, is not within the shared perspectives, and even, most likely, present in human desires. Sanna, then, hopes to overcome the simplifications of identity, now active in vast areas of the planet through a kind of "anthropological ecumenism," (Sanna 2011) a unification of humanity founded on religious freedom and universal brotherhood.

Obviously, in this perspective, the problem areas are those relating to the actual dialogue between religions and faiths that tend to be exclusivist, rather than inclusivist.

Cross-References

- [Economic Sociology](#)
- [Ethics](#)
- [Global Christianity](#)
- [Justice \(Philosophically\)](#)
- [Pluralism \(Religious\)](#)
- [Political Theory](#)
- [Utilitarianism](#)

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Globalized Christianity

- [Global Christianity](#)

Gnostic

- [Gnosticism](#)

Gnosticism

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Related Terms

Gnostic

Gnosticism is a general term that has been used by many scholars over the last several centuries to typify certain belief systems and practices that were regarded by early Christianity from about 150 C.E. onward as “heterodox.” The word Gnosticism comes from the Greek word *gnosis*, which connotes a secret, privileged, and mystical form of “knowledge,” contrasting with the more conventional expression *episteme*, which refers to knowledge gained by sound, rational demonstration, and argument. It was initially used as a term of derogation by its early orthodox Christian antagonists.

At the same time, the word “Gnostic” has been employed in an extended sense by intellectual and cultural historians to identify certain common hereditary strings of thinking in Western and Middle Eastern civilizations that persist up until the present day. Gnosticism has been associated not only with libertarian, Bohemian, antinomian, and anti-authoritarian attitudes among both countercultures and certain cultural elites throughout modern history as well as with certain revolutionary and totalitarian ideologies in the nineteenth century. The work of the late political philosopher Eric Voegelin has been critical in this regard. In most of his major works, including his multi-volume *magnum opus* entitled *Order and History*, Voegelin analyzed how what he called “Gnostic” thought – the notion prevalent in Marxism, fascism, and even various “human potential” philosophies that are often well received within liberal democracy that special human insight and bold expertise can bring about a utopian transformation of human

nature and the social order. Gnosticism, finally, has been compared to the general, postwar movement known as “existentialism,” an outlook that was highly fashionable among Western intellectuals during the 1950s and 1960s and stressed the human being’s fundamental alienation as well as autonomous human striving in the face of a hostile and “absurd” universe. *The Gnostic Religion* by German-born philosopher Hans Jonas, which first appeared in 1958, compared convincingly ancient Gnostics to modern existentialists.

The study of Gnosticism is not a field or a discipline, but a general subject matter that is often a special subdiscipline of research within certain recognized fields. Since about 1980 “Gnostic” studies has burgeoned as a broad, interdisciplinary area of inquiry, mostly in the humanities. Subspecialties in the study of Gnosticism, therefore, have proliferated in a variety of fields, predominantly religious studies, Biblical studies, history of religions, and Middle Eastern and Asian studies. Because of the obvious similarity of the worldviews of classical Gnosticism and certain Oriental philosophies, a search for possible Asian links through the trading networks in the ancient world between the Levant and India and China has been one trajectory of investigation over the years. However, Gnostic studies have for the most part concentrated on a Mediterranean provenance for the general phenomenon. Since Gnosticism is almost by definition a world view rather than a self-designated community of religious believers or practitioners, and in lesser degree a philosophy of human nature and values, those academic methodologies which start from material remains are less consequential for research in this subdiscipline than those which are primarily concerned with textual artifacts and symbols.

The issue of how to identify “Gnostic” strains per se in history, thought, and culture – and increasingly whether the Gnostic “label” itself really designates anything of importance – remains an ongoing item of contestation. In his *Rethinking Gnosticism: An Argument for Dismantling a Dubious Category* (1996) Michael Allen Williams systematically takes apart what

he considered the overextension and overuse of the term in modern scholarship. He suggests that what was originally a polemical term deployed as a catch-all against a spectrum of deviants from the fledgling Christian consensus about who Jesus was and what kind of salvation he offered late morphed into a pseudo-taxonomical category. Williams makes the case that Gnosticism has become a largely useless locution to lump together countless and diverse forms of novel Hellenistic religious movements, similar to the promiscuous category of “New Age” that is routinely invoked nowadays.

Thus the study of Gnosticism, if Williams’ argument holds, is neither a field nor a subdiscipline, but a generic descriptor encompassing a wide-ranging and helter-skelter array of phenomena for something that does not really cohere conceptually, or possibly even exist in the genuine theoretical sense. Williams, who was praised for his own erudition and the precision of his line of reasoning, may represent an extreme academic reaction to debasement of the coinage of the word in recent popular culture and among those scholars who have bedded down with its enthusiasts. But he has put his figure on something that is troubling among partisans of what might be called contemporary “Gnostic studies.”

What might be called the “definitional” and “typological” difficulties with research into Gnosticism have extended even to the limited subject matter that religious historians once took for granted. Even the interrelationship between Gnosticism and what we now regard as “orthodoxy” is not as clear as was presupposed until recently. Scholarship surrounding Gnosticism took root during the nineteenth century under the influence of the new historical-critical scholarship concerning ancient Christian texts prevalent in mostly German universities. The leading researcher into ancient Gnosticism was the German historian of ideas Adolf von Harnack (2009), best known for his extensive writings on the history of church dogma. However, Harnack was limited in the scope of his research because of the lack at the time of original early sources. Harnack’s work, like most scholarships during

this period, was wholly dependent on the well-known anti-Gnostic polemics that are found throughout the writings of the early Church fathers. The standard view until very recently was that Gnosticism must be seen a foreign “gospel” that covertly insinuated its way into the early Christian congregations around the Mediterranean basin, particularly during the second and third centuries. Harnack summed up this dominant perspective by depicting Gnosticism as the “acute Hellenization” of Christianity.

More than any other scholar of the nineteenth and first half of the twentieth century Harnack was responsible for the spread of the notion Christianity was religiously unique and could be boiled down to the simple message behind Jesus’ preaching of the Kingdom of God in Galilee during the first century. Harnack was bent on showing how Christianity’s “essential” teachings were impervious to the process of syncretism, the genetic blending of different cultural ideological streams. According to Harnack, neither the “Judaizers,” whom the Book of Acts portrays as St. Paul’s chief antagonists, nor the “Hellenizers” – that is, the Gnostics, were able to corrupt Jesus’ essential message, even up until the present day. Like much of what the Germans called [▶ Religionswissenschaft](#) (the “science” of religion) throughout the nineteenth century, overwhelmingly liberal Protestant in character, Harnack was committed to the view that the new historical-critical method would ultimately not undermine Christian doctrine, but relativize and explain away all its competitors, leaving the pure “essence” of Christianity untouched. Thus early research into Gnosticism was colored strongly by a hidden agenda to preserve a certain kind of Protestant orthodoxy under the pretense of mapping out new methodologies of research in the study of religion.

This paradigm, however, was both challenged and began to shift dramatically after the end of World War II. The period between the two world wars was a kind of *interregnum* dominated, at least in Europe, by a dogmatic, albeit erudite, form of Protestant theology known as “neo-orthodoxy,” which not only did not purport to be any kind of *Wissenschaft*, or “science,” but

also held any “science” of religion as a whole largely in contempt. All sciences of religion, Barth suggested, should be dismissed exclusively as the “word of man” as opposed to the true and transformative “Word of God.” But in December 1945 some peasants living around the city of Nag Hammadi on the Nile in Upper Egypt accidentally stumbled upon a collection of ancient papyrus fragments in earthen jars that dated back to the second century of the Christian era. The papyrus documents turned out to be an actual library of original Gnostic texts, which had most likely at some time during the Constantinian era or later been squirreled away by local Christian monks, who were forbidden to possess such “heretical” writings. The so-called Nag Hammadi Library, like the even more famous Dead Sea Scrolls discovered in Palestine 3 years later, revolutionized scholarly understanding of Gnosticism and led to a revaluation of who the ancient authors of such texts actually might be. Although the texts offered little clue to their historical or social identity, they called into question the prevailing scholarly consensus and opened the way for trajectories of hypothesis and speculation that left behind the model that had been institutionalized by Harnack.

As is customary for major archeological finds, it often takes decades for new textual discoveries to bring about a significant change in the operative theories themselves. For one thing, the fragments of manuscript need to be translated, dated, and compared with other known texts. Because the Gnostic library at Nag Hammadi had been translated into Coptic from Hellenistic Greek at some point, it was not clear at first when they had actually been composed. Finally, the peasants who first found the jars with the first papyri were not aware immediately of their significance. A few years later the Egyptian government seized what was then in circulation and kept them largely from scholars outside Egypt. It was through some contraband segments of the papyri, smuggled into Europe, that interest in the manuscripts first awakened during the late 1950s.

The papyri were mostly recovered and translated into English, however, by the mid-1970s. At that point the fascination with Gnosticism

became a veritable industry, popular as well as scholarly, that churned out numerous (largely conjectural) interpretations of who the Gnostics were and what their texts actually meant. The rise of New Age religions from the late 1970s onward even led a number of groups to adopt contemporary “Gnostic” beliefs and practices that may, or may not, have any actual correlation with what went on in the ancient world. The density and obscurity of the Gnostic writings themselves, deliberately fostered by the elitist and secretive nature of the tight little societies who produced them, encouraged wild and often fanciful scenarios that are as much fiction as fact. Dan Brown’s 2003 runaway best seller *The ► Da Vinci Code*, subsequently made into a movie, for example, propounds the canard that the ancient Gnostics were actually goddess-worshippers who were the true disciples of Jesus, a “secret” tightly guarded and suppressed at all costs by the Catholic Church. There is virtually no historical evidence for any of the suppositions of Brown’s novel, but it illustrates the growing confusion today in the popular understanding of Gnosticism that mirrors a somewhat less, but substantial, divided mind among credible scholars.

The ► *Da Vinci Code* fantasies were, unfortunately, the natural outgrowth of one influential, “revisionist” strand of scholarship that arose among the new breed of feminist academics during the 1980s. In her *The Gnostic Gospels* (1989), which was also a best seller in its own right, Princeton University religion professor Elaine Pagels insisted that Gnosticism merely numbered among various, divergent trends within early Christianity. Pagels actively promoted the view, based on an inferential and not a transparent reading of church history, that Gnosticism did not gain ascendancy in the church and was ultimately stamped out, chiefly because of the persecuting zeal of orthodox clerics, who also happened to be misogynist. Pagel’s arguments, while based on real and plausible circumstantial information, are nevertheless flawed because they confuse outcomes with causal factors. Roman civilization, not just Christianity, was generally misogynist (Christianity of all kinds was far less so than patriarchal paganism),

and there is strong indication that the Gnostics' elevation of the feminine in their curious, baroque forms of mythology was contrary to their real-life contempt for women. The history of religions provides countless examples (especially in the stories and traditions of South Asia) of a religious imagination that exalts the feminine on the one hand, and mistreats them in social custom and practice. This same compensatory mechanism can be found in many feudal contexts.

Much of the current "revisionism" about the sources and significance of Gnosticism turns out to be more a kind of wish-fulfillment than the result of the discovery of any major material artifacts. As is obvious with the outsize popularity of *The ► Da Vinci Code*, the more sensational and counter-traditional a theory turns out to be, the more credibility it seems to garner with a credulous, media-saturated public.

At the same time, Harnack's "acute Hellenization" hypothesis – at least from a scholarly perspective – probably has more going for it than today's pop Gnosticist mania enjoys. Harnack's thread of analysis has ironically in quite recent decades been bolstered by some scholars who look upon Gnosticism not so much as a Christian heresy as a kind of heterodox Judaism that first appeared in Egypt and then spread throughout the Mediterranean world through Hellenization. The leading scholars who have advanced this perspective are Birger Pearson and Kurt Rudolph (1983). In *Judaism, Gnosticism, and Egyptian Christianity* (1990) Pearson showed that not a few motifs from Gnostic cosmology are simple knockoffs from Rabbinic *midrash* – that is, textual interpretation of the Hebrew Bible, or Old Testament. Researchers with this bent have focused on the isomorphism between Jewish apocalyptic literature, which was written as a secret "underground" coded set of communications to those resisting Gentile domination and Gnostic themes, and symbology. The Gnostic preoccupation with ambivalent Scriptural personalities, some perhaps entirely mythical, – for example, Cain, Seth, Enoch, and Judas – offers a hint of this Jewish provenance for Gnostic thinking.

What Harnack referred to "acute Hellenization" had already, therefore, affected Judaism before it had an impact on early Christianity. We know now that Christianity in the first 100 years after the death of Jesus was almost exclusively a form of heterodox Judaism, and with the end of the Jewish establishment in Jerusalem after the two failed revolts against Rome in 66 and 132 A.D., these two heterodox streams most likely merged. Furthermore, it was the non-Jewish factions in the early persecuted church that led the charge against denouncing the "heretics" who came to be called Gnostics. Moreover, the sizable Jewish population in Egypt was far more intellectually influential throughout the empire and among the non-Palestinian Jews, who made up the bulk of the first century. As Judaism declined in prestige after the revolts and Roman persecution became ever more fierce, the dark, pessimistic world view of Gnosticism among the Jewish and Christianized Judaic intelligentsia became increasingly attractive. Inasmuch as Roman authorities had a hard time differentiating Christians in the first two centuries from Jews, the perception that of Gnosticism as a major form of Christianity was not entirely unfounded. The anti-Gnostic movement in the church that putatively resulted in the triumph of "orthodoxy," in fact, may indeed have been part of a widespread *de-Judaizing* trend from the second century onward.

Whereas there is little of what could be legitimately designated "scientific" (other than a reliance on empirical data) in Gnostic studies, one field of investigation that has maintained over the years a certain theoretical rigor is Jungian psychology (Jung and Segal 1992). The movement, which began early in the twentieth century and has burgeoned since the Vietnam era, was an outgrowth of the meticulous clinical investigations and voluminous publications of C.G. Jung, a renegade Swiss disciple of Sigmund Freud who, like his mentor, wrote in German and had a significant impact on avante-garde German-speaking culture right after World War I. Jung rejected complete Freud's "pan-sexual" interpretation of clinical symptoms and postulated in its place a theory of "archetypes" –

universal and ahistorical patterns of imagery and symbolism found in religious rituals, dreams, and myths – that have survived since time immemorial in the collective memory of the human race. It is the job of the psychoanalyst, Jung maintained, to help the patient identify these patterns and to shepherd them skillfully into an integration of the archetypes with the client's own personal experience, a process Jungians have termed "individuation."

But Jung's theories have gone far beyond clinical practice, which remains far more accepted than Freud's to this day. Their central impact has been on not so much myth and ritual studies, including pre-eminently the fields of comparative religions, psychology of religion, and religious studies as a whole in its early phases, as on the investigation of Gnosticism. Jung was enamored with what was known about ancient Gnosticism ever since about the time he broke with Freud on the eve of World War I, and wrote at length throughout his life on the subject.

Indeed, it can be said that Jung fashioned his own version of a neo-Gnostic philosophy or "theology," which was at times hardly distinguishable from his psychological models. Jung closely tied Gnosticism to ancient Egyptian wisdom traditions (known as "hermeticism") as well as to alchemy, a historically dubious association. Within this highly personal conceptual universe Jung evolved from his study of Gnostic texts, Jung was able to elaborate a theory to support his clinical practice of letting the collective unconscious speak and manifest itself to his patients. Jung termed this technique the "active imagination." The active imagination is the Jungian correlate to what Freudians term the "talking cure," where the free-wheeling discourse and insights of the client with the assistance, and sometimes the direct intervention of the analyst, are assumed to generate a self-regulating procedure resulting in psychological growth and healing. Jung was of the opinion, unsupported by any direct evidence from the Gnostic texts or the reports of their critics, that the experience of gnosis was akin to the successes of his own treatment of patients. Jung regarded his own methodology as a "science" (as did Freud) but not in the

sense of modern empirical science, although he was convinced his work with patients yielded immense usable data for the understanding of the human personality and human religion in general. Jung considered his approach a form of *scientia* in the classical meaning of the term – the deliberate and focused pursuit of both general and individual "wisdom" (one translation of the German *Wissenschaft*).

Jungian psychology, at least since the 1930s, has had a negligible effect on Gnostic research. But ironically it has been one of the key ideological underpinnings for popular Gnosticism, which has come to regard itself as an actual religion. As it turns out, some of these "religious" groups have been instrumental in both aggregating and disseminating Gnostic scholarship and writings. The most important of these groups is the Gnostic Society in Los Angeles, founded in 1928 by John and James Priese, theosophists and followers of the Russian mystic Helena Blavatsky. The Gnostic Society, even at present, is centered around the work and ideas of Jung, but its primary mission recently has been to promote ways in which Gnosticism can be cultivated by the average person as a personal religious philosophy and style of life. Dr. Stephen Hoeller, the main luminary and teacher of the Gnostic Society, is also bishop of the Ecclesia Gnostica, which describes itself on its website as "the oldest sacramental Gnostic body in the United States."

Cross-References

- ▶ [Astrology](#)
- ▶ [Christian Cosmology](#)
- ▶ [Dualism](#)
- ▶ [Incarnation](#)
- ▶ [Soul](#)

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Goal

► [Eschatology](#)

Goal Programming

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Goal programming is a branch of multiobjective optimization, which in turn is a branch of multi-criteria decision analysis (MCDA). Its main characteristic is that for each of the criteria relevant to the problem, a goal or target value to be achieved is established. These values are determined by the decision maker and are usually subjective. Unwanted deviations from this set of target values are then minimized in an achievement function. The technique looks for the satisfaction of the target, not for the optimization of the objective, and then, an underlying satisfying philosophy is assumed. A discussed weakness of goal programming is the possibility to produce solutions that are not Pareto efficient, that is, without the property of not existing other solution not worse for all criteria considered, and better in

at least one criterion. This contradicts the rationality of the decision maker, in choosing an alternative when a better one may exist, difficulty that can be overcome with different techniques.

God

► [Allah](#)

God and Devil in Buddhism

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Related Terms

[Brahmā](#); [Māra](#)

Description

The role of the denizens of the ancient Indian pantheon in Buddhist texts can in general be understood as part of a tendency to include, albeit in a subordinate position and at times with some significant modifications, central elements of rival institutions or movements into the framework of one's own system.

An instance of such “inclusivism” can be observed in the case of the ancient Indian god Brahmā, who in Buddhist texts features in a plurality of manifestations. The inclusion of the god Brahmā in Buddhist texts occurs in two distinct modes. Several passages mock the claim that a Brahmā could be an all-knowing and eternal creator god, while in other discourses a particular Brahmā acts as a guardian of Buddhism.

The tendency to satirize Brahmā is exemplified in a discourse which professes to explain how the notion of a creator god came into being in the first place. This explanation is based on the ancient Indian cosmological notion that the

world goes through repeated cycles of dissolution and evolution. Once a period of dissolution is over, the *Brahmā* world reappears, and a particular being, in accordance with its merits, is reborn in this world (Carpenter and Rhys Davids 1890–1911, I 17). This being feels lonely and develops a wish for company. In due course of time, other beings are also reborn in this *Brahmā* world, again in accordance with their merits. The living being that arose first in the *Brahmā* world now thinks that his wish for company was the cause for those other beings to come to the same location. This mistaken idea then becomes the basis for the first being's claim that he is the creator of the others, a claim those other beings accept as fact and truth. In this way, the idea of a creator god is parodied as being the outcome of a deluded *Brahmā*'s belief that beings arose in his realm in compliance with his wish for company.

Besides the satirical attitude toward *Brahmā* as a creator, evident in the above passage, the early Buddhist discourses also feature a *Brahmā* in the role of a Buddhist disciple. In a range of texts, the role of this *Brahmā* is to do what he can in order to further the growth and continuity of the Buddha's dispensation. A particularly prominent instance occurs in the Buddha's autobiographical account of his own awakening. According to this account, when the Buddha had just gained awakening, he was hesitant to teach what he had discovered to others. *Brahmā*, who had become aware of the Buddha's disinclination to teach, was alarmed at this prospect and decided to intervene (Trenckner and Chalmers 1888–1896, I 168). He appeared before the Buddha and requested him to teach, proclaiming that there would be those who understand. Following this intervention, the Buddha did indeed decide to teach, so that this episode functions as the starting point of what we now refer to as Buddhism.

The scene of *Brahmā* standing with palms together in reverential salutation to one side of the Buddha who is seated in meditation has become a favorite topic of ancient Indian iconographical representations, vividly illustrating the theme that underlies this episode: the superiority of the

Buddha over *Brahmā* and thereby implicitly of the Buddha's teaching over Brahminical beliefs.

In contrast to this particular *Brahmā*, who behaves as a guardian protector of Buddhism, the devil in Buddhist texts acts as an antagonist to the Buddha and his disciples. The Buddhist devil carries the name *Māra*, a name that literally signifies "death." According to Buddhist cosmology, *Māra* dwells in the highest of the heavens that still belong to the sensual realm, inferior to the celestial realms of the nonsensual heavens, where *Brahmā* dwells. In Buddhist texts, *Māra*'s role is to advocate the enjoyment of sensual pleasures in contrast to renunciation and striving for awakening. The need to defeat *Māra* and to go beyond his reach is therefore a recurrent topic in Buddhist discourse.

In his role as a tempter, *Māra* tries to impede the future Buddha Gotama's progress to awakening by recommending the acquisition of merit and the performance of fire sacrifice instead of striving for liberation (Andersen and Smith 1913, Stanza 426ff). Later tradition presents a more dramatic version of his attempts to prevent the Buddha's awakening. At the head of a frightening army, *Māra* attacks the Buddha-to-be, who in turn calls the goddess earth to witness for his right to remain on the seat where he shall win awakening. This scene became another favorite theme in ancient Indian art.

A series of Buddhist discourses report various attempts by *Māra* to disturb the Buddha and his disciples (Feer 1884–1898, I 103ff). At times, he does so by taking on a frightful appearance, such as a great elephant or a huge snake. Alternatively, he creates a loud noise by shattering some rocks. Such attempts to frighten the Buddha are from the outset doomed to failure, as according to Buddhism a fully awakened one is beyond fear. The same holds for a series of temptations that has *Māra*'s daughters as its protagonists (Feer 1884–1898, I 124). The text reports that they assumed various beautiful shapes in order to arouse sensual desire in the Buddha, the arising of which is similarly held to be an impossibility in the case of one who has reached full awakening.

Māra also accosts Buddhist nuns who are meditating in solitude, trying to tempt them to give up

their life of renunciation and enjoy sensual pleasures instead, or else wanting to confuse them with doctrinal arguments. In each of these instances, he is recognized for being Māra and thereon has to vanish in discomfiture.

It appears to be an invariable pattern that Māra has to disappear as soon as he is recognized by those he is attempting to disturb. Especially remarkable are those episodes which involve attempts to lure arahant nuns or the Buddha with sensuality. Since according to early Buddhist doctrine an arahant has forever eradicated sensual desire, such attempts are from the outset doomed to failure. This would make it clear that in such contexts Māra does not represent a personification of inner defilements. Rather, in these tales, challenges the Buddha and his disciples presumably had to face are represented as the work of Māra. The didactic function of such tales would thus be to indicate by way of example how such challenges should be handled.

In its early Buddhist use, the term “Māra” does not stand just for the individual Māra that lived at the time of the Buddha, but rather represents an “office” that is taken up by a succession of individuals. This reflects the general position taken in Buddhism toward any god or celestial being, in that they are held to be subject to death and rebirth, just like human beings. Thus, an arahant and chief disciple of the Buddha is on record for having in a past life been a Māra himself (Trenckner and Chalmers 1888–1896, I 333). While in early Buddhist texts Māra continues to act as an antagonist of the Buddha and his disciples, according to a later tale, after the Buddha’s passing away Māra is eventually tamed and converted to Buddhism by a fully awakened Buddhist monk (Strong 1992). In this way, with Māra eventually converted and at least one Brahmā acting as a faithful protector of Buddhism, both god and the devil assume their specific Buddhist roles and functions.

Besides Brahmā and Māra, Buddhist thought recognizes a range of other superhuman beings, which up to the present day have their place in local cults in the various Buddhist countries. With the Mahāyāna and especially the Vajrayāna

traditions, the pantheon of such deities expanded by incorporating various celestial bodhisattvas and Buddhas, which serve a variety of functions in a ritual and meditative context.

Cross-References

- [Concept of God in Contemporary Philosophy of Religion](#)
- [Evil, Problem of](#)
- [Names of God](#)

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God as Semper Creator

- [Divine Creativity](#)

God of the Gaps

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Related Terms

[Argumentum ad ignoratiam](#); [Deus ex machina](#); [Intelligent design](#)

“God of the gaps” refers to the argument that gaps in scientific knowledge are evidence for God’s existence and direct intervention. One example of the God of the gaps argument is the argument from ignorance or argumentum ad ignoratiam. The argument goes as follows: If a proposition has not been *disproven*, then it cannot be considered false and must therefore be considered true. If a proposition has not been *proven*, then it cannot be considered true and must therefore be considered false. However, this argument is a fallacy, because it says that true things can never be disproven and false things can never be proven but this implies that true things can never be proven and false things can never be disproven.

Today, the God of the gaps argument comes in two variants, namely, an epistemological and an ontological one. The former represents a lack of scientific explanatory power; in other words, more scientific work is needed in order to fill the gaps. The latter, represents a lack of the possibility of falsification; for example, interpretations of quantum mechanics are not amenable to refutation, and so are unscientific. In either case, the use of the term “God of the gaps” is often used in a derogatory sense.

The God of the gaps argument has its roots in ancient Greece. Indeed, dramatists sometimes ended the plot of a story by letting a human-powered vehicle (the machine) appear with an actor or actress on board playing a God or Goddess whose will provides the solution to the difficulties. The play *Orestes* by Euripedes

provides an example. Such a dramatic device was called by the Romans ► *deus ex machina*, god from a machine or vehicle.

The literature refers to Henry Drummond as the one who coined the term. He was a Scottish evangelist. 1894 he wrote:

“There are reverent minds who ceaselessly scan the fields of Nature and the books of Science in search of gaps – gaps which they will fill up with God. As if God lived in the gaps? What view of Nature or of Truth is theirs whose interest in Science is not in what it can explain but in what it cannot, whose quest is ignorance not knowledge, whose daily dread is that the cloud may lift, and who, as darkness melts from this field or from that, begin to tremble for the place of His abode? What needs altering in such finely jealous souls is at once their view of Nature and of God. Nature is God’s writing, and can only tell the truth; God is light, and in Him is no darkness at all” (1894, 333).

Perhaps the most famous example of the God of the gaps argument came about when Isaac Newton considered the question of the long-term stability of the solar system. He was not able to calculate whether the small gravitational forces between pairs of planets would cancel on the average or accumulate. He considered that in the latter case, the unstable behavior would be avoided by the gentle action of God, applying small forces at the right times and places. A century later, Pierre Simon de Laplace showed that the solar system is indeed stable against such perturbations. When his former student, Napoléon Bonaparte, asked why Laplace’s treatise on celestial mechanics did not mention God, Laplace answered “I did not need that hypothesis.”

Another famous example of the God of the gaps argument comes from chemistry at the beginning of the last century.

The question was whether it would be possible to make organic compounds out of inorganic ones. At that time, many believed that inorganic compounds contained some kind of nonmaterial, supernatural life-substance. This theory is known as *Vitalism*. This was so because until then nobody had been able to produce organic compounds out of the inorganic ones. However, this theory was soon to be put aside. Indeed, in 1828,

the German chemist Friedrich Wöhler succeeded in synthesizing urea from inorganic compounds. Once again, God had to retreat.

In more recent times, the gaps in the narrative of biological evolution have sometimes been filled with claims for direct divine action, especially for what concerns human evolution. While most have accepted Darwinian evolution as the principle of the origin of all species including human beings, some accept evolution for plants and other animals, but they reject it for human beings. The advocates of this view lean often on the theory of intelligent design. Irreducible complexity also appears in this context. The argument goes that an organism (such as a cell) has many components, all of which are essential to its proper functioning. Evolution by natural selection of the properties of the organism could not proceed, because there is no intermediate stage that would permit the organism to live (Dembski 1999, 146–49, 237–41).

With the arrival of quantum mechanisms on the scientific scene, the predictability of classical physics gave way to indeterminacy and probabilistic principles. William Pollard suggested that God could influence events in human lives by manipulating outcomes of random events at the atomic or molecular scale. Such small changes can lead to macroscopic results but without making manifest changes in the distribution of large numbers of such events (Pollard 1958, ch. 4).

Chaos theory, the descriptor of classical systems that turn out to have unpredictable long-range behavior, can also be seen as a locus for God's action in areas where detailed explanations are not forthcoming. There have been careful and informed critiques of the approaches of both quantum mechanics and chaos theory to provide the locus of God's action (Polkinghorne 2001, 188–90). Studies along these lines have been made and published with particular attention to avoiding the pitfall of the God of the gaps (Tracy 1995, 290 and especially 320–21).

Cross-References

- [Intelligent Design](#)
- [Magic](#)

- [Myth](#)
- [Religion and Pseudoscience](#)

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God's Foreknowledge

- [Relativity](#)

Golem

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Related Terms

[Robotics and religion](#)

A magical humanoid in Judaism. Very holy rabbis can allegedly produce golems out of clay or dirt through magical incantations, the inscription of divine names on a parchment or the creature's head, or occasionally, through other methods. In the early twentieth-century Europe, Jews described golems as having protected them

from persecution by Christians, and told tales of such exploits, apparently as a palliative against renewed persecution in Germany, Poland, and elsewhere.

Cross-References

[Robotics and Religion](#)

Good Clinical and Good Laboratory Practice (GCP)

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Good clinical practice is an internationally accepted quality standard for the regulation of clinical trials on human subjects as defined by the International Conference on Harmonization (ICH). GCP advocates the protection of human rights in clinical studies and provides assurance of the safety and efficacy of substances under investigation.

Good laboratory practice then, this is an internationally accepted quality standard within which laboratory studies are conducted and controlled in order to ensure their consistency and reliability, uniformity, quality, and safety.

Good Life

► [Happiness](#)

GoodWork Project

► [Intelligences, Multiple](#)

Grace

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Related Terms

[Eternal life](#); [Gift](#); [Love](#); [Mystery](#)

“Grace” is a theological concept within the Christian tradition that broadly expresses the beneficial relationship with the divine. This is hardly a definition, but trying to get closer to the topic becomes a hard endeavor. Indeed harsh discussions characterize the history of this word; it tries to describe a dimension as mysterious as the divine itself; its content is manifold and resists clear unification or distinction. Nevertheless ► [Christianity](#) – and perhaps other universal religions – would lose its identity without this word and the experience it reflects.

In theological terms, the concept of “grace” firstly refers to God, or is associated to His reality, as a source of life and blessing; secondly it is applied to humans and the renewing or regenerating effect consequent to a relationship with the divine. This theology makes sense inside an anthropological framework in which humans are characterized as creatures, and as such, similar to and close to God; as sinners, or limited and subjected to negative drives; and as potentially redeemed and transformed by “grace.” Christian narrative tradition claims that this renewal is rendered possible by Christ’s death and resurrection, and is available to everybody through faith and the means of the Church. However this last sentence might be subjected to confessional disputes. The effects or reach of this divine influence is no less disputed, and the answers span between minimalist solutions, limited to a general “clearance” of ► [sins](#), allowing for eternal life, and a true renewal that points to sanctity or excellence in ► [virtue](#). Furthermore issues concerning grace and personal ► [freedom](#) have been part of this long argument, since some interpretations portray

an idea of grace that substantially limits human freedom.

One essential aspect of the theology of grace is its character of “gift”: It is given by divine dispensation, not deserved because of human merits, efforts, or sacrifices. This aspect is shared by other religions, which point in some of their writings and authors to a similar experience of the divine generosity, “gratis” dispensing its blessing and gifts. The inherent logic of “grace” challenges therefore the dominant logic of rational gain, of self-interest and calculation, of a material view of reality. It sets up a different realm and an alternative perspective that is able to transform everything and to subvert the current order of things. This aspect renders the idea of “grace” clearly counter-intuitive and harder to conceive by a mentality formed on the pattern of rational choice or utility.

The religious idea of “grace” clearly defies some of our most established cognitive schemas, such as the one of agency, and the one of value. Regarding the first, opinions among specialists are divided. On the one hand, the idea of favorable divine action cannot be easily grasped in the current conditions of life in a natural setting. Causes and effects can be seen as merely natural phenomena not requiring a supernatural explanation, which would become something unnecessarily “added” through some psychological trick. On the other hand, cognitivist scholars have pointed to the “agency” or “intentional stance” to explain religious beliefs (McCauley 2011): Some positive surprising events would claim a kind of external agency to understand their unexpected happening and to make sense of that “good luck.” The human mind is so made to such an “agency pattern” that it hardly could assume the existence of very positive and very negative events without such an explanation; without agency they would become unbearable, and would nourish a feeling of excessive contingency. In popular terms, the “nothing happens for nothing” adage expresses a somewhat similar logic.

The second cognitive problem comes from what can be called “value principle”: Things and actions have a value and need to be

recognized as a condition of social order. Thinking in terms of “value” means to be able to account and to decide on the basis of costs and benefits. The idea of “grace” would distort this pattern since it introduces something that has at the same time a great value, but is costless, and as a consequence becomes unmanageable inside a human order of things. This problem finds a solution – always in cognitive terms – pointing to the benefits that could result from an alternative order of things, a form of “reframing” that influences human relationships. In this new frame, the constraints of the value pattern can be overcome or at least momentarily suspended to allow for unaccountable mercy and donation. Its function would be similar to a “psychological buffer” allowing for a view less entrapped in the logic of counting and having, less distressed by the amount of human debt.

This proposed analysis might explain the close link between religious mind and attitude, on the one hand, and the principle of “grace” pointing to divine dependence, on the other. However, the religious mind does not always follow such a schema. Indeed the ideological history of grace reveals tensions with an alternative model of conceiving religious attitude. This different approach resorts to a pattern of exchange, sacrifice, and “trade-like” relationship: The human person gives to God, as a condition to receive blessings or benefits from the Divine. Merit becomes paramount in this model that recovers the logic of value and accounting. A hypothesis arising from this contrast points to the temporal precedence of the “trading pattern” and to the consecutive form of a “religion of grace.” In a similar vein, the first model would reflect a simpler, cognitively easy or comfortable schema, while the idea of grace would represent its “costly form” (Whitehouse 2004). Many tensions inside Christian tradition mirror the intrinsic difficulties at proposing and conceiving a “religion of grace” against a more simple pattern of merit and “trade with the Divine.” Besides this, dangers of disengagement and “free riding” could loom when the message of grace goes too far and completely displaces the idea of merit.

Difficulties at conceiving grace are increased in a more secularized society, in which this idea becomes more and more external to the dominant culture, and to an increasingly scientific mentality. There are nevertheless attempts to translate this traditional notion into more friendly modern categories. New spiritualities, for instance, point to the existence of “positive energies” somewhat available in our environment, and able to transform or to uplift persons. Similarly the idea of “connectedness” that is paramount to new spiritual proposals could be understood as expressing what the old concept of grace made in traditional religions: Being linked to the deep reality, to the “ultimate being” provides positive influence.

Beyond the realm of spiritual developments, the very idea of grace can find other ways to fit into a more scientific and technical worldview. Research in the specialized field of “religious ► [coping](#)” and “religious human flourishing” tries to highlight positive effects of religious attitudes on many aspects of personal and social life. In general, the therapeutic meaning of religious beliefs and practices could be understood as something akin to the idea of grace. This approach might be linked with what in the classic theological jargon was designed as the chapter on “effects of grace.” However, some distinctions need to be kept as a condition to preserve the original content of the concept of “grace.”

Christian spiritual tradition has tried since old times to overcome a too functional or utilitarian conception of divine grace, as something useful to cope with uncertainty and to deal with current dangers and threats. Such a mentality would distort the original meaning of this experience: Grace could become a punctual help matching human interests, and God would become a “provider of benefits” useful for human self-management. The experience of grace is deeply linked to the ones of forgiveness and conversion; this means that the main scope of divine grace is not to supply what is required each time for human self-realization, but to offer a new mentality, a new way of living, away from the old selfish or self-centered condition, and more focused on love of God and other people. Grace

implies a transformation as a condition of its therapeutic effect.

The former statements can suggest an idea of grace as therapeutic instance provided by religious bodies, and in concurrence with other more secular or “technical” therapeutic means. This is hard to assess; in most cases, “grace” does not compete with psychological or physical therapies, but clearly can help healing processes implemented by medical resources. “Grace” cannot be seen as a substitute for standard therapeutic procedures, but as an instance of human renewal or regeneration. Its meaning can be better appreciated inside of a frame of human fullness, or providing purpose, meaning, and reconciliation.

“Grace” is a very specific concept, in the sense that it is clearly placed into the semantics of “transcendence,” as do concepts like God, soul, eternal life, or the sacred. However, some attempts have been made to naturalize it, resorting to the idea of “events of grace” or experiences of “creative transformation” inside an immanent frame (Hardwick 1996). How successful this proposal may be is still a question of time and cultural acceptance; in any case, it seems unlikely that the category of “grace” can survive outside of a horizon of transcendence or the perspective of a divine agent and the cognitive frame of ► [love](#) and donation that God inspires.

The main challenge for theological reflection is perhaps how to update that concept in a cultural context predominantly influenced by a scientific view of reality. The question touches the recent discussion on the levels of “enchantment” and “disenchantment” perceived in Western cultures, a discussion greatly enhanced by Charles Taylor (2007). To perceive a world in sheer physical or material parameters would mean accepting a completely disenchanted reality, something dull and dreary, as Max Weber noted at the beginning of the twentieth century. The idea of “grace” would represent the possibility of opening an alternative space.

The German philosopher Habermas already complained in 1971 that

Philosophy [...] has not been capable of mastering by means of consolation and trust the *de facto* meaninglessness of death in its contingency, that of individual suffering, or that of the private loss of happiness – in general the meaninglessness of the negativity of the risks built into life – in a way that had been possible for the religious hope in salvation.” (Habermas 1971, 17 f)

The religious hope in salvation is a way to speak about grace. The open question is still, four decades after this gloomy prediction, whether developed societies can survive without resorting to a horizon of transcendent grace, just fitting into a complete immanent frame.

The elaboration of the concept of grace might take into account these challenges and try to find new space in the scientifically driven mentality. To this end, some conditions and suggestions can be mentioned.

In the first place, the idea of grace requires some more explicit content in order to connect with modern secular sensitivities, not used to the traditional framework in which such idea made sense and related to a quite well-known Christian horizon. This content has to do with the traditional idea of “salvation,” which becomes problematic as well. Some suggestions come from sociological and psychological studies pointing to religion as a way of “empowerment” and a mean for “human flourishing.” However, it seems that alternative experiences would be more fitting in this case, like the one of forgiveness, of extensive love, or the one suggested by Taylor’s idea of “human fullness” (Taylor 2007). In any case it seems that these proposals remain somewhat fuzzy and require further concretion.

In the second place, the religious proposal of the experience of grace comes in a plural milieu in which many other proposals of full life and love can be found and followed. Its specificity appears to be linked to its predominantly religious character, even its mostly confessional setting in Christian Churches, and its program of reversing one’s own interest and the logic of sheer merit.

In the third place, the concept of grace intends to play a different game, in a different place or with different rules as the one usually played inside the dominant human categories. Here we

have the idea of “displacement,” or of moving into a distinct realm in which our views and experiences acquire specific meaning, to the point of reversing what is usually deemed good and bad. Such a new perspective can provide a way to understand reality in a deeper and more liberating form from the more dominant material perspective. This transformation is not only cognitive, nor just emotional. In a part of Christian tradition, it becomes a dynamic of “divinization” or assuming a condition and orientation closer to how God sees, judges, and behaves.

At the end, what can be proposed under the label of “religious grace” to a scientific mentality is to assume a “variable,” a “factor” that hypothetically can change many things or transform for the best many aspects of a dull and gloomy reality. What counts is what changes or which effect has divine grace as a possible dimension of human reality and the cosmos as we know it; whether this “addiction” can improve things or render them less valuable by themselves. The theological view, deeply engaged with the concept of grace, assumes the wager of looking to reality assuming the presence of transforming divine grace to assess its consequences; or to test the effects of its absence.

Cross-References

- [Christianity](#)
- [Coping](#)
- [Freedom](#)
- [Love](#)
- [Sin \(Vice, Human Limits, Negativity\)](#)
- [Virtue](#)

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Graph Theory

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Description

Graph theory is the field or topic in mathematics related with the study of some particular mathematical structures usually called [▶ graphs](#). Graphs are structures that represent the pairwise relations (usually denoted as links or edges) among a set of elements (usually referred to as nodes or vertices). See Bondy and Murty (2008), for more details about graph theory.

Since the origins of the graph theory in 1736 with the paper written by Leonhard Euler entitled “the Seven Bridges of Königsberg” too many papers have been written in this topic. Some of the most well-known problems in graph theory are routing problems (as the shortest path problem or the traveling salesman problem), covering problems, matching problems, planar graph problems, enumeration problems, network flow problems, visibility graph problems, graph coloring, and partition graph problems. The problems studied in graph theory have had a great impact in the recent years involving different areas; see, for example, Mahadev, N.V.R., and Peled, U.N. (1995), Newman (2006) or Newman (2010). In mathematics, operation research, computer science, logistics, industry, or statistics among other disciplines, graphs are used to model networks of communication, data organization, flow process, control theory, etc. Some examples of the real situations that are studied from the graph theory are (among others) the structure of a website, road transport maps, airplane network routes, train routes problems, and chip design.

Recently, other areas or disciplines have received the attention of the graph theory community as biology (with the development of cellular networks representations), sociology (social networks, the calculation of centrality measures, cohesiveness measure), linguistics (natural language often lends itself well to discrete structure), chemistry and physics (atoms structure underlies in a graph structure), marketing (the diffusion of an idea can be analyzed from a graph theory point of view), and medicine (among other problems, the spread of a particular disease are analyzed from a graph theory point of view). In addition with these recent developments and applications, in pure mathematics, graphs are useful in geometry and topology (see Harary 1967 for more details).

To conclude, it is important to make emphasis again in the importance that has received the study of complex networks in the recent years and the new developments in this research area. The understanding of complex networks and its derived problems is actually a requirement in different disciplines of Science as: sociology (social networks as Facebook, Tuenti, or Twitter among others have a great impact in society), physics (among other disciplines), community detection problems (which requires a sensible decomposition of the graph into subgraphs, where, in some reasonable sense, the nodes in each subgraph have more to do with each other than with outsiders), biology, computer science, medicine, marketing, economics, mathematics, literature, politics, and almost all science disciplines.

Self-Identification

Science

Yes, this discipline/subdiscipline self-identifies as a science. Nevertheless, there are some researchers that consider graph theory as a mathematical science, while others consider it as a branch of mathematics. Because of its focus on applications, graph theory is usually considered to be a distinct mathematical science rather than a branch of mathematics.

Characteristics

Graph theory is distinguished from the other disciplines as mathematics, computer science, or operation research, by its focus on the mathematical structures that can be modeled by means of graph and the problems involve in these structures. Nevertheless, it could be said that actually most of the disciplines of mathematics require the new developments in graph theory for the understanding of the complex networks.

Relevance to Science and Religion

Although mathematics has had a considerable impact in the development of logic and philosophy, which in turn has been very influential in theology, few interest can be founded in “Science and Religion” among graph theory researchers. In order to find some relevant relations among these two topics and taking into account that too many religious symbols as 4-point Star, Star of David, 5-point Star, 6-point Star (Christianity), 6-point Star (Judaism) can be represented as a standard graph, we could include some questions as: What are the mathematical properties of the classical religious symbols? Is there any relation between math & symbols in a similar way as happen with art & math or beauty & math? What have in common the language of religion, arts, and graph theory? Obviously, the possible religious implications of such discoveries are typically not considered professionally by graph theory researchers.

Sources of Authority

The sources of authority in graph theory are the results published in peer-reviewed journals with a relevant impact in the area of graph theory or its applications. Actually, there exist too many journals that deal with the pure and applied impact of the study of graphs. Some of these journals (pure graph journals mainly) among others are: *Discussiones Mathematicae*, *Graph Theory*, *Journal of Graph Theory*, *Journal of*

Combinatorial Theory, Series B, *Graphs and Combinatorics*, *Journal of Graph Algorithms and Applications*, *SIAM Journal on Discrete Mathematics*, *Combinatorics*, *Probability, and Computing*, *Discrete Mathematics*, *Australasian Journal of Combinatorics*, *Ars Combinatoria*, *The Journal of Combinatorial Mathematics and Combinatorial Computing*, *Bulletin of the Institute of Combinatorics and its Applications*, *Discrete Applied Mathematics*, *European Journal of Combinatorics*, *Electronic Journal of Combinatorics*, *Annals of Combinatorics*, *Combinatorica*, *Discrete Mathematics and Theoretical Computer Science*, *SIAM Journal on Computing*, *Diskretnaya Matematika*, *Journal of Combinatorial Theory, Series A*.

The authority of these sources is self-derived by the peer-review process of the researchers more important in the field of graph theory. Some of the more important graph theory pure researchers are (among others): Alon, Noga; Berge, Claude; Bollobás, Béla; Chung, Fan; Dirac, Gabriel Andrew; Erdős, Paul; Euler, Leonhard; Faudree, Ralph; Golumbic, Martin; Graham, Ronald; Harary, Frank; Heawood, Percy John; König, Dénes; Lovász, László; Nešetřil, Jaroslav; Rényi, Alfréd; Ringel, Gerhard; Robertson, Neil; Seymour, Paul; Szemerédi, Endre; Thomas, Robin; Thomassen, Carsten; Turán, Pál; Tutte, W. T.; Whitney, Hassler.

Ethical Principles

As any discipline that affects the human life and improves the quality of the society, nonmaleficence is also an ethical principle for graph theory community.

Key Values

The key values of graph theory are the same that any field in mathematics that are close to the values of publication works in mathematics. The American Mathematical Society, recently resume these key principles in the following

way ...the correct attribution of mathematical results is essential, both because it encourages creativity, by benefiting the creator whose career may depend on the recognition of the work and because it informs the community of when, where, and sometimes how original ideas entered into the chain of mathematical thought. Others key values are thoroughness, rationality, honesty, and curiosity.

Conceptualization

Nature/World

During the nineteenth century, most of the scientists focused their efforts on modeling and accurately modeled many natural phenomena. It is for this reason that many modern historians of science consider the classical deterministic physical, among others, the kings of science during this century. However during the twentieth century, one of the most remarkable discoveries in science was, in my opinion, the complexity of nature/world when you want to model it and understand it. Nothing is easily predictable (e.g., chaos theory) exactly. One of the many factors that make this nature/world terribly complex is the number of relationships between factors, causes, phenomena, ideas that in earlier times were considered unrelated or independent. Graph theory is the natural mathematical tool that allows us to model, analyze, and to change methodologies/previous analysis to take into account that these relationships exist. Many branches of mathematics that model the real world/nature problems have included the graph theory as a key element when it comes to modeling the complexities associated with relationships between entities that were previously considered independent or unrelated.

It can be found that too many disciplines of mathematics have developed different methodologies and models to incorporate the relations that exist among items by means of a graph. For example, in statistics and probability theory, new recent studies have defined “the probabilistic graphical models.” In these models,

a graph represents the conditional independence structure between random variables. Another interesting application can be found in ► [cooperative game theory](#). In this field, usually it is assumed that all the players can communicate without restriction. Recent studies included a standard graph in their models to represent the communication in a more realistic way.

Human Being

The understanding of the human being (specially his mind) has been received too much attention in the Mathematical and Computer Science community. In complex/intelligent systems, it seeks to understand and replicate the learning that takes the human mind to solve complex problems. In this research line, or discipline (among others) we find the neural networks theory (also addressed as ► [Artificial Neural Network](#) theory). Neural network theory has served both to better identify which is the behavior of the neurons in the brain and to provide the basis for efforts to create artificial intelligence. The fundamental-mathematical tools that represent the structure of neural network theory are graphs structures.

Following the fact that graph theory is considered beyond all the strategies that intend to reproduce and understand the human mind, we could conclude that human being (we focus here in the human mind that is what establish the main differences with other species) can be modeled by means of a complex graph.

Life and Death

In mathematics, the Markov Chain models are represented by means of graphs. In this discipline, the terms of life (also denoted as birth) and death is usually addressed with a special case of continuous-time *Markov process* where the states represent the current size of a population and where the transitions are limited to births and deaths. Birth-death processes have many applications in demography, queuing theory, performance engineering, or in biology, for example, to study the evolution of bacteria.

Reality

See section “[Nature/World](#).”

Knowledge

The knowledge is the conclusions or results that you obtain after an empirical study or after some mathematical proofs.

Truth

As in any mathematical discipline, truth is something that is proved (from mathematical point of view) under some assumptions or hypothesis.

Perception

The perception in mathematics is usually addressed as conjecture. Something that could be truth but still is not proved.

Time

Time is a fundamental topic in graph theory. Time is one of the fundamental factors that represent the quality of an algorithm that solves a graph theory problem and also shows the difficulty of the problem that it is solving. In graph theory, a problem is regarded as inherently difficult if its solution requires significant resources of time, whatever the algorithm used. Many of the mathematical models can be classified into hard or nonhard problems depending on the amount of resources needed to solve them, such as time and storage. In terms of ► [computational complexity](#) the problems in graph theory can be divided into P class problems (those problems that can be solved on a *deterministic Turing machine* in polynomial time) and NP class problems (those that can be solved on a nondeterministic Turing machine in polynomial time). For more details, see Garey and Johnson ([1979](#)).

Consciousness

See section “[Human Being](#).”

Rationality/Reason

Rationality is a key topic and concept in mathematics and also in graph theory. Rationality in terms of logic is the way in which the knowledge is built and the truth is found.

Mystery

Mystery is an unusual concept in graph theory. When there exist something that is yet unknown it is usually referred to as open problem, or as a conjecture.

Relevant Themes

An important issue partially addressed in graph theory (especially in artificial neural networks) as regard to “Science and Religion” is the understanding of human mind. The human mind for many researchers is the main difference from the rest of the animal in the world. From a religion point of view, these differences have other explanations (e.g., the soul that the human has instead of any animal). Taking into account the new developments in this area (artificial intelligence could be close to human intelligence in a future) it would be necessary to establish some ethical and moral questions about the differences between “artificial intelligence” and human intelligence.

Taking into account previous problems, in graphs and artificial intelligence it has developed a new discipline addressed as “the ethics of artificial intelligence.” Here it is included the ethics of technology specific to robots and other artificially intelligent beings. Some critics have argued that artificial intelligence has the potential to introduce some new dangers and malaise. For these reasons, there are some researchers that think that there exist some positions/jobs that have to be done by humans as a judge, police, among others. Nevertheless, it is clear for everybody the possible advances that could give us these new methodologies.

Cross-References

- [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)
- [Artificial Intelligence, General](#)
- [Complex Systems](#)
- [Computer Science in Human Learning](#)
- [Game Theory](#)
- [Mathematics in Human Learning](#)

- [Mathematics, Modern](#)
- [Operations Research in Applied Mathematics](#)
- [Statistics and Probability](#)

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Graphic and Plastic Arts

- [Art, Studio](#)

Graphs

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In mathematics, a graph is an abstract representation of a set of objects where some pairs of the objects are connected by a relation. The interconnected objects are called vertices, and the relations that connect some pairs of vertices are called edges or links. Typically, a graph is depicted in diagrammatic form as a set of dots for the vertices, joined by lines or curves for the edges. Graphs are one of the objects of study in discrete mathematics. A standard graph is then defined by a set of nodes N and a set on links L . The relations among the nodes in a graph can be directed (asymmetric, then these relations

are usually called as edges) or undirected (symmetric, then these relations are usually called as links).

Gravity

- [Relativity](#)
- [Space](#)

Gravity: From Classical to Quantum

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Related Terms

[Force of attraction](#)

Gravitation is the first type of force according to the way force is defined by modern physics. If you release an apple, it moves toward the ground; hence, there is a force that makes it move that way. The astronomers in the ancient world tried to first record the movement of the stars and then to explain it. It has been quite puzzling (until Galilean times) that on the night sky, there were zillions moving in a regular way, as well as a few other “stars” that were moving in a funny way and that were named after some of the gods of the time – Venus, Mars, Jupiter, and Saturn. One of the main tasks of science about two millennia ago was to describe the motion of the planets. Then, for nearly 1,500 years, not much happened until the time of Copernicus who replaced the Earth by the Sun as the center of the Universe. Soon afterward, Tycho Brahe performed the most accurate measurements of the motion of the stars and the planets of his time. These became the “data set” from which Johannes Kepler deduced his famous laws of planetary motion. And then came Sir Isaac Newton. The simple law of universal gravitation he wrote down not only makes Kepler’s

laws simply a collateral outcome, a matter of mathematical manipulation. Much more importantly, he realized that the force which makes apples fall down and the force which makes the planets revolve around the Sun is one and the same force, the force of gravity.

As far as the forces are concerned, the nineteenth century is the century of electromagnetism with the triumph of Maxwell equations. These equations managed to explain all known electromagnetic phenomena, but they had a major “flaw” – they did not transform properly under the Galilean transformations, they did not respect the law for addition of velocities. Instead, they predicted the existence of a limiting speed, the speed of propagation of the electromagnetic waves and in particular, the speed of light. Well, the story is well known, the Maxwell equations were here to stay, and the Galilean transformations had to give the way to a different procedure for adding velocities, known as the Lorentz transformations. And then Einstein enters into the picture with his special theory of relativity named after the special principle of relativity. The special principle of relativity states that physical laws should be the same in every inertial frame of reference, that is, in all frames of reference, which move with respect to one another with constant velocities. What interests us here is the second part of this definition. What would happen if we compare a physical law in two reference frames, one of which moves with acceleration with respect to the other. After 10 years of hard work, Einstein figured out the answer – nothing would happen if we take into account the force of gravity. The general principle of relativity states that “all systems of reference are equivalent with respect to the formulation of the fundamental laws of physics.” In another words, there does not exist a physical experiment, which will allow us to distinguish motion, say with acceleration $g = 9.8 \text{ m/s}^2$ in deep space away from any massive body and state of rest at Earth’s surface.

This simple statement, through a long line of reasoning, led Einstein to the ideas of curve space-time and to his law of gravitation. This law can be formulated roughly as “the masses of

the objects present tell the space-time how to curve and at the same time the curved space-time tells the objects how to move.” A simple thought experiment, based on the principle of general relativity, tells us that light should bend when passing near a massive object and soon after Einstein’s general theory of relativity was proposed this effect was observed.

One could say that the special theory of relativity of 1905 has two progenies – the general theory of relativity of 1916 and quantum theory with Schrodinger’s equation written down in 1926. And these are the most important, groundbreaking achievements of twentieth-century physics. And for the last already 50 years, the theoretical physicists try to reconcile these two theories or to find a unification, which we will call quantum gravity.

Quantum gravity self-identifies as a science. It is a natural science, part of theoretical physics, dealing with the physical world around us. It should be pointed out, however, that quantum gravity is not a full-scale theory yet. Rather, it could be considered as a long-term project aimed at developing a new physical theory by focusing on the nature of space, time, and the gravitational interaction and intertwining them with a quantum picture of the world. Quantum gravity seeks to find general truths and the operation of all encompassing laws, obtained and verified through the commonly accepted scientific method that is used in the natural sciences and in particular in physics. Although quantum gravity, among all other natural sciences, is, to the biggest extent, concerned with the nature and the beginning of the Universe, it does not consider the Universe as the creation of a superhuman agency; it takes it as all that is and as if there was nothing outside of it (Smolin 2002). In particular, quantum gravity does not contain any moral code, governing the conduct of human affairs other than the one that is typically used in the pursuit of science itself. The issues of life and death in their everyday sense as well as of human ultimate destiny in general are not considered in the theory. The only way these concepts enter into the framework of the discipline is through the question about the

origin of the Universe, which is currently labeled as the Big Bang.

Considered most generally, quantum gravity is a quest for a theory that will, in some appropriate way, unite the two most celebrated achievements of physics of twentieth century, namely, the general theory of relativity and quantum theory. Indeed, almost all of the progress in physics in the last century is grounded in these two theories.

The general theory of relativity led to profound developments in human understanding of the solar system and the Universe as a whole. Now we know a lot about the stars, these mysterious lights on the night sky that have puzzled us from the very dawn of our existence as humans. We know how they are born, how they evolve, while they burn their nuclear fuel, and how they die. We know how they pile into galaxies and galaxy clusters and how all they run away from each other. We even can convincingly speculate on the possible answers to the question about how the Universe came into existence (the Big Bang has become almost a household term).

On the other hand is quantum theory. The theory was developed in order to explain how the world of the small things works, how protons and neutrons combine into nuclei, how electrons wander around these nuclei to form atoms, and how atoms combine into molecules. Quantum theory tells us a lot of puzzling stories, for example, about how atoms, nuclei, and elementary particles manage to behave both as waves and as particles. But we learned how to work with it and managed to reconstruct theoretically the world around us from bottom up. Over the course of the twentieth century, quantum theory has proliferated into a variety of disciplines – from fundamental theories such as those of the electroweak interaction and quantum chromodynamics to the myriads of applications – lasers, microelectronics, and quantum chemistry, to name just a few.

We should say that the two theories are not complete strangers to each other. They have worked together successfully in certain cases. For example, they combine in order to explain how stars produce all the heavier than hydrogen

elements we find in the periodic table, how they mature, and what their ultimate fate is. Yet, these two theories, general relativity and quantum theory, describing one and the same world, are completely different – they speak different languages and produce completely different outcomes. Quantum theory speaks the language of operators and wave functions, of uncertainties and cross-sections, and produces probabilities for various outcomes. General relativity relies on precise geometric constructions like the metric tensor and connections and leads to predictions about the exact trajectories of free-falling observers.

One can say that there is no problem. The two theories have their respective domains, and within those domains, they have achieved profound success. There are certain theoretical considerations as to why some sort of unification should occur, but we can say that currently there is no experimental data that demands univocally that a new theory should replace general relativity and quantum theory. Still, since the middle of the twentieth century, many scientists have undertaken the task of finding a middle ground for the two theories, and a lot of work has been done.

There are two main approaches to find a theory unifying or replacing relativity and quantum theory, which roughly can be classified as (1) the approach of general relativists, who try to quantize gravity, and (2) the approach of the specialists in elementary particle physics who seek a unification of all four fundamental interactions in physics.

The most successful theory in the first approach is the so-called loop quantum gravity (Rovelli 2004; Thiemann 2007; Ashtekar and Lewandowski 2004). It starts from general relativity and repeats the main steps of quantization of a classical system with given coordinates, velocities, and a Lagrangian. Then one defines momenta, performs the transition to a Hamiltonian description, and proceeds with turning the basic coordinates and momenta into operators. There exist various modifications of this procedure, but in all of them, the Schrödinger equation turns out to be represented by some set

of quantum constraints, reflecting the coordinate invariance of the classical theory. Among the main results of this first approach are the definition of geometric operators of area and volume and the introduction of spin-network quantum states where these operators are diagonal. The most successful representative of the other, the elementary particle physicists, approach is string theory (Becker et al. 2007; Greene 2003; Dine 2007), which was recently redefined as the M-theory. It replaces the point particles of ordinary quantum field theory (particles like photons, electrons, etc.) with one-dimensional extended and vibrating objects called strings. The various modes of vibration of the strings correspond to various particles, one of which is the graviton, a massless “spin-two” field propagating on flat Minkowski space-time. String theory aims at describing all four known fundamental forces as well as the matter in a mathematically consistent way. There are other approaches to quantum gravity as well – among those are twistor theory (Witten 2004), noncommutative geometry (Connes 1994), and causal dynamic triangulation (Ambjørn et al. 2008).

But stepping back and looking at the current overall results, we should say that there is a long way to go before we can say that we have built the theory we are looking for. In any case though we can point out at certain features of the theory, whatever it turns out to be. There are two most important differences between quantum gravity and the other natural sciences. The first one is in the way it treats space and time. Most of the natural sciences (with the notable exception of classical general relativity) study their respective subjects assuming that they have on their disposal ever present and all encompassing space and time. We can easily build a reference system using physical objects in order to measure distances and look at the clock on the wall to measure time intervals. In particular, the standard procedure of quantization in conventional quantum mechanics relies on a set up, in which space and time serve as a stage where quantum fields exist and evolve. When we turn to quantization of gravity though, the situation becomes completely different. One of the most important features of

quantum gravity is that in its final form, it should be background independent. Thus, quantum gravity could be considered as a result of a quantization, in which space and time are to be treated in some sense on equal footing with all the other fields.

The second important distinction between quantum gravity and most of the other modern natural sciences is the fact that its predictions cannot easily be verified in an experiment. Simple arguments suggest that because of the nature of gravitational interaction, the effects of quantum gravity would become relevant only in experiments in the so-called Planck regime. In general, all individual particles obey the laws of quantum mechanics, and there are many relevant quantum effects. When we make the transition to large systems of particles, the quantum effects progressively cancel out and the laws of classical physics prevail. In all considerations of quantum mechanics though, we neglect the gravitational interaction altogether. This is because for any two elementary particles, the gravitational force of attraction is much smaller than any other force acting between them, and this is in part because of their small masses. Now, the question is what will happen if we manage to squeeze much larger mass into a region of space which is typically occupied by an elementary particle. The expectation is that the conventional logic is correct – the gravitational interaction will become important, and at the same point, we will need to work within the setup of quantum theory. There is one caveat though, which makes the situation very challenging. A typical length scale corresponding to an elementary particle is its Compton wavelength, which is equal to the wavelength of a photon having energy equal to the particle’s energy at rest, that is, the energy which is due to its mass. It is at this length scale that the quantum effects should be taken into account. The larger the particle’s mass, the smaller its Compton wavelength. But if we try to compress certain mass in smaller and smaller region of space, say corresponding to its Compton wavelength, the gravitational force becomes stronger and stronger, and, at some point, the mass would collapse and form a black hole with a certain characteristic

size which is defined by the so-called Schwarzschild radius. The Schwarzschild radius denoted the radius of a massive spherical object, depending on its mass, such that if the object shrinks beyond this radius, it becomes a black hole. Roughly speaking, the Planck regime corresponds to a situation when the Compton wavelength of a particle becomes approximately equal to its Schwarzschild radius, and in that case, the expectation is that its dynamics would be governed by quantum gravity. Actually, it is believed that quantum gravity will get rid of the commonly expected singularity at the “center” of a black hole or will explain the many unknown processes, which we tend to hide behind the term Big Bang.

The Planck regime is quite inaccessible for any modern or foreseeable in the near future experiment, and this is what makes the development of quantum gravity so difficult – there are no experimental results to guide it. There is a hope though, in the recent years, that the experimental data accumulated via the observation of the Universe with most advanced technologies would provide us with some of the lacking guiding data.

Among the many questions quantum gravity is supposed to answer are those about the beginning (and possibly the end) of the Universe and about the nature of space and time. However, these questions are not analyzed from a religious point of view. In general, people working on the quantization of gravity do not consider it as being relevant to the “science and religion” scholarly area. More specifically, quantum gravity does not try to answer questions it does not pose (Smolin 2002).

As for any natural science, the source of authority for quantum gravity lies within the scientific system of publication of peer-reviewed articles. In case of quantum gravity, these articles contain primarily theoretical derivations and very few, if any, predictions to be verified by experiment. Since currently experiments for verification of the predictions of quantum gravity are impossible to perform, the theoretical constructions that are published are judged in the peer reviews mostly on the basis of mathematical

consistency and noncontradiction with the existing experimental data. Actually, this is one of the most typical and important critiques that are being usually directed at people dealing with quantum gravity research, namely, that they do not produce experimentally verifiable predictions so it is impossible to judge the relevance of their scientific contributions to the “real” physics world.

In general, the ethical principles guiding quantization of gravity are those in place for any theoretical natural science – comprehensive referral to all the scientific sources used in the process of developing the new constructs. Something specific for quantum gravity is the fact that the lack of experimental data and verifiable predictions by the various approaches to quantization of gravity has led to a somewhat strange from an ethical-point-of-view situation. Any modern science requires substantial financing, and in most cases, the financing is related to the effectiveness of solving specific problems. Since in quantum gravity it is difficult to judge objectively the merits of any one of the approaches, the financing is provided on the basis of better marketing and advertisement, rather than on success in experimentally verifying the fundamental laws of nature. As a result, since some of the existing approaches in theoretical physics are much better off financially, many more young people are encouraged to work on them rather than on others. This creates substantial tensions between the approaches. But nevertheless, the key values of quantum gravity are curiosity and determination in pursuing the goal of understanding how nature works at its most fundamental, according to our current understanding, level.

In the framework of quantum gravity, nature comprises of space and time (actually of space-time) and all fundamental elementary particles of matter (fermions) and energy (bosons) entangled in an ever-changing configuration. On the other hand, the human being enters into the considerations of quantum gravity in its role of an observer. In standard quantum theory, unlike in classical physics, the process of observation becomes part of the theory since it influences its predictions – the most famous example of this

situation being the story about the Schrödinger's cat. But still, in the standard quantum theory, the observer can be thought of a human being separated from the system that he or she observes. In quantum gravity, such a separation is impossible, and the observer is part of the picture. To put this simply, in classical theory, the system under study evolves on a fixed stage, observed by the audience. In quantum theory, the stage is still fixed, but the audience participates in the evolution. In classical general relativity, the audience is outside the system and the stage, which evolve together. In quantum gravity, there is nothing fixed and left outside, everything evolves together, and this poses substantial philosophical and technical problems.

Quantum gravity defines the reality as the totality of all objectively existing events and things, which are susceptible to being observed, measured, understood, and explained. It conceptualizes knowledge as the set of all facts or the entirety of truth, information, and principles acquired by humankind via its simple experience or the study of reality. Truth is considered as being the property of a statement of corresponding to or being in accord with reality. Since quantum gravity deals with fundamental questions about space, time, and all physical interactions, some scientists consider it as being the quest for finding the ultimate truth in physics. This is reflected in the fact that string theory has as one of its goals building the theory of everything.

In quantum gravity, perception is considered as being related to the objective reality and as such is a consequence from observations and measurements. While it is understood that it is never complete and always refracted through one's personality, it is also believed that we can strive to make our perception ever closer to the reality.

Time has a special place in quantum gravity, which is quite different from its everyday use. It is one of the main ingredients of space-time, and as such, because of the coordinate invariance of general relativity, time is just a label on events. One of the biggest challenges in quantum gravity

is to extract somehow the usual, familiar to everybody time from the theory.

Quantum gravity relies on the understanding that the physical world can be studied and comprehended outside the concept of consciousness. The consciousness enters into quantum gravity framework only in the sense that in quantum measurements, the observer affects the evolution of the measured quantum system. Rationality is a cornerstone in quantum gravity. It is firmly believed that starting from the established, experimentally tested theories through deep thinking and reasoning a new theory could be developed that will produce verifiable predictions. In quantum gravity, "mystery" is a term used to denote the fact that there is something puzzling, something we do not understand yet. It is generally believed that nothing can prevent science from uncovering the laws of nature. Usually, "mystery" is not used as a term that denotes the impossibility of understanding and describing in scientific terms some finding.

For quantum gravity, as regards "science and religion," the critical issue is the origin of the Universe. Currently, the widely accepted hypothesis among scientists is that some 13.6 billion years, the Universe started with the so-called Big Bang. With this term, we hide our lack of precise understanding as to what exactly had happened at that instant. The expectation is that quantum gravity will provide us with that understanding and eventually would answer the question about the Universe before the Big Bang. Clearly, this theme has direct relevance to the way any religion would talk about the Beginning.

Cross-References

- ▶ [Astrophysics](#)
- ▶ [Christian Cosmology](#)
- ▶ [Electromagnetism and optics](#)
- ▶ [Energy in Physics](#)
- ▶ [Particle Physics](#)
- ▶ [Physics](#)

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Gross Body Language

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Patterns of bodily movement that are more fluid
and dynamic than particular postures.

Group Altruism

- [Altruism](#)

Group Dynamics

- [Social Psychology](#)

Group Processes

- [Social Psychology](#)

Group Theory

- [Altruism](#)

Guidance

- [Counseling Psychology USA/Europe](#)

H

Hadith

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The hadith are the official collections of Muhammad's sayings and doings. The hadith are viewed as the second most authoritative source of Islamic teachings. They are also used to understand the Qur'an in its proper historical context. Any given hadith can be labeled from *weak* to *authentic* depending on how sure the scholars are that Muhammad actually said and or did what the hadith reports. This oftentimes depends on the strength of the chain of transmission (silsilah).

Happiness

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Related Terms

[Eudemonia](#); [Good life](#); [Hedonism](#); [Pleasure](#); [Salvation](#); [Vital satisfaction](#)

Description

Happiness can be broadly described as a positive feeling in a subject regarding his/her current life

or state of affairs. This is a subjective sensation or mood linked to the fulfillment of expectations or the achievement of desires, but it can be associated with a state of serenity or internal peace as well. Indeed, part of the difficulty in the study of happiness regards its very fuzzy contours and plural status, which is a consequence of its subjective and to a large extent unverifiable character.

The study of happiness has traditionally been a subject of the philosophical and literary wisdom; religions have often played a role of normative regulation on what should be deemed a good life. In any case, it has until recently been considered a "humanistic topic" (Bok 2010). However, it has become more and more a subject of scientific enquiry, opening the doors to the application of more empirical and experimental methods, providing rigor and data. "Happiness studies" is a well-established field of research that has delivered to this date a considerable amount of essays and specialized papers. Science aims to understand what renders human beings happy, or which factors weigh more in achieving a fulfilling life.

Several interests are involved in this research program, justifying its efforts, as for instance, social policy, educational systems, and even economic planning. Indeed, many governments see as one of their roles facilitating the achievement of the highest levels of life satisfaction for their constituencies. Being such an important and sensitive issue, it is to be expected that the scientific approach enters the arena by providing a large

amount of data, often calling for meta-analysis and in-depth reviewing.

The described interests and the recent arrival of the scientific approach could mean some marginalization of the traditional treatment of the issues related to human life satisfaction. Some disciplines are competing now, when the issue has become less a subject of humanistic and religious study, to offer a better understanding and means for dealing with the general striving for happiness. In any case, the current status of the study of happiness invites deeper analysis and that takes into account the different and sometimes competing perspectives.

The first issue at stake in the study of this complex experience is the semantic one. An interdisciplinary program studying “good life” might help to clarify the ground and to give more accurate descriptions of the terms used and the different contents and ideals referring to the best human aspirations and positive models of life. Indeed, a part of the research is trying to distinguish models and to better understand the characteristics of the main proposals. In that sense, the scientific research on happiness connects with a humanistic tradition deeply concerned with the improvement of human beings. When the ground has been cleared, then the study of the factors involved in the achievement of happiness becomes paramount.

Distinctions and Models

The reader of the abundantly available literature on *happiness studies* will notice that the specialized treatment of this issue points to a fundamental distinction, giving place to what can be called a “dual pattern” of human happiness. The basic distinction discriminates between a subjective concept of happiness, seen as a positive balance in one’s own affects and experiences (*hedonic dimension*), on the one hand, and a more objective and global meaning of personal satisfaction in one’s own existence (*eudemonic dimension*) on the other. The issue is not only semantic but concerns the contents or ideals of good life. On one side, we find the expressivist ideal of living life with intensity, taking advantage of the opportunities to enjoy,

looking for very gratifying experiences, or cultivating satisfying relationships and, at the same time, avoiding pains and sadness. On the other side, we have a model recovering the classical ideal of “virtuous life,” which could be expressed in modern times as “fulfilling life” or “meaningful life.” In this case, we talk about a sense of global satisfaction beyond the passing good moments of pleasure, an experience of gratitude for the whole life, even one assuming negative times and distress into a constructive all-encompassing view.

Even if a consensus has grown regarding the heuristic value of that distinction, scholars devoted to the study of happiness continue to be divided in their focus and the characteristics of each pattern. Many studies report the first model as more selfish and temporal, while the second would be more lasting and generalizable, in the sense of being able to be proposed as ideal for everybody. However, some analysts distrust the embellished image of the eudemonic model, as too fuzzy and indeterminate to be taken as a serious topic for rigorous research (Feldman 2010). The discussion is giving place to two different research programs but still more to applications of this dual model to diverse settings. For example, some authors point to the distinct cultural backgrounds associated with each form: the hedonistic ideal could be associated with a more consumerist and individualist culture while the eudemonic to more socially oriented ideals, presided over by empathy and alternative models of satisfaction. Something similar can be deduced at the level of social policies and the prescriptions that can be deduced from each form for therapeutic practice and educational programs, since both apparently reflect contrasting ideas concerning the human person and social integration. It is not easy to understand both as complementary, since they often may appear as competing ideals of human fulfillment.

At the end, the basic distinction is not only about happiness as something that can be isolated from other human or social dimensions. At issue is an entire conception of life and meaning and purpose in society and morality; in that sense, a circularity arises between ideals of a good life

and its perception or realization between the descriptive and the normative levels and between what is defined and what is looked for. The study of happiness cannot be disconnected from the study of the ultimate questions affecting human nature; and this issue seems hardly distinguishable from social and ethical dimensions.

Factors that Influence the Perceived Happiness

The scientific study of happiness has contributed in large measure to better knowledge regarding which variables might be linked to personal satisfaction. These studies are mainly empirical in method: once indicators of happiness can be isolated or identified through self-assessing surveys, other series of data help to compare variables and calculate correlations between them. Even if this approach presents many limits and can be easily debunked, nevertheless, many lessons can be learned from the large amount of available research papers published in the last 20 years. The following cases make reference rather to the hedonic model, even if not exclusively.

The most studied variables have been income, health, social relations, especially marital state, and work or unemployment. Demographic variables are also considered, like age, gender, and levels of education. The research tries to ascertain in which measure each of these variables affect levels of happiness.

Take income as an example. A lot of research has tried to understand the complexities that link economic income and happiness. The bulk of published papers point to a similar pattern: income has a positive influence in the perceived happiness for those at the lowest level or struggling to cope with their elementary needs. This influence decreases or becomes nonsignificant when earnings increase. From a different perspective, those very happy are unaffected by increases of income. Then this variable weighs in a comparative way: it depends on contexts and forms of life. Discussion arises about which model of happiness would be more related to material income. The intuitive answer points to the hedonistic orientation; however, some studies

reveal that in the long run, earning significantly more than average confers some sense of personal achievement; since in modern societies, income is related to social status.

As could be expected, a positive correlation arises between indicators of health and happiness; perhaps, it is less clear in which direction this positive influence works: is the perceived health what helps to be happy, or is it happiness that renders people more healthy? By the same token, the variable of social capital relates positively with happiness. However, in the case of education, things are more disputed, and the evidence is less clear, even if recent research finds a similar pattern as with income: that variable is relevant in the cases of lowest perceived happiness or for more destitute people.

Several studies point to the great dispersion of happy persons in different societies. It is relatively easy to identify what renders – on average – people unhappy and miserable, but it becomes harder to find broadly shared patterns about what makes most people happy: too many factors appear involved. In other words, even if policies can be designed to tackle forms of unhappiness, it is much harder to find a formula that could ensure happiness for everybody.

Happiness as a Lifestyle

Focusing now on the eudemonistic version, some attempts have been made to better describe what is associated with a fulfilling life, correcting the general or fuzzy elements, and achieving more empirical standards. Carol Riff (1989), for instance, has proposed a widely used model based on six factors that contribute to reaching a good level of life satisfaction. The model is inspired by the tradition of “humanist psychology.” These six points are:

- Self-acceptance
- Positive relations with others
- Autonomy
- Environmental mastery
- Purpose in life
- Personal growth

A second attempt at categorizing this seemingly fuzzy idea of “life satisfaction” reduces the number of factors to four:

- Pursuing intrinsic goals and values for their own sake, including personal growth, relationships, community, and health, rather than extrinsic goals and values, such as wealth, fame, image, and power
- Behaving in autonomous, volitional, or consensual ways, rather than heteronomous or controlled ways
- Being mindful and acting with a sense of awareness
- Behaving in ways that satisfy basic psychological needs for competence, relatedness, and autonomy (Ryan et al. 2008)

The collected data after distributing these questionnaires reveal some interesting patterns about which factors are more dominant in males or females or which age cohorts feel higher levels of satisfaction. The data point to significant variations in time and cultural milieus. For example, in the 1980s, people in their middle age were the most satisfied, while recent surveys show that more mature people appear as the most satisfied. However, some doubts persist. In both models, a mix of self-determination and social aptitudes appear as relevant; the problem is that in real life both goals become less compatible.

Happiness and Religion

In many cases, religion has been considered as a variable influencing happiness. Its absence in the former lists of factors linked to a fulfilling life might be suspicious, but this is part of the problem: is religion involved in that ideal of life? Some studies reveal positive correlations between indicators of religiosity and those of quality of life in the USA (Stark and Maier 2008); the explanations mostly point to the social character of religious activity and its beneficial effects. However, in Europe, the correlations hardly emerge. Take the cases of Denmark and Sweden: both come out as the less religious and the happiest countries in world surveys. In any case, fresh studies propose an influence, on the condition that we assume a slightly different version of happiness: religious intensity influences in a life perceived as purposeful and committed to others, which to some can be considered as “authentic happiness” (Headey et al. 2011).

These results are in line with previous expectations: the religious factor only weighs in a form of happiness, more linked to its set of values, and depends on contexts. It could be stated that Christian faith – and in other religions alike – determines its own pattern of happiness. Religious approaches cannot ignore the value of sacrifice, expiation, and grace, which often get their meaning beyond ideals of happiness. However, even such concepts might be integrated inside a broad program of the pursuit of happiness, or at least of one of its possible and competing versions.

Discussion and Prospective

The current research on happiness offers interesting contributions but at the same time, confronts some limits calling for further revision and a more interdisciplinary approach. The following are a list of questions arising in the reception of the published material.

- “Happiness” is a subjective, hardly observable, concept. As a result, virtually all scientific data on human happiness is based on self-report, which is subject to self-deception and therefore becomes less reliable. Nevertheless, some efforts have been made to correct that restraint, for example, resorting to hormonal indicators and neurotransmitters associated to well-being.
- There are too many factors involved in trying to measure happiness, an increasing complexity that cannot be reduced to few variables; people can feel happy even in harsh conditions.
- The empirical approach has to recognize that happiness continues to be a too elusive concept, and its statistical treatment becomes of limited scope, requiring hermeneutic analysis or taking into account the cultural background allowing for a better understanding of what renders people happy in some place and time.
- There is a suspicious absence of the dimension of alterity: often our happiness depends strongly from the happiness of people close to us; the problem is broader and reflects the flaws of a too reductionist program.
- The consequences at the normative level are dubious; should we opine about which kind of

happiness is better? Should we discourage some of them as too selfish?

Relevance of Happiness for Science and Religions Dialogue

The scientific approach provides interesting data but can hardly displace or substitute some other forms of traditional wisdom related to this topic. From a theological point of view, however, more needs to be done to integrate this knowledge into an updating of the Christianity's and other religions' promise of salvation. Or, by the same token, more needs to be done by the scientific program to integrate traditional religious contributions.

The question is how useful all of this corpus of scientific research on the correlates and causes of human happiness is for theology and religion in general? At first sight, its relevance is apparent: theology deals with salvation, and whatever the meaning of this term is, the usual understanding of happiness and a good life, and the means to achieve them cannot be left outside the theological vision as to what is believed to "save" humans and render them better off. On the other hand, some apprehension may be justified. Theological concepts about salvation belong to a rather different "linguistic game," to say the least, as compared to the semantics of happiness and the secular ideals of a good life. However, this is part of the problem: whether this is the case, whether we can really develop a theology of salvation apart from a consideration of the empirical factors helping to live a better and full life, or to overcome suffering and misery. As happens in many other settings, theology divides between a more intratextual, self-referential approach; and a more open, externally related effort of steady dialogue with contemporary reason. This second approach could obtain some advantages engaging in a constructive dialogue with the empirical, scientific happiness studies.

Probably, the scientific treatment of happiness and a good life can supply theological reflection with an interesting input when theologians try to update and renew the Christian discourse on salvation; the same can be said concerning other religious proposals. This is a point badly needed, since

the meaning of the Christian promises of salvation fades away, once departed from their former dominant eschatological dimension. This revision or latent dropping of more eschatological views are not the only causes of concern affecting Christian promises. Furthermore, the attempts of politically inspired theologies that aim to overcome material and socially unbearable conditions collapse when they come close to western environments with higher levels of equality and good welfare systems; salvation cannot in that context be described in terms of material collective improvement; such strategy soon becomes redundant. The great challenge now for theology is to adjust the message of salvation to the social and cultural conditions of advanced societies, with different sources of concern and distinct and varying aspirations. Knowing more about these issues might help to make better and more fitting answers.

In any case, the religious reception of happiness studies needs to be nuanced. As a first step, it is necessary to account for a spectrum of models of happiness beyond the reductive dual model; such spectrum could range between the extremes of pleasure born from satisfying desires, and Buddhist appeals to silencing desires. Then, second, there are some insights from Christian tradition, which can correct some one-sided views; issues like guilt or moral failure are apparently aspects deeply related to a good life and ignored in the current treatment. In this sense, religious views can help to complement the reductive program of scientific research and offer insights from their wisdom traditions, of value beyond historical contexts.

Cross-References

- [Christianity](#)
- [Empathy](#)

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Health Science

► [Occupational Therapy](#)

Heart

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Heaven's Gate

► [UFO Cults](#)

Hebrew Bible (Old Testament)

► [Language and Literature, Hebrew](#)

Hebrew Christianity

► [Messianic Judaism](#)

Hebrew Literature

► [Language and Literature, Hebrew](#)

Hedonism

► [Happiness](#)

Hegel's Thesis-Antithesis-Synthesis Model

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A dialectic method of historical and philosophical progress that postulates (1) a beginning proposition called a thesis, (2) a negation of that thesis called the antithesis, and (3) a synthesis whereby the two conflicting ideas are reconciled to form a new proposition. Although this method is commonly referred to as the Hegelian dialectic, Hegel actually attributed the terminology to Immanuel Kant. Moreover, many scholars argue that the dialectic is represented of German idealism as developed by Johann Gottlieb Fichte.

Hegemony

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Imperial domination by one group over another. Antonio Gramsci refers specifically to cultural hegemony, which refers to domination by one social class over another through the manipulation of mainstream society's beliefs about social norms and values, which subsequently contributes to a dominant worldview that reinforces the status quo.

Heisenberg's Uncertainty Principle

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The uncertainty principle is the recognition that a precise, simultaneous measurement of some complementary variables - such as the position and momentum of a subatomic particle, or its energy and the time at which the energy was measured - is impossible. Contrary to the principles of classical physics, the simultaneous measurement of such variables is inescapably limited; the more precisely one is measured, the less one can learn about the other. One of the consequences of this is that one can have small fluctuations in energy for short periods of time.

Cross-References

► [Space](#)

Hellenization

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The process whereby an ancient religion, or culture, such as Judaism was “Hellenized” with the result that it lost many of its indigenous characteristics and was made to conform to the dominant Greek norm. The historian of Christian doctrine Adolf von Harnack famously explained the rise of Gnosticism as the “acute Hellenization” of Christianity.

Helmholtz Energy

► [Chemical Thermodynamics](#)

Hermeneutics

► [Biblical Studies](#)
► [Ecclesiology](#)
► [Theoretical Psychology](#)

Hermeneutics and Hermeneutic Philosophy

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Hermeneutics is the theory of interpretation concerned with a theoretical exploration of the manner in which we grasp the significance or meaning of texts, utterances, or actions. Hermeneutic philosophers from the nineteenth century onward generally think that the human sciences concerned with facts of significance and meaning has to be methodologically distinguished from the natural sciences. Traditionally, this distinction has been expressed as the distinction between understanding versus explanation.

Hermeneutics, Theological

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Related Terms

[Interpretation theory](#)

The Problem of Hermeneutics

The word “hermeneutics” can be etymologically linked to the Greek verb *hermeneuô* and the Greek noun *hermeneia*. *Hermeneuô* refers to the

act of explaining, expressing, and translating; *hermeneia* is an interpretation or translation. The word “hermeneutics” can also be linked to Hermes, who was in Greek mythology the messenger of the gods and the one who not only transmitted but also explained or translated their messages for humankind. The verb *hermeneuō* thus refers to activities which are typical for all human beings. Humans are interpreting beings, that is, beings that experience consciously, interpret their experiences, try to give meaning to them, and express these interpretations and meanings in language. In a certain sense, the whole of human culture can be understood as the outcome of the interpreting way of existing that is so typical for humankind. “Hermeneutics” is then the discipline that reflects on human beings qua interpretative. It is an interpretation theory. As such, it is of course at least as old as Western civilization. The need for hermeneutics emerges from the moment a culture ascribes authority to a body of texts which are handed down from the past. For, when a culture does this, it is unavoidably confronted with the problem of the gap which separates present-day readers of these authoritative texts from the time and context in which these texts were written down. This gap results from the fact that history inevitably goes on and that things inescapably change. As a result, presuppositions of the authors of a culture’s authoritative texts are most often no longer shared by those who read the texts in a later age, and things which were self-evident and unquestionable at the time that the texts came into being have become strange and objectionable for later readers. But precisely in so far as a culture’s identity is founded on these texts that shape private and public life to a considerable degree, it cannot simply dismiss them as distant relics of the past without relevance to the present. This is why the issue of how these texts should be interpreted and understood becomes inescapable. This happened in ancient Greece, where the age-old narratives, and in particular Homer’s work, were judged by later generations to contain acts that were morally reprehensible. The same was the case in Alexandria among educated Jews, like Philo

of Alexandria (c. 25 BCE–50 CE), who felt uneasy about the all too anthropomorphic picture of God in their Scriptures. Also, the rabbis were confronted with the issue of how to apply the Scriptures to the present-day situation, which often posed new challenges unknown at the time when the texts were first written down. It may not come as a surprise then that, both in ancient Greece and in Judaism, hermeneutics emerged, that is, reflection on how to interpret authoritative texts. Christianity, in which the Greek and Jewish heritage merged, of course inherited the problem of how to interpret old texts, especially because it claims to offer a *new* interpretation of the Hebrew Scriptures in light of the Christ event. Early Christian reflection on this issue eventually culminated in the publication of *De doctrina christiana* by Augustine (354–430). (For an extensive overview of the early history of hermeneutics, see the second chapter of (Jeanrond 1991).)

The Emergence of Philosophical Hermeneutics and the Transition to a Hermeneutical Philosophy

Until the end of the eighteenth century, there were a number of specialized hermeneutics, each with a rather limited scope and concerned with formulating rules to guide the interpretation of a particular set of texts. Biblical hermeneutics, for instance, dealt with the interpretation of biblical texts, and legal hermeneutics dealt with legal texts. It was thought that the special character of, for instance, the biblical text as revealed by God necessitated separate rules to interpret it. This changed with Friedrich Schleiermacher (1768–1834) who conceived hermeneutics as the discipline which should deal with the understanding of texts *in general* and who denied the need for a special hermeneutics when reading the Bible: no matter whether we read a biblical text or any other text, the same rules should apply. This also entails that the hermeneutical problem, as we have sketched out in the previous section, pops up, not only when we read certain authoritative or classic texts, but each time when we read a text.

Or, to put it differently, the hermeneutical problem has a universal scope, and therefore we need a general theory of what it means to understand a text. Schleiermacher was the first to offer such a theory and can, for this reason, be designated as the grandfather of contemporary hermeneutics. Yet, this innovation remained relatively unnoticed, and it was only toward the end of the nineteenth century that hermeneutics as a *general* theory of understanding was revived. This was the merit of Wilhelm Dilthey (1833–1911), who conceived hermeneutics as a foundational theory for all the humanities (in German: *Geisteswissenschaften*, in French: *les sciences humaines*), a foundation which was urgently needed to be able to respond to the impact of the natural sciences, which understood themselves as the only way to truth and objective knowledge, dismissing the humanities as inferior disciplines. Dilthey attempted to secure a role for the *Geisteswissenschaften* by distinguishing between their supreme *verstehen* (interpretative understanding) and the ordinary *erklären* (causal explanation) of the natural sciences. The concern to counter nineteenth-century positivism was also shared by Edmund Husserl (1859–1938), the founder of phenomenology, who attempted to safeguard the independence of philosophy via the claim that philosophy should concern itself with the role played by the human subject in the constitution of *all* knowledge, both in the humanities and in the natural sciences. Phenomenology was transformed into a completely hermeneutical philosophy by Martin Heidegger (1889–1976), Husserl's most important student. It was Heidegger who established hermeneutics as we know it today. Many basic ideas that are common sense for hermeneutical thinkers were developed by Heidegger. In this regard, we can, for instance, refer to the view of language as not merely an instrument to express prelinguistic thoughts but as the very medium of thinking itself and to the stress on the decisive role of presuppositions in understanding as well as the circular character of understanding, the so-called hermeneutical circle (see below Section “[The Hermeneutics Circle](#)”). This suggests that if Schleiermacher was the grandfather of contemporary hermeneutics,

Heidegger was its father. After Heidegger, hermeneutics was developed further, first, by Heidegger's disciple Hans-Georg Gadamer (1900–2002) and, subsequently, by Paul Ricœur (1913–2005). Ricœur's merit was that he developed a hermeneutics that aims at recovering the meaning of the tradition (as Gadamer aimed to do as well) while also being critical of the tradition. This move beyond Gadamer had become necessary by the critique of Jürgen Habermas (b. 1929). According to Habermas, Gadamer's hermeneutics ran the risk of merely continuing the oppressing elements of tradition. (For further details on Schleiermacher, Dilthey, Heidegger, Gadamer, and Ricœur, see Chap. 3 of (Jeanron [1991](#)).) A prominent contemporary hermeneutical philosopher is Gianni Vattimo (b. 1936), who draws on the work of Heidegger, Nietzsche, and Gadamer.

The Emergence of a Hermeneutical Theology

Hermeneutics and Christian theology are inextricably bound up with each other. As previously noted, Christianity was, from its beginnings, confronted with the question how the texts of the Bible were to be understood. Yet, a theology which explicitly understands itself as being hermeneutical has only come into existence in the course of modernity when, thanks to the work of the aforementioned philosophers, continental philosophy became conscious of the linguistic character of every experience of reality. As a result, hermeneutics is no longer the specialized study of particular texts (as it was before Schleiermacher) and also no longer that part of philosophy which concerns itself with the study of the interpretation of texts in general (as it still was for Schleiermacher), but the discipline which makes clear that humans are interpretative beings, that being human means living an interpreting existence (cf. Section “[The Problem of Hermeneutics](#)”). In the wake of the developments wrought by the aforementioned philosophers, Christian theologies that explicitly understand themselves as hermeneutical have

also come into being. This first happened in the Protestant tradition, with the first major step in this direction having been taken by the Lutheran theologian Rudolf Bultmann (1884–1976), who fell back on Schleiermacher, Dilthey, and Heidegger. Bultmann has presented the basic principles of his hermeneutical theology in an article which was published in 1950 in the *Zeitschrift für Theologie und Kirche* (Rudolf 1950). Following the lead of Bultmann and his disciples, like Ernst Fuchs (1903–1983) and Gerhard Ebeling (1912–2001), as well as in the wake of the Second Vatican Council (1962–1965) in its turn to the world, hermeneutical theologies also came into being among Catholic theologians. In this respect, we can refer to Edward Schillebeeckx (1914–2009) (Schillebeeckx 1972), Francis Schüssler Fiorenza (Schüssler Fiorenza 2002), and David Tracy (Tracy 1989). More recent developments include Ricœur becoming the most important source of inspiration for hermeneutical theologians (cf. Geffré (1983) and Geffré (2001)) and the impact of deconstructionist thought, which was founded by Jacques Derrida (1930–2004) and has given rise to attempts, by, for instance, John D. Caputo (Caputo 1987) and Caputo (2000) and Richard Kearney (Kearney 2001), to integrate deconstructionism into the legacy of hermeneutics. Against this, other theologians, like Lieven Boeve, have defended that these attempts are not radically hermeneutical enough because they do not take sufficiently into account the particularity of religious narratives and traditions. Being radically hermeneutical entails, Boeve claims, that the deconstructionist search for universal, but empty and formal, structures should be abandoned. Religious truth happens, not despite of, but thanks to particularity (Boeve et al. 2005). This does not mean, however, that all theologians have adopted philosophical hermeneutics/hermeneutical philosophy. Ever since Karl Barth (1886–1968) rejected the hermeneutical tradition begun by Schleiermacher because he considered it to be a threat for the recognition of the Bible as God's self-revelation, there has been a strong line of theologians denying the importance of a general, philosophical hermeneutics

or hermeneutical philosophy for theology. As pointed out by Jeanrond, even Bultmann's students Fuchs and Ebeling moved in the direction of a Barthian "inner-theological hermeneutics." (For the debate between Bultmann and Barth on hermeneutics and its aftermath, see Chap. 6 of (Jeanrond 1991).) In the same line, we can also situate George Lindbeck (b. 1923), Hans Frei (1922–1988), and other theologians connected to the so-called Yale School of theology, all of whom reject the Enlightenment belief in the universality of reason which would enable *Verständigung* (agreement) across all borders. Of course, this does not mean that these theologians do not accept the need for interpretation, but they claim that theologians should concern themselves with a *specifically theological* hermeneutics, which aims at the *intra-textual* interpretation of Christian texts. (See for further details on this Sect. 7.1 in Jeanrond (1991) and Schüssler Fiorenza (2002).) Moreover, the rejection of the universalist claims of reason and the stress on the irreducible particularity of religious narratives and traditions would probably also be shared by many theologians, like Boeve (Boeve 2005), who nonetheless, to put it in the words of Jeanrond, "favour an open-ended dialogue between Christian interpreters and other thinkers interested in hermeneutics" (Jeanrond 1991). This suggests that the distinction in contemporary theology between a "Bultmannian" line (which holds on to the attempt to reach universal *Verständigung*) and a "Barthian" line (which stresses the specificity of the Christian "grammar") should not be considered as being absolute. While Christians may in fact use a particular grammar, this does not entail that they should not try to reach *Verständigung* with non-Christians: it is always possible to translate. But this is only possible to a certain degree: absolute *Verständigung* is impossible. A language can never be rendered into another without at least some of the nuances or meanings being lost. The same is the case with Christianity: Christians can and should explain what is at stake in Christianity but can only do so to a certain degree; to grasp what it is all about in Christianity, one has to experience Christianity *from within*. The distinction between the

“Bultmannian” and “Barthian” line then concerns a different emphasis: “Bultmannians” will stress the explainability of Christianity while “Barthians” will stress what remains inexplicable for those who are not involved in the mystery of which Christianity speaks.

The Hermeneutical Circle

One of the most important concepts, if not the most important concept of philosophical hermeneutics as it has been adopted by the hermeneutical theologians is without doubt that of the “hermeneutical circle.” (a) In a primary and restricted sense, the concept refers to the dialectic between the whole of a text and its parts: we can only understand the whole of a text by reading its different parts but at the same time the different parts only receive their meaning by their place in the whole. This suggests that the “whole” and its “parts” both inform and elucidate the other and as a consequence, what we have here is actually a never-ending hermeneutical spiral. (b) In its general sense, however, the hermeneutical circle/spiral refers to the interaction between a text and its readers. Readers cannot but approach a text from their particular pre-understanding, that is, their questions, concerns, expectations, and prejudices, which will color how they will read the text. On the other hand, however, a text always has a certain objectivity and therefore resists to a certain degree to our attempts to mold it completely in line with our pre-understanding: there are limits to the interpretations allowed by the text. This is what hermeneutics means when it speaks about reading as a “transformative” act: by reading a text, that text questions and changes our pre-understanding. Furthermore, what is the case when we read a text is also applicable with what we experience in general. Hermeneutics rejects any clear-cut distinction between experience and interpretation and stresses that experience and interpretation go together: experiencing is always interpreting, when we experience reality we do so from within a particular pre-understanding. It is not the case

that we first experience “pure,” “non-interpreted” facts and that only afterward, we integrate these facts into a theory or frame of interpretation. It is precisely the other way around: what we experience as facts is to a large degree determined by the theory with which we approach the world. Most often, we only see what we are expecting to see or have learnt to see. The knowledge we already have acquired, the models, schemes, and categories which we already have and which are the result of previous experiences, determine the way we approach the world, and we will always attempt to integrate new experiences in that already-existing framework. But at the same time, experiences also challenge our frame of interpretation and this sometimes to such a degree that only a radical reorientation of that frame makes it possible to deal with the newness we experience. All this shows that hermeneutics rejects any naïve empiricism which considers the human mind as a “mirror of nature,” while, on the other hand, not falling victim to a pure subjectivism and relativism because it accepts the stubbornness of reality, which cannot be reduced to whatever we make of it but always continues to question our interpretations and theories. (c) The hermeneutical circle can also be applied to the relation between a religious tradition and contemporary religious experiences. From the given that experience and interpretation always go together, it follows that the distinction between a believer and a nonbeliever is not merely a matter of interpreting the same experiences differently, as if the believer and the nonbeliever share the same experiences and the believer, in contrast to the nonbeliever, is making all kinds of fanciful interpretations of what he or she experiences. To a certain degree, the believer and the nonbeliever have different experiences because they approach the world from within different frames of interpretation. This shows that a religious frame of interpretation is important in order to have religious experiences: religious experiences do not occur out of the blue but can only take place when people share in a tradition which gives them a religious way of looking at things. This entails that being part of a community in which a religious narrative is

brought into practice is of utmost importance to have religious experiences.

Hermeneutics and Natural Science

As the examples of Dilthey and Husserl suggest, the hermeneutical tradition is rooted in a countermovement against the all-pervading scientism of the Enlightenment as it reigned supreme in the positivism of the nineteenth century. Hermeneutics began as part of Romanticism, which was an attempt to protect the daily life world and the reflection on it against the invasion by a modern natural science which understood itself in an aggressive way as the sole way to truth and objectivity. As the examples of Dilthey and Husserl show, hermeneutics did this by making the natural-scientific understanding of truth in terms of objectivity and correspondence subservient to a more original and more fundamental type of truth which can only be grasped by the philosopher. This kind of distinction is also to be found in the work of Heidegger, who considered truth qua correspondence between proposition and thing as only a secondary type of truth, subsidiary to a more fundamental truth qua *Weltoffenheit*, that is, truth qua horizon in which the many factual truths can appear. When Gadamer adopted Heidegger's distinction between truth as opening and truth as correspondence, he did this in order to confirm, as Dilthey and Husserl had done before him, the superiority of the humanities vis-à-vis the natural sciences, who are in need of legitimization by "a thinking which relates them back to the *logos*, to the common consciousness expressed in the natural-historic language of a society and in its shared culture, whose continuity . . . is assured precisely by the human sciences and by philosophy in particular" (Vattimo 1994). In this way, however, Gadamer leaves unquestioned the opposition between *Naturwissenschaften* and *Geisteswissenschaften*, and, by doing so, he actually subscribes to the positivist-Enlightenment view of science which considers the natural sciences to be an exceptional human activity, though it is, according to Gadamer, an

activity which has to be controlled by practical reason. Neither does Ricoeur question the distinction between exact and interpretative sciences because his hermeneutical method is explicitly developed with only the humanities in mind (O'Murchadha 1997). It is, however, precisely the very opposition between natural science as exact and the humanities as interpretative that has become questionable today. This is the case because recent developments have shown that the positivist-Enlightenment view of science is no longer tenable, though it still is the way many scientists and ordinary people think of science. The positivist-Enlightenment view entailed the conviction that science is the "mirror of nature" which offers humankind a unique and privileged access to reality as it really is in itself. Science was thought by the positivists to be an exceptional human activity: a disinterested search for knowledge, objective, neutral, value-free, and primarily theoretical-conceptual. A first development which contributed to the problematization of this rather naïve view of science was the work of a number of philosophers of science in the Anglo-Saxon tradition, namely, Karl Popper (1902–1994), Thomas Kuhn (1922–1996), Imre Lakatos (1922–1974), and Paul Feyerabend (1924–1994). For instance, Kuhn, in his *The Structures of Scientific Revolutions* (1962), negated the common view of science as the linear accumulation of ever more accurate knowledge. Instead, he defended the view that in the development of science periods in which scientists work within a paradigm alternate with periods of crisis in which a paradigm shift takes place. These ideas of paradigms and paradigm shifts have been applied to the history of theology by Hans Küng and have also been linked to Heidegger's truth as opening. Also, the development of the so-called science studies, which investigate science from a sociological, historical, and/or cultural perspective, has contributed to the critique of the positivist-Enlightenment view of science. It is argued that the sciences have not developed in isolation from their historical, political, social, and cultural context and that such sciences are not so objective, neutral, and value-free as the positivist-Enlightenment view

naïvely thought. The critiques have even gone so far as to claim that science is actually deeply gender-biased and Eurocentric. This post-positivist view of science, which has come into being in the wake of the aforementioned developments in contemporary thought, suggests that it is no longer possible nor desirable to uphold the traditional distinction between *Naturwissenschaften* and *Geisteswissenschaften* when it comes to their interpretative character. Fundamental insights of hermeneutics – such as the impossibility of a noninvolved neutral observer, the theory-ladenness of all observation and experimentation as well as the nonexistence of “pure” facts (see Section “[The Hermeneutical Circle](#)” above) – not only apply for the humanities but for the positive sciences as well. Despite this, however, contributions in forming a hermeneutical philosophy of science (by, for instance, Joseph Kockelmans and Patrick Heelan) have not yet entered mainstream philosophy of science and have until today remained largely invisible for the broader philosophical and theological community. (For examples of philosophical reflection on science from a hermeneutical point of view, see, for instance, Kockelmans (1993), Crease (1997), Ginev (1997), Heelan (1998), Fehér et al. (1999), Ihde (1999), Babich (2002), Kockelmans (2002), Eger (2006)).

Science and Religion from a Hermeneutical-Theological Perspective

The conclusion that even natural science shares in the interpretative character of human existence also unfolds a new perspective on the so-called conflict between science and religion. In particular, the interpretative character of natural science is bringing natural science and religion much closer to each other than ever possible within a positivist view. Rather than considering natural science as the sole way to objectivity, truth, and knowledge on the basis of which we have to dismiss religion as belonging to an earlier phase of human civilization, we have to

recognize science and religion as two activities of humankind by which it attempts to deal with the mystery of its being in this world. This suggests that at the basis of both science and religion is a shared sense of wonder and amazement. In this respect, we can speak, following Boeve, of “a ‘kind of unity in tension’ that characterizes both faith and science, that is, a fundamental passivity, openness, receptivity, which drives both faith and science forward.” Science and religion, moreover, also share another structural similarity, namely, their “pathos for truth, the urge to search for meaning and understanding.” At the same time, however, a hermeneutical-theological perspective on the relation between science and religion will also stress the irreducible “specificity and incommensurability” of both. They may both be interpretative enterprises which share their sense of wonder and pathos for the truth; this does not mean that we should strive for an integration of them. This suggests that a hermeneutical-theological perspective on the relation between science and religion only allows for a moderate or limited dialogue between science and religion, that is, a dialogue that limits itself “to situat[ing] the independence of both language registers while seeking structural affinities.” Only in this way, Boeve claims, unnecessary conflict between and hegemonic unity of science and religion can be avoided, and he concludes that what the dialogue between science and religion has to do is “to reflect . . . on what it means to be a human person in today’s multifaceted world” (Boeve 2007).

Cross-References

- [Biblical studies](#)
- [Classics](#)
- [Experience](#)
- [Humanities](#)
- [Meaning, the Concept of](#)
- [Phenomenology](#)
- [Philosophy of language](#)
- [Religious experiences](#)
- [Scientism](#)

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Hierarchy

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Hierarchies order entities, processes, or realms into a system of levels. The ordering principle ("is-a-part-of" for the *compositional hierarchy* and "is-a-kind-of" for the *subsumptive hierarchy*) is transitive across levels. In both of these hierarchies, when used to model systems, higher

levels control (regulate, interpret, integrate, harness) lower levels, whose behaviors are made possible by properties generated at still lower levels. It is important to realize that only some users of hierarchical forms would insist that particular levels exist in actuality. Levels are discerned from hierarchical analysis, aimed at discovering Nature's "joints" with respect to given projects.

High Art

► [Art, Studio](#)

Highest Point

► [Pāramitā](#)

Hindrances (Buddhist)

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Related Terms

[Nīvaraṇa](#) (Pāli); [Nivāraṇa](#) (Sanskrit)

Description

The approach taken in the Buddhist traditions to meditation and mental culture is fairly methodical, a feature exemplified in the singling out of specific mental states or conditions as "hindrances" to the cultivation of meditative calm and insight (► [Buddhist Meditation Practices](#)). Buddhist texts identify five particular mental states as "hindrances," in the sense that these five prevent the gaining of deeper levels of

concentration and therewith also obstruct the growth of wisdom. The presence of any of these five hindrances is held to obstruct the proper functioning of the mind to such an extent as to make it difficult to remember properly what happened earlier or to understand what is for one's own benefit or for the benefit of others.

The standard list of these hindrances to the development of meditation covers the following five:

- Sensual desire
- Ill will
- Sloth and torpor
- Restlessness and worry
- Doubt

The above listing of five hindrances actually comprises seven distinct mental qualities. The circumstance that these are subsumed under a fivefold presentation would be due to the similarity in effect on the mind of sloth and torpor as well as of restlessness and worry.

The nature of these five hindrances finds illustration in two sets of similes. The first set depicts a bowl filled with water that is used to see the reflection of one's own face (Feer 1884–1898, V, 121). In the context of this simile, the effect of sensual desire is similar to water that is mixed with dye, ill will resembles water that is heated up and boiling, sloth and torpor is comparable to water overgrown with algae, restlessness and worry is like water stirred by the wind, and doubt is like muddy water placed in the dark. In each of these five cases, one is unable properly to see the reflection of one's own face.

This set of similes thus illustrates the effect each hindrance has on the mind: sensual desire colors the way one perceives things, with ill will one gets quite literally heated up, sloth and torpor result in stagnation, restlessness and worry toss the mind around, and doubt obscures.

The other set of similes illustrates the absence of the hindrances (Carpenter and Rhys Davids 1890–1911, I, 71). In this set, overcoming sensual desire is compared to being relieved from debt; removing ill will is like recovering from a disease; abandoning sloth and torpor is similar to being released from prison; going beyond

restlessness and worry is as if one has been liberated from slavery; and leaving behind doubt is akin to having crossed a dangerous desert safely.

In this way, this set of similes indicates that sensual desire affects the mind comparable to being heavily in debt, ill will afflicts body and mind like a disease, sloth and torpor imprison the mind, the agitation of restlessness and worry can completely control the mind, and doubt leaves one in a condition of deplorable insecurity.

In the case of the first of these five hindrances, according to Buddhist meditation theory, close inspection shows that sensual desire arises not simply because of external stimulation, but to a considerable extent is the outcome of an inclination of the mind toward searching for satisfaction in sensual pleasures. The dynamic of sensual desire is such that, with every instant of its satisfaction, the tendency to have sensual desire becomes strengthened. Hence, the way to inner peace, according to the early Buddhist analysis, requires overcoming this never-ending vortex of desire and gratification and thereby gaining inner freedom from its incessant pull.

According to an intriguing analysis provided in one passage, the search for satisfaction through a partner is intrinsically related to one's own identification with the characteristics and behavior of one's own gender (Morris and Hardy 1885–1900, IV, 57). In other words, to search for union externally implies that one is still caught up in the particulars of one's own gender role and identity.

Methods for going beyond sensual desire are thus a diminishing of one's sense of identification with external aspects of one's gendered behavior and a sober appreciation of the nature of the body as something whose beauty is only skin-deep. Moreover, developing an inner sense of peace and joy will counter one's tendency to search for happiness outside.

In the case of ill will, patience needs to be developed, ideally coupled with a closer examination of what tends to arouse one's ill will. Here, too, the sense of identity often plays a considerable role in stimulating anger and ill will. An important remedy for overcoming ill

will, mentioned frequently in Buddhist texts, is the development of loving kindness (Sanskrit *maitrī*, Pāli *mettā*), an attitude of friendliness and companionship extended impartially toward all living beings, without making any distinctions or exceptions.

Sloth appears to stand predominantly for mental boredom and lack of inspiration, whereas torpor would correspond to physical lethargy, such as may manifest after overeating, oversleeping, etc. Besides the self-evident need to avoid overeating, oversleeping, etc., a remedy to sloth and torpor could be found in making an effort and in developing clarity of the mind.

Restlessness may arise because of excessive striving and a pushy attitude, whereas worry is usually related to concern with something not done properly in the past or something still to be done in the future. In both cases, calming and tranquilizing the mind will help remedy the situation, together with focusing on the present moment instead of getting lost in the past or in the future.

Doubt as a hindrance is mainly due to lacking a clear understanding of the difference between what is wholesome or skilful and what is unwholesome or not skilful. To overcome doubt, introspective analysis helps discerning the skilful from its opposite. This takes place in particular through investigation of phenomena, the second of the seven so-called factors of awakening, *bojjhaṅga*.

These factors of awakening present a set of mental qualities diametrically opposed to the hindrances, being of particular relevance to progress to awakening. The first factor in this set is mindfulness, followed by investigation of phenomena, energy, joy, tranquility, concentration, and equanimity. Overcoming the five hindrances and developing the seven factors of awakening, then, could be considered the heart of Buddhist meditation practice.

Cross-References

- [Passion and Emotion, Theories of](#)
- [Sin \(Vice, Human Limits, Negativity\)](#)

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Hinduist Anthropology

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Related Terms

[Anthropology in Hinduism](#)

Description

Interwoven in his creation, the Spirit (ātman or puruṣa) is beyond destruction. No one can bring to an end the Spirit which is everlasting. For beyond time he (ātman or puruṣa) dwells in these bodies, though these bodies have an end in their time; but he remains immeasurable, immortal (The Bhagavad Gītā, 2, 17–18)

This quote refers to the Hindu philosophical understanding of Man as a compound of two elements: (1) the eternal element either called ātman or puruṣa and (2) the mortal element consisting of matter or nature often referred to as prakṛiti. The latter is something you should not strive for, idolize or worship, because that will carry you away from the process of realization. Instead, it is important to ignore its ongoing call

for needs and instead concentrate on what really matters: the understanding of ātman as identical with brahman, the absolute, one supreme, all-pervading Spirit. This realization leads you to moksha, the liberation of rebirths (saṃsāra) and all that binds you to the profane life. Yoga is seen as a method of both realizing the ātman-brahman identity and restraining the bodily needs or mentally disorders coming from the senses, but it also outlines an anthropology, where the ideal seems to be asceticism and a world and life denial ethics. This outlined anthropology is developed in the Upanishads from around 600–300 B.C.E. and further elaborated in different Hindu philosophical schools called the Darśhanas.

But the development of a special Hindu anthropology is an ongoing process modified to the new circumstances, and in later texts, we also find an explicit emphasis on the worldly life as well. Here, the primary goal (moksha) is woven into a worldly committed ethics which could be called “one thing at the right time and place ethics.” This has a strong impact on the understanding of Man because, first of all, it emphasizes that the goal or ethics (dharma) of life depends on varnāśramadharma, the social class (varṇa) you belong to and your stage of life, implicitly also your sex. Secondly, it underlines the importance of human existence as such.

The Hindi poet Tulsidas (c. 1532–1623) rewrote the Sanskrit text Rāmāyana to Hindi in the sixteenth century and gave the text the name Rāmācharitamānas. It is today one of the most influential texts in popular Hinduism, especially in North India, and the following quotation gives an example of how the understanding of the human is seen as a necessary stepping stone for attaining moksha:

It is a great and good fortune that you have secured a human body, which – as all the scriptures declare – is difficult even for heavenly beings to attain. It is a tabernacle suitable for spiritual discipline and the gateway to liberation (Rāmācharitamānas, pp. 720–21)

This means that, while the Hindu tradition upholds liberation (moksha) as the ultimate goal, it also underlines that human existence is the only gateway. But only if you follow the specific

dharma in relation to varna and āśrama – which can be called a relativistic dharma.

Four Goals of Life

The relativistic dharma mentions four goals of life or ends, which can be seen as necessary steps toward the ultimate one. They are meant to cultivate the mind in relation to the position you have in the world according to your stage of life (āśrama), but they are also meant to legitimize worldly needs and strives and, in doing so, to underline the need for engaging in the world before turning the back to the world. The four goals or ends are called *purusārtha* and are as follows: *kāma* (pleasure), *artha* (wealth or worldly success), *dharma* (ethic, right conduct), and *moksha* (liberation from *samsāra*).

In a person's first stage of life as *brahmacārin* (student), the primary goal is to get to an understanding that dharma is the fundamental guideline for your life and that dharma has both a universal expression as well as a relativistic one. It can be called an introduction to the core of the Hindu tradition.

The next stage of life as *gṛhastha* (male householder) or *gṛhīni* (woman householder) in the *dharmaśāstra* literature is seen as the most important stage of life because the other stages of life are depending on it. To fulfill this stage of life, it is necessary to be engaged in the world: get children, work hard, socialize, and so forth. And it is in this stage of life that *kāma* and *artha* are seen as primary goals. The Hindu recognition of *kāma* and *artha* as valid human pursuit tells strongly against the common characterization of Hinduism being life negating. It is true that Hinduism does not uphold these two goals as the highest goals – and they should always be strived for in the light of conducting dharma – but the goals at least approve fulfilling some bodily pleasures and a strive for wealth. The latter is implementing a strong working ethics, which can be seen among Hindus all over the world.

In the last two stages of life as *vanaprastha* (a forest dweller) and as *samnyāsin* (ascetic), the

primary goal is *moksha*. But to gain this goal, the Hindu tradition underlines that it is necessary to have been living through the other stages of life with other ideals of life. In other words, you cannot leave the desire for fulfilling your pleasures, and the desire for achieving material gains before you know the limits of these goals:

Not by non performance of actions does a man attain freedom from action, nor by mere renunciation of actions does he attain the spiritual goal (Bhagavad Gītā, 3, 4)

The Unclean Body

As an overall framework, the Hindu tradition sees the human as a microcosmos containing all the elements and processes of which macrocosmos or the Universe is constituted, including the transcendent or divine entity. This leads to a categorization of the body as consisting of two different substances: matter and spirit. While spirit is the everlasting and clean part, matter is the ever changing and unclean part. To cultivate spirit, it is important to cultivate the matter as well. That can be done by rituals through which the unclean substances of matter are purified or by isolating a person or persons in impure periods (menstruation, death in the family, childbirth).

Yoga can be seen as a thoroughly thought out method of cultivating the body or isolating the two substances of the body. The method or methods that are pointed out include bodily positions, hand gestures, the understanding of the subtle body, and breath control.

Cross-References

- [Anthropomorphism](#)
- [Biology of Religion](#)
- [Body](#)
- [Personalism](#)
- [Philosophical Anthropology](#)
- [Psychology of Religion](#)
- [Reality in Buddhism](#)

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contexts, however, are used somewhat interchangeably, and cytology in medical terminology is also used to refer to cells used in pathology which can be easily removed from the body for microscopic examination such as vaginal or oral scrapings. Most of the earlier work in histology and cytology focused on describing structure, but these disciplines are increasingly integrated with genetic, biochemical, and molecular studies on cells and tissues. The “cell theory” is the major generalization in this area and holds that “all living things are made up of cells and the products of cells.”

Self-identification

Science

These disciplines unashamedly identify as sciences with their emphasis on empirical observations of cells and tissues.

Characteristics

Histology and cytology are distinguished by the emphasis on the microscopic structure of cells and tissues.

Relevance to Science and Religion

These disciplines are not generally interested in the study of “science and religion” scholarly or otherwise, although some practitioners of the disciplines may be and may seek to find “god” in the amazingly detailed structure of cells as seen in the microscope.

Sources of Authority

Repeatable and verifiable observations are the cornerstone of histology and cytology, and such data are published in peer-reviewed journals and are summarized in numerous student texts for science and medical students.

Histology, Cytology

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Related Terms

[Cells; Tissues](#)

Description

Histology and cytology seek to describe especially the structure of the tissues (histology) and cells (cytology) of animals and plants especially at the microscopic level. Technically, histology (Greek, *histos* = woven fabric = tissue) is the study of the macrocellular arrays of cells which make up animal and plant tissues, and cytology (Greek, *kutos* – *cytos* = receptacle = cell) refers to the study of cells. The two terms in some

Ethical Principles

As with most branches of science, the ethical principle underlying these disciplines is full reporting of observations and methods in anticipation that others can reproduce and thereby corroborate them.

Key Values

Curiosity, betterment of the human condition, detailed observation.

Conceptualization

Nature/World

Physical matter and the energy needed to keep it organized.

Human Being

A member of the species *Homo sapiens*.

Life and Death

The “cell theory” holds that “all living things are made up of cells and the products of cells.” Life is a product of preorganic evolution plus organic evolution and natural selection. All present life arises from preexisting life by cell division, and life consists of metabolism, homeostasis, and reproduction. Death is the irreversible cessation of these functions in the individual organism.

Reality

Not specifically dealt with as such but consistent with other science – empirical, reproducible observations

Knowledge

Nature of knowledge not specifically dealt with but only empirical observations are considered “real.”

Truth

Empirically derived knowledge is our best approximation to truth.

Perception

Is the conscious sensation the physical senses produce. In histology and cytology in particular, there is an awareness that what is seen in microscopic images may only imperfectly correspond to the living entity, so our perceptions may be incomplete in this sense.

Time

Not dealt with as such but consistent with scientific world view.

Consciousness

An “emergent” property of the human brain arising from neural complexity.

Rationality/Reason

Our key tool in understanding the physical world and manipulating it to our own ends. Adherence to rules of evidence, objective reporting, and conclusions supported by evidence.

Mystery

Not a useful concept in dealing with cells and tissues. This word may be used loosely to describe something presently unknown, but there is an assumption that if it is part of the physical world, it can be known and eventually will be. If it is unknowable, it is not relevant to science and is probably fantasy as well.

Relevant Themes

Histologists and cytologists are centrally interested in microscopes and microscopy both at the light and electron levels since these instruments produce much of the data we have about cellular structure and function. Frequently in the past, the hand of God has been seen in these images, but this is increasingly a “god of the gaps.” As with much of science, our increasing understanding of cellular function and capacity to manipulate to our own ends (genetic engineering, stem cell technology) brings ethical concerns and concerns that we are “playing god for some people.”

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Historical Theology

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Description

Christianity cannot but refer to the event giving rise to its history, the coming of Christ in the world. In the light of the biblical view of history – that assigns even a revelatory value and meaning at the time, the reinterpretation of this event allows us to consider the whole human story, since that moment, as Christian time.

Historical Theology (HT) focuses its interests on the theological doctrines and their developments over the centuries as an outcome of both the biblical interpretation and the consolidation of the ecclesiastical tradition. In other words, following the history of the Christian thought, the HT is mainly interested in the history of the *making* of speculative theology. Studying theological issues, HT takes into account social, historical, and cultural ideas and contexts in which they arose in space and time; as far as possible, it looks for a pure objective review (Hart 2000).

Hence, HT is epistemologically different from the *History of Theology*, which is concerned with

the historical development of theology and analyzes the most significant movements and personalities marking the history of Christian thought and orienting it toward a specific direction. This is a valuable approach but, critically speaking, merely defines (or tell) a story, leaving theological issues open.

HT is also different from the *Theology of History* which, according to a definition by W. Kasper, is rather a reflection on the *structures* of Salvation history and their historical and theological consequences (Kasper 1964). Then, its aim is to develop deeper theological understanding of History. In this way, theological statements are used as criteria for assessing *what has happened*.

Focusing on *Theology in History*, HT is the only theological discipline that, by nature, considers the history as a *theological history*, that is, a *locus* where the understanding of the faith in the diversity of the *thought-forms* of its ages is processed (Lafont 1994). It does not describe nor analyze the past *as past* but, remaining in the present, it allows the scholar to approach customs and modes of thought in some cases foreign or completely far away from his own context. It is a discipline that keeps memory alive, recalling the tradition and its parts, sometimes still valuable in our contemporary era but too often forgotten.

At least as currently understood, HT finds its origin in the late nineteenth century, within German theological (Protestant) Schools; its final development and dissemination took place thanks to the French and German Catholic Schools of Theology in early twentieth century.

Protestant thought aroused considerable debates, especially around both the meaning of the *authenticity* of Christianity and the bond between modern Churches and the primeval Christian community. Important consequences of these debates were both the gradual acquisition of an *historical consciousness* and a clearer and clearer understanding of Patristic doctrines, and their supposed alteration in the Middle Ages. During the nineteenth century, especially in Germany, HT research area enjoyed further developments thanks to the exegetical schools, interested in the *History of the Dogma*.

Affirming that the doctrinal formulations were also a result of social and cultural conditions, these Schools stated that a survey done in accordance with the criteria of historical analysis allowed to consider these doctrinal formulations as inappropriate to the changed conditions of the Church in modern times. Therefore, the Church had basically the task of reformulating these doctrines in order to make them more understandable.

Originally established by G. S. Steinbart, these ideas were received in the writings of F. C. Baur, the founder of the Protestant exegetical School of Tübingen. Influenced by the ideas of Schleiermacher and Hegel, in his book *Die Lehre von der christliche Dreieinigkeit Menschwerdung Gottes und Entwicklung in Ihrer geschichtlichen* he established a new standard for the study of the history of Christian doctrine. After him, the ideas of Steinbart reach their maturity in Adolf von Harnack, and, especially, in his *The History of Dogma*. Von Harnack stated that the dogma, considered *in se*, was not a genuine Christian concept, but derived from the progressive move (or detachment) of Christianity from a Palestinian and Jewish environment to an Hellenistic – especially Alexandrian – one. In order to articulate the transmission of both the faith and the Gospel, in practice Christian writers absorbed the Hellenistic outlook, especially in its dialectical and metaphysical aspects. This concept led von Harnack to assert that even the doctrine of the Incarnation as a result of the Hellenistic influence should be refused, taking, on the contrary, in greater account the *historical* Jesus and the impact that both his action and his preaching had on a specific, chronologically and geographically circumscribed, portion of humanity. The removal of metaphysics from theology, he said, may produce nothing else than a greater awareness of the soteriological aspects already present in the historical life of Jesus (Gonzalez 1987).

Although this view was later questioned, its general methodological principles can still be considered valid for the approach of HT, since many aspects of the Christian faith were influenced by the Hellenistic metaphysics which must necessarily be taken into account for a more serene and complete analysis of the doctrine's

development. It must be recognized that von Harnack highlighted a fundamental element for the subsequent development of HT: History provides methods and tools useful for a better understanding of the theological thought, allowing to define the HT as a *critical consciousness* of theology.

In the Catholic area, one of the main authors of the Tübingen School was J. A. Möhler, who considered theology as a science of an external and historical reality animated by an inner principle. He explained his method and his ideas in an analytical way in the *Symbolik*, published in 1832, which generated many debates (particularly with Baur). For Möhler, HT's primary tasks are the analysis and the re-understanding of the theological tradition not as a representation of the past (nowadays elapsed and set aside), but as a living reality (Dulles 2005).

Theological ideas of different past ages are not only *past*, but they are part of a tradition that endures and lives in rituals and devotions, in the acts of Councils, in theological discussions. Then HT seeks to shed light not only on tradition – which goes beyond any possible and manifold concrete expression in history – but also on ideas and systems of theological thought, including those which are totally dependent on the *esprit du temps* and are therefore outside the contemporary context.

Beyond more specifically controversial issues, the method, along with its typical approach, is what makes Historical Theology *special*: First of all, in fact, it puts the *life* of the Christian community in the middle, examining it in all its aspects and considering it as a response to what has been received by the Christian community as *presence* and will of God.

While remaining within the boundaries of the Anselmian *fides quaerens intellectum*, it must take into account liturgy and worship, discipline and ethics, ecclesiastical organization, biblical interpretation, and theological thought. The Christian community remained true to his vocation, but his thoughts, however, assumed many forms, also as a result of historical and geographical changes. They were transcribed into the *corpus* of Christian doctrines, transfused in the

theology or *theologies* of the Christian community (or, following schisms, of one or more of its divisions).

Tradition and theology, in turn, found further fixation in dogmatic formalizations, expressions of faith of a portion of Christian people in a given context and promulgated as rules for members of the community. Apparently, the scholar may bring only an analysis of the main current or main formulations and not all the theologies and the doctrines of the Church. Therefore, the HT focuses only on the historical development of Christian doctrine – putting at the center of its attention the living but strict structure of dogma – and its main factors that, on occasions, have promoted new formulations or changes. In this sense, it offers the possibility to formulate a clear *status quaestionis* on events and circumstances that contributed to the major theological themes, helping to identify not only the subject of previous analysis or debate, but also the most significant personalities of various historical periods and their key documents.

In order to consider certain visions with equanimity – even if they are different and sometimes conflicting with each other – and without making any preliminary judgment on them, the efforts of the theologian must link with those of the historian, because in order to shed light on theology and history both the disciplines must operate in synergy. The aim is to provide a correct and vivid description made up, as far as possible, with objectivity, knowing that the *terminus ad quem* can only be defined in accordance with rigid space-time parameters: What happened in a given geographical area and in a given historical period is the edge to which the scholar of HT should strive as far as possible, balancing scientific objectivity with own personal involvement. This feature in some ways is the most difficult to define and maintain: HT is in fact necessarily conditioned by the historical period and the context of the scholar. Consequently, even though the scholar may strive to be objective, he certainly cannot be *neutral*.

It is also for these reasons that HT cannot be said simply *history*; in fact, it does not share its purposes nor it can be limited to the application of

historical investigation's criteria and sources (ecclesiastical, intellectual, political, cultural, or social). Rather, it is a peculiar form of *theology* and therefore it must consider its approach as well as its own hermeneutic method in an *osmotic* exchange with other branches of human knowledge – such as psychology, sociology, philosophy of religion – and with a strict and due attention to biblical studies. Theology is a discipline based and dependent on the Word of God, which is *beyond* any historical process and, for good reason, can judge their degrees of correctness.

For HT scholars, the Christian theology is not a *tabula rasa*, but rather a research area already occupied by traditions. Of these, in some ways, they are only caretakers and (sometimes critical) interpreters; at most, they can reform them or help reviewing them, but cannot supersede them, since freshness and newness are hidden within them, and have yet to be discovered. Therefore, in the light of new scientific discoveries, the approach of HT scholars makes possible continuous reassessment of the Christian thought.

Moreover, it makes human beings aware of origins, causes, continuities, and discontinuities of human events and ideas, relativizing in a right way what previously was seen as absolute. Above all, it is a constant reminder that human beings and their communities are *historical*.

The HT method and approach can be useful for accessing and understanding the science-religion intersection, considering conflicts and interactions arose in the course of time.

Indeed, considering the path of science, from its rise in the medieval West up to the scientific revolution, HT must regard not only major even theological shifts – marked by discoveries such as those by Copernicus, Galileo, and Isaac Newton – and the Catholic and Protestant reactions to them, but also the cultural improvement occurred during the eighteenth and nineteenth century, with the changes in geology, cosmology and biology, as well as the scientific revolutions of the twentieth century, that produced answers and reactions from both mainstream religious groups and newer movements such as evangelicalism and fundamentalism.

Consequently, for a complete and systematic analysis of the various theological positions of the contemporary era, HT must take into account even the theological implications of scientific research while evaluating recent approaches such as environmentalism, social construction, postmodernism, which are at the center of current debates.

Historical analysis, if considered from the point of view of the Christian faith and its theology, let us highlight that there are both an ultimate purpose of the historical process and a vital objective of human life, which all continuities and discontinuities of human experience make reference to.

Christian faith, in fact, cannot accept the *historical relativity* (an idea historically unverifiable but rather philosophical) as the ultimate explanation of human condition. When placed within the theological discipline, historical research is not merely a description and interpretation of the past as past, although it may be valuable. While living in his own present, the scholar of history – and especially the scholar of HT – may highlight practices and ways of thinking nowadays unknown to his contemporaries. The Church, as Hans Küng pointed out some years ago, keeps alive memory of its past but sometimes, unfortunately, loses it. It must be helped to remember the things it forgot (Küng 2000). This is the role of the historian and, more specifically, the role of the scholar of HT. In describing or interpreting ideas and practices, the scholar acts as a memory of a tradition and, as the intellectual revival movement called *nouvelle théologie* – arisen in France after the First World War – reminds us, sometimes can have a leading impact on contemporary theologies. In some cases, like the one just mentioned, a history of tradition helps making judgments about the present, to correct or rejuvenate both theological thought and religious life. Therefore, the scholar of HT must be honest about what happened, presenting evidences emerging from historical facts and not from his own concern about the present era, realizing, finally, that his attempt to be objective is related and certainly not indifferent to the Truth.

Cross-References

- [Cultural Studies](#)
- [Ecclesiology](#)

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Historiography (Classical)

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Until recently, historiography has referred simply to the “writing of history,” and is to be distinguished from the modern “science” or “academic study of history” (in German *Geschichtswissenschaft*). Historiography in Greco-Roman

antiquity sought to ascertain the rational causal connections between events of the more distant past and the immediate present by forging them as a narrative. It exposes myth decidedly as fiction. According to Aristotle, the goal of fiction, especially drama, is to articulate what can perennially happen, what are termed “paradigms.” In contrast, historiography accounts for the special, individual case (Aristotle, *Poetics*, 9). Myth explains the processes of nature and the actions of human beings in terms of the influences of the gods. It thinks in cycles of time and originates in those realms that are outside human control. Historiography, however, seeks this-worldly explanations and sees history as the totality of autonomous individual experiences, which are patterned after human design. It thinks in linear time sequences and stems from a technical way of thinking using measurable criteria. Important considerations for the historiographer are the *epos* (which relates the outcome of events), journeys of discovery (which secure the empirically determinable data about geographical areas), and the Ionian philosophy of nature (which looks for rational explanations for incidents in the world of appearances).

Herodotus (ca. 484–424 B.C.E.), the “father of historiography,” set down three goals for the discipline: (1) events should be rescued from oblivion (*memoria*); (2) only important and decisive facts should be chosen (“selection”); and (3) the causes of events, especially wars, should be explicated (“theory”). Thucydides (c.a. 455–400 B.C.E.) introduced the securing of historical data (“autopsy”) as the criterion of truth for historiography. The sites of occurrences must be investigated and the events themselves that are reported must either be experienced, or their eyewitnesses interviewed (Greek *historia*=“witnesses”). The object of this primary investigation includes the different versions of the accounts of eyewitnesses, which compares their subjective experiences as related to their memory capacity with independent reckonings of the same occurrences, as well as to prove their likelihood. The single fictive element in the account given by the historian, according to Thucydides, are speeches.

In them the motives and underlying reasons for history are to be laid bare.

In Hellenistic times, two strands of historiography were set forth: (1) melodramatic historiography, which like fiction or drama portrayed the universal validity of certain basic human situations in their true-life particularities (*mimesis*) and thus might move the reader, or viewer, emotionally; (2) pragmatic historiography, which concentrates quite strictly on the establishment of causal linkages between events. From the beginning onward two ways of selecting material could be distinguished – universal history, which deals with large spans of time and aims to connect the present with cultural and political developments in the past (e.g., Herodotus, Polybius, Livy); treatises or monographs, which illuminate specific events from contemporary history (e.g., Thucydides, *The Peloponessian War*; Sallust, *The Conspiracy of Catiline*).

Reflections concerning one’s own specialty of historiography are to be found here and there, mainly in the prefaces of historical writings (e.g., in Herodotus) as well as in chapters on methodology (e.g., Thucydides, Polybius). From Lucan can be obtained an essay on “how one is supposed to write history,” or how to manage and render materials. Only the modern “science” of history starting in the nineteenth century takes the constructivity of its own historical reconstructions as its theme.

Cross-References

- [Christianity](#)
- [Classics](#)
- [Cultural Studies](#)
- [Historical Theology](#)
- [History of Ideas \(Intellectual History\)](#)

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History

► Ecclesiology

History of Chemistry in Islam

► Alchemy in Islam

History of Ideas (Intellectual History)

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Related Terms

[Intellectual history](#)

Description

History of ideas is the interdisciplinary inquiry into the workings of human thought as it transgresses conventional categorization according to historical period, geography and ethnicity, schools and *-isms*, and the division between high and low culture. Targeting a mixed academic audience rather than specialists in a single field, the historian of ideas rejects the compartmentalization and departmentalization of post-Enlightenment thinking. Instead, the tradition examines synthetic complexes, or “unit ideas,” that may seem superficially dissimilar due to their different expression across philosophical and cultural temperaments but nevertheless possess resonant congruities.

Recent contributions of the history of ideas include the growth of humanities centers in contemporary universities, which extend the tradition’s effort to corral together scholarship in literature, philosophy, religion, foreign languages, the fine arts, and the history and rhetoric of science. The history of ideas has also raised questions about the relevance of periodicity as a substantive marker of textual and conceptual similarities and differences, advocated an approach to “comparative literature” attendant to the international and interlinguistic dialogue of ideas, and interrogated identity-based divisions of texts and cultures that can be better understood in more global contexts. The emphasis among historians of ideas on comparison and synthesis has offered an antidote to postmodern tribalism and its insistence on the logic of cultural difference.

The holistic approach to thought adopted by the history of ideas facilitates treating the methodologies of science and religion not as antithetical but as inextricable from one another, inaugurating a postpositivist approach to science that is deeply critical of the common valorization of empiricism and rationality as the sole viable modes of intellectual inquiry. The intellectual historian assumes instead that human nature and experience is vastly complex and that no element of it can be understood independent of its relations to all other things. The tradition’s

assumption of the impossibility of complete knowledge contrasts sharply with the scientific “man of action” confident in the power of human understanding to produce certainty through empirically verified knowledge.

Thus, the history of ideas proffers a critique of science as it is conventionally constructed, one invested in the discovery not merely of information but of the formative theoretical concepts that shape the gathering and interpretation of information. Prominent religious unit ideas, for instance, can structure systems of thought underlying and even enabling scientific discoveries. Science is thereby treated as an extension of metaphysics and not metaphysics’ opposite. Thus intellectual history is a way of introducing scientific invention to the conditions for its own existence and imagining the new conditions in which future inventiveness might exist.

Intellectual historians have also used scientific practices to critique the humanities, however, as in Franco Moretti’s *Graphs, Maps, Trees: Abstract Models for a Literary History* (2007). Moretti’s study bears mentioning for its assertion that the humanities might profitably adopt scientific methodologies like counting, graphing, and mapping as antidotes to the ubiquity of reading in humanist inquiry. Moretti believes that reading relies upon too limited a body of evidence insofar as it is mainly confined to canonical books and authors and unable to account for multiple texts at once. Graphs, maps, and trees, however, could unveil a mass cultural spectrum of ideas and suggest global continuities scholars are unlikely to see due to the normalizing and exclusionary influence of existing and elite transmissions of knowledge. Within the history of ideas, scientific empiricism can paradoxically be a vehicle of public opinion, an element of collective thought too commonly lost in the humanities’ tendency to focus exclusively upon ideas expressed within a small number of masterpieces composed by a few eminent writers.

The history of ideas takes inspiration from religion no less than science, however, as when it emulates certain practices in comparative religion which trace the structures underlying deeply divergent religious practices and belief

systems, and notes profound variations within presumably monolithic systems. G. B. Vico, sometimes named as an antecedent historian of ideas, wrote of theology as the “new science” of modernity. Vico’s representation of theology was an antidote to Cartesian rationalism in its own era, contending that unifying structures of thought could become apparent through the intercultural study of art, mythology, and rituals. Theology preserved an important component of thinking, one considerate of relationships between ideas, to complement the discrete and particular modes of knowledge accessed through the scientific method.

Vico’s “new science” was antimodern in its insistence upon the continued relevance of theology, but it nevertheless resembles the critique waged from within modernity by numerous thinkers who have questioned the value of many of modernity’s conditions. For instance, Nietzsche’s theorized poetry as the “gay science” of experiences that exceed the limiting mediocrity of the rational. Claude Levi-Strauss’s structural anthropology took seriously the persistence of transcendent cultural forms. And Foucault relied upon the spiritual art of revelation as an antidote to the soul-deadening construction of selfhood orchestrated by institutional power. In each case, mystery or “spirit” is not that which must be overcome to pursue ideas but that which must be recovered to facilitate a more authentic and contextualized intellectual culture.

The distinctiveness of the history of ideas thus pertains to its insistence upon the relevance of metaphysics and aesthetics to the modern pursuit of knowledge. Rather than trying to eliminate the ambiguities of affective modes of perception, the historian of ideas studies the meanings, associations, and even obscurities therein suggested. One of the unique key values of the tradition is error, insofar as the historian of ideas is interested in human thought even when it is confused or absurd. Another key value can be found in the persistent defense of universalism, in that the history of ideas tends in its active sense for the vast entanglement of ideas with one another to view cultures and people as fundamentally syncretic. Though ethics is not an explicit

component of the tradition, one can extrapolate critiques of nationalism, essentialism, and the institution, which manages thought by penning it within stable categories that limit challenges to the institution's structural integrity.

Sources of authority within the field include Arthur O. Lovejoy's "Introduction to the Study of the History of Ideas" in *The Great Chain of Being* (2007), which theorizes before practicing the tradition in the analysis of a religious unit idea and also coins the terms "history of ideas" and "unit ideas." Lovejoy critiqued pragmatism for importing scientific positivism into the humanities, but the influence of William James, who was Lovejoy's teacher, in his pupil's invention of the history of ideas can be discerned in James's "A World of Pure Experience" (1904), which theorizes a *Weltanschauung*, or unified world, that can be recovered through "radical empiricism," the registry even of the transitions and conjunctions between ideas as important components of experience. On science and religion, important texts include G. B. Vico's *New Science* (2002), especially accompanied by Mark Lilla's *G. B. Vico: The Making of an Anti-Modern* (1994). Also see Jeremy Carrette's edited selections on *Religion and Culture: Michel Foucault and Foucault's "Nietzsche, Genealogy, History."* Important recent contributions include Mieke Bal's *Travelling Concepts in the Humanities* (2002), Franco Moretti's *Graphs, Maps, Trees* (2007), and Carlo Ginzburg's "Minutiae, Close-Up, Microanalysis" (2007), which discusses the importance of the "microanalysis" of historical minutiae in uncovering significant "macroconcepts" otherwise lost to historians. Ross Posnock's *Color and Culture: Black Writers and the Making of the Modern Intellectual* (2000) brings the history of ideas into critical contact with identity politics. Finally, Susan Sontag's *Against Interpretation and Other Essays* (1994) explains how art and literary criticism might better attend to intuition and affect in their readings of texts, and her essay, "Fascinating Fascism" (2002), models the intellectual historian's attentiveness to conceptual unities in its analysis of extant and thriving fascist unit ideas in western constructions of beauty.

Lovejoy, who founded the "History of Ideas Club" at Johns Hopkins University in 1940, is the most immediate source of the terminology and theory of the history of ideas. Nevertheless, within continental philosophy, Nietzschean "genealogy," Foucauldian "archaeology," and Derridean "etymology" all similarly destabilize the natural appearance of conceptual commonplaces by tracing their invention and evolution.

The history of ideas conceptualizes *the world* as structurally connected by the limited diversity of ideas across cultures. *Nature, reality, knowledge, and truth* are perpetually reconstructed by the individual perceiving them, thus placing the *human being and human consciousness* at the center of the tradition. Notions of the *origins of life and the function of death* are not relevant to the history of ideas, except insofar as they might serve as unit ideas. *Time* is rejected as a valid marker of unity or difference, as the historian of ideas might find profound variation within chronologically simultaneous ideas while tracing the continuity of other ideas over centuries. The history of ideas should be understood as a critique of the modern ascent of *rationality* as the ultimate value and insists upon permitting the reemergence of *mystery* as an essential component of thinking through engagement with theology and art.

Cross-References

- [Humanities](#)
- [Pragmatism \(Theological Interpretations\)](#)
- [Transcendence and Immanence](#)
- [Worldview](#)

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History of Islamic Medicine

► Medicine in Islam

History of Medicine

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Related Terms

[Medical history](#); [Restoring health](#)

Description

Medicine may be defined as the art of preserving or restoring health and treating disease, illness, or physical dysfunction by means of drugs, surgical procedures, or manipulations. The history of medicine is the history of both the changing concepts of health and disease and the greatly varied social roles and ethical responsibilities of those who seek to preserve or restore health. The former is properly an aspect of the history of science in general and of the biological sciences in

particular. The impact of religion on the history of science, in its broadest sense as well as in some of its specific disciplines, is reflected in the history of changing concepts of health and disease. The roles and responsibilities of medical practitioners, while affected by changing scientific concepts, are less features of the history of science than of social, religious, moral, legal, and economic history.

Self-identification

The study of the history of medicine in America owes its beginnings not to professional historians but to physicians, who were in many cases men of broad culture and classical education. In the first half of the twentieth century, American medical schools produced a distinguished group of physicians, like the neurosurgeon Harvey Cushing (1869–1939), who were not only enthusiastic students of the history of medicine but who published in the field. It would be unfair to call them (as they have been termed) amateurs. But they were clinical specialists, not professionally trained historians. Most prominent was Cushing's mentor, William Osler (1849–1919), one of the four founding members, in 1893, of the School of Medicine at Johns Hopkins University. Osler believed that the study of medical history, of great doctors, of the history of disease and therapy, and of the classics of medical literature from Hippocrates to the present would illuminate modern medicine by placing it within its broader cultural context. But more than that, he believed that it had the potential for humanizing medicine and for maintaining the proper balance between the art and science of medicine. Osler incorporated the history of medicine into the clinical courses that he taught rather than treated it as a separate subject for study. In the first half of the twentieth century, courses in medical history expanded in American medical schools, reaching their peak in the 1950s, then declining rapidly. In the 1970s, the newly emerging field of bioethics brought to the public consciousness a whole series of urgent questions. Like many new disciplines, it quickly expanded, producing new

journals, departments, and symposia. Courses in medical ethics began to proliferate in American medical schools, replacing courses in the history of medicine. Paradoxically, during the same period that the history of medicine was being dropped from the curriculum of medical schools, courses in medical history were proliferating in history departments at many universities. But their approach was very different from that adopted in medical schools. They taught the social history of medicine primarily to undergraduate or graduate students in history (Burns 2000).

Characteristics

Scores of universities today offer courses in the history of medicine. They are nearly always taught by professionally trained historians with Ph.D.s rather than M.D.s, and their approach is sociological. Some departments of medical humanities in schools of medicine now hire professionally trained historians to teach medical history as well, with the result that new historiographical methods are penetrating medical schools. As a specialized field of historical research, history of medicine in the United States is quite healthy today, but as a field of history, not of medicine. It has, like the history of science, come under the strong influence of *social constructionism* and Kuhnian ideas of the *sociology of knowledge*. This professionalization has itself been partially responsible for the decline of the teaching of medical history in schools of medicine. And it has widened the gap between physicians who teach medical history and academically trained historians. By applying the methods of cultural studies to medicine and by placing it within the context of the new social history, historians have rendered the subject more naturally suited to departments of history than to medical schools.

Relevance to Science and Religion

In the past generation, historical scholarship has devoted a good deal of attention to the

relationship between science and religion. Two historiographical perspectives that have influenced, even revolutionized, scholarship provide the orientation of the discussion. The first is the reaction against what is commonly called *Whigism*. The term denotes a perspective that views the past through the lens of the present and sees history as moving progressively toward the ideas and institutions of a later age, particularly one's own. Many historians of medicine writing today attempt to avoid its correlatives, presentist and essentialist approaches, which have traditionally influenced the historical understanding of both religion and science. *Presentism* is the tendency to shape the past by employing modern definitions and understandings. *Essentialism* assumes that an idea or a discipline is basically the same in all ages and that the history of medicine is distorted by imposing modern definitions on the study of the past or by admitting as truly scientific only what a modern medical scientist would regard as such. *Social constructionism* provides the second modern perspective that informs much recent writing in the history of medicine. Social constructionism is a methodological orientation that views the pursuit of scientific knowledge not as an autonomous but as a human endeavor that reflects social backgrounds and conditions as well as the prevailing spirit of the age. It marks a reaction to the previous dominance of *positivism* in the history of medicine (Ferngren 2002: ix–xiv).

Sources of Authority

Social constructionism as an intellectual movement was inspired by Thomas Kuhn's *The Structure of Scientific Revolutions* (1962), which accounted for major transformations in science (Kuhn termed them "paradigm shifts") as the result of social and psychological factors. Kuhn's approach owed much to antirationalistic and relativistic notions and marked a reaction to the long-standing emphasis on the autonomy and rationality of traditional science. It unintentionally created an agenda for the next generation of scholars, who pursued what came

to be called *science studies*. Their research program emphasized the *sociology of knowledge* and the contextual and socialcultural setting in which new science developed. Positivistic scientists and intellectual historians of science and medicine reacted vigorously in defense of older views, however, and the resulting “science wars” came to characterize the last two decades of the twentieth century. Adding to the ferment was the emergence of feminism and postmodernism. Feminism became a major force in the scholarship of many academic disciplines, including history of medicine, with its study of gender as a factor in the construction of medical knowledge and its exploration of women’s participation in medicine.

Another major factor has been the rejection of the thesis formulated by John William Draper (1874) and Andrew Dickson White (1896) that Christianity has had a long history of opposing scientific progress. White, the first president of Cornell University, argued that the early church had hindered the progress of science both by denigrating the investigation of nature and by subordinating observation and reasoning to the authority of scripture and theology. The Draper-White or “conflict” thesis, as it is called, became enormously influential in America in both popular and academic circles. During much of the twentieth century, it dominated the historical interpretation of the relation of religion and science (Lindberg and Numbers 1986: 1–18). In the late twentieth century, the thesis underwent a systematic reevaluation. The result has been the growing recognition among historians of science and medicine that relations between religion and science have been much more positive than is often thought. John Brooke suggests that a “complexity thesis” is a more accurate model than the familiar conflict thesis (Brooke 1991). Although popular images of controversy continue to exemplify the supposed hostility of Christianity to new scientific and medical theories, recent studies have shown that Christianity has often nurtured and encouraged scientific and medical endeavor, while at other times, the two have coexisted without either tension or attempts at harmonization. If Galileo and the Scopes trial come to mind as examples of conflict, they were

exceptions rather than the rule. Christian clergymen, for example, actively supported the introduction of inoculation and anesthesia.

Ethical Principles

Postmodernism has injected a radical, though hardly pervasive, influence in the modern study of medical history. Postmodernists reject all “totalizing” systems, arguing that no human endeavor, not even medicine, can claim to be based on universal truths or on Enlightenment-based assumptions, such as rationality. Hence, they deny the universal claims of both medicine and religion, which have found themselves deprivileged and attacked for their authoritarian pretensions (Ferngren 2002: 381–387). Assumptions of cultural and ethical relativism are widespread in the modern social history of medicine. But recognition that medicine and religion have developed historically and have been influenced by their historical and cultural context does not necessitate acceptance of relativistic assumptions. Nor need it deny the claims of Christianity or other religions to special (i.e., divine) revelation. It does, however, require an awareness of the cultural limitations that are imposed on all societies, ideas, and disciplines, including our own. And it should persistently strive to avoid the comfortable assumption that modern Western cultural values or current theoretical constructs constitute the bar before which all other values are to be judged. The modern age is a historical period like any other, limited in its perspectives by time and culture, and subject to the constraints of its own zeitgeist. Understanding that we, too, have historical limitations should force us to view the past in a manner that is neither patronizing nor disparaging, but appreciative of the power of ideas and practices that we do not always share or fully understand.

Key Values

Every language employs a variety of words, some precise and some imprecise, to express the

manifestations of physical disability and dysfunction. When imprecise terms are used to indicate that someone is ill, the language is usually not scientific and does not denote a particular medical condition. One often employs general terms to express merely the perception that one is not (in the commonly accepted understanding of the term) in good health. Hence, words like *illness* and *sickness* carry with them a social or cultural rather than a scientific medical connotation. Among medical anthropologists, *disease* is usually taken to describe a pathological condition, while *illness* denotes a subjective feeling of physical discomfort. But even when a specific (i.e., medical) vocabulary is employed, if it is symptomatic rather than pathological, it normally reflects the particular culture that created it rather than indicates a scientific description. And when the vocabulary of disease becomes pathologically specific, it reflects a particular classification of disease or medical model that is culture-specific and cannot be taken as necessarily consistent with modern theories of disease (Kleinman 1980: 72).

Conceptualization

Given the emphasis in the current study of the history of medicine on *contextualism* over earlier traditions that shared assumptions of essentialism and presentism, it is impossible today to provide precise definitions of key terms in the history of medicine. Indeed, contemporary writing in the field tends to avoid general definitions in favor of carefully nuanced and temporally conditioned conceptualizations. An example is the variety of definitions of health that have been given at different times and in different cultures. *Health* is an imprecise concept. The words for *health* in many languages are semantically related to ideas of wholeness and are virtually synonymous with wellness and even well-being. They may refer to the body, the mind, and the soul. The World Health Organization has defined health as a “state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity.” Metaphorical uses of health are virtually limitless. The basic definition of the

concept is the absence of disease. The spectrum of disease includes sickness, infirmity, illness, mild physical discomfort, dysfunction, disability, and deformity. *Disease*, like *health*, can be used metaphorically and applied to body, mind, and soul.

Relevant Themes

Posing questions to sources that are separated from the modern interpreter by a considerable spatiotemporal as well as cultural and imaginative distance is a familiar problem to the scholar who seeks to interpret historical texts. In the study of the historical relationship of medicine and religion, several issues are relevant for the modern student who wishes to adopt a balanced approach to understanding the evidence. (1) Though recent scholarship has rendered untenable the Draper-White (conflict) thesis, it continues to underlie some modern studies of the historical relationship of medicine and religion. Yet it reflects a dated positivist outlook, viewing biomedicine as continually progressing and overcoming the entrenched antagonism of religious opinions, which invariably retreat before its advance. That view is simplistic and will not stand close examination of the context in which the supposed conflict arose. (2) Many modern historians who have adopted the theories and models of the social sciences, such as social anthropology, view theological or ideological factors in history as mere epiphenomena, choosing to employ cultural or material explanations of a sociological nature. While the insights of the social sciences can be helpful, they provide pitfalls as well as benefits. Ideologically laden with Western cultural assumptions, as they are, the methods of social anthropology need to be used to complement – not to replace – the textual-philological historical method. A synthetic approach, which assumes a mutual interaction in which ideas contribute to the shaping of cultural and social phenomena, just as cultural and social phenomena contribute to the shaping of ideas, provides greater balance (see Ferngren 2009: 8). (3) The past several decades have seen the rise of

poststructural and postmodernist theories, which reflect the influence of French scholars such as Roland Barthes, Jacques Derrida, and Michel Foucault. Poststructuralists argue that discourse reflects no reality other than its own and cannot be taken as an accurate portrayal of the events (“pretextual reality”) it describes. Truth is not discovered but made, historical events not reconstructed but constructed. The meaning of any ancient text is not to be found in the author’s world of thought, but rather in the interpreter’s own world, where, appropriately deconstructed, it can be constructed in a manner that is free from the controlling function of the cultural or literary world that gave rise to it. The notion of history as a process of cause and effect receives short shrift in a historical quest that focuses on modes of discourse as the nearest one can come to “real historical processes” or “extralinguistic realities (Ferngren 2009: 8–9).” For a critique, (see Strenski 1998).

Cross-References

- [Bioethics in Christianity](#)
- [Bioethics in Judaism](#)
- [Bioethics in Islam](#)
- [Christian Healing Cultures](#)
- [Medical Sociology](#)
- [Medicine in Islam](#)
- [Pain \(Suffering\)](#)
- [Social Constructivism](#)

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Holism

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Related Terms

[Whole](#)

Description

The term “holism” derived from the Greek “*hōlon*,” “whole,” and designed the doctrine of global interconnection and dependence. Holism focuses on two notions: the first is that wholeness “is more than the sum of its parts” and the second is that if “these parts are taken to pieces, the more the phenomenon is complex, the more the information and the knowledge about it are lost”.

A whole is not simple but is an organic unity in which the parts cooperate in the function for the stability of the system. A whole is *more* than the sum of its parts, i.e., demonstrates an inner relation among the parts and a degree of information of the system particularly important in the case of the complex phenomena. On the contrary, the mechanical approach obtains its major results only analyzing the parts, and doing this loses that *more*. In this way, the whole is not something additional to the parts: it is *these* parts but so *strictly interconnected* that the characteristics and the activities of them are *changed by the synthesis*. In this respect a whole possesses an autonomous power of causation, regulation, and correlation: *it forms a system qualitatively different from the sum of the parts*.

During the first years of the twentieth century, the erosion of the classical analytic and reductionistic paradigm opened from the epistemological side, favored the discussion about the opportunity to study nature – in particular the living phenomena – with a global, or holistic, approach. Many philosophers and scientists, especially in the field of biology, considered the following problems:

1. To affirm the independence and autonomy of biological science in comparison with physical and chemical sciences.
2. To show the limits of the method of analysis to study a complex phenomenon – i.e., a living organism – and to discuss the applicability of a global or holistic method to nature.
3. To explain the marvelous and incessant increasing toward complexity showed by natural phenomena, from inorganic to organic, from matter to mind, and from individual to social, as the result of a natural principle, as a tendency in the universe to form wholeness more and more complex.
4. To develop a philosophy of the interconnection of all the parts with the whole and a vision of nature as a big organism able to self-organizing and self-evolving.
5. To overpass the metaphysical division and the incommunicability between natural science and human science, matter and spirit, inorganic and organic, and naturalism and spiritualism. In this sense, holism is seen able to develop a monistic but a nonreductionistic approach and an openness to the spirituality and religiosity. In this perspective, some philosophers conceived the sacred not as a metaphysical construction but as a result of the cultural evolution of humankind, i.e., a constitutive tendency of reality toward an increasing of hierarchical levels toward complexity.

During the second half of the twentieth century, the holistic vision is near and supported by the science of complex systems. The systemic paradigm recognizes four principles for explaining reality in its essence (both material and immaterial): *hierarchy*, *emergence*, *communication*, and *control* (Prigogine 1989; von Bertalanffy 1969). Hierarchy is able to explain

reality as a system of systems, whose main characteristics are openness and connectedness. Emergence denotes an evolutionary state of reality which manifests itself as creativity, i.e., the occurrence of novelty (emergence) in its becoming. There are many levels of organization. Each level produces (causes) a kind of reality that cannot be broken down into more basic elements. In conclusion, there is a pluralism of realities and properties, correspondent to regional ontologies.

Communication, or transmission of information, is the principle that confirms the ontological need of connecting components in the unity of system. Control is the principle that set constraints by a system against its subsystem components.

The general framework for explaining reality according to a system paradigm is to represent it as an unfolding, evolutionary, self-organizing universe. Reality appears as a continuing development process characterized by a series of nested levels of organization of increasing complexity and autonomy. Autonomy manifests itself as the capacity to last in a state of dissipative structure governed by an autopoietic regime.

The origin of the debate on the relation between the whole and the parts is obviously immemorial, but the notoriety of holism is due to General J. C. Smuts – a South African statesman, Prime Minister of South Africa, soldier, scholar, and philosopher – who published in 1926 *Holism and Evolution*, a book that concerned the debatable borderland between science, philosophy and religion (Procacci 2001, 2003; Smuts 1926).

Smuts created the term holism to distinguish wholes in the strict sense from mere aggregates, mechanical assemblies, and chemical compounds. These kinds of phenomena can be studied analyzing their parts and simplifying the interconnections among the parts as much as possible. In a true whole, the parts lose their prior identity, while in aggregates, the identity of the parts of elements is not lost but is always recoverable. He conceived reality as a hierarchical level of complexity: at the bottom of the ladder, mechanistic features and the ontology of the part predominate, while at the top, there are holistic features.

Wholes are exemplified in minds or psychic structures, which appear among higher organisms, in particular in the human personality, that is considered by Smuts the supreme embodiment of holism, but even atoms and molecules are wholes, but much simpler. In the sphere of spiritual values the holistic process in nature shows its clearest importance.

Smuts refused the division among matter, life, and mind, while suggested a genetic interrelation and rise with each other throughout the course of natural evolution. So, life is developed from matter, and mind has an evident physical basis. But from this thesis is illegitimate to infer, like the materialists do, the primacy and self-sufficiency of matter and to reduce life and mind to a subsidiary and subordinate position as mere epiphenomena of the unique reality, matter.

This erroneous and reductionistic viewpoint derived from the influence of the hard physical concept of cause and effect, elaborated in the science of the nineteenth century, that sustains there could be nothing more in the effect than there was already in the cause; and if matter caused the soul, there could be nothing more in the soul than there always was in the matter. In this respect, the spiritual phenomena were considered merely appearances and not a real advance on matter, and at the same time, the complex systems were obscured to privilege the elementary and the simple.

For this reason, the evolutionary theory, assured as a metaphysical-philosophical interpretation of nature, is for long time considered as the origin of the opposition between materialistic and spiritualistic. On the contrary, conceiving nature as an evolution of wholeness and complexity, we can overlap a universe as a purely physical mechanism to award importance to the psychical and spiritual causes.

The atom, the cell, and the mind are the great fundamental structures of the holistic universe. In particular, the mind is a continuation of the simple and linear behavior of the inorganic level and of the capacity of self-organization of the organic level. The conscious acts are the emergence of a complex level of organization of the matter. From a biological point of view, human

personality is a new synthetic system in which the material and the psychical elements are incorporated in a new complex whole. The mind is able to coordinate all the experiences and is an instrument of individuality and of socialization through the language and the abstraction faculty. But the major character of the mind is its partial freedom from external determination. In fact, while the inorganic is approximately governed by deterministic constraints and animal is conditioned by its hereditary characters, the human personality is oriented by the cultural evolution and social environment. The mind is so a new system of organic regulation and interrelation with the world.

The holistic vision considers wholes not mere artificial constructions of human thought, an epistemic results of the human knowledge, but an ontological aspect connected with the evolutionary process of the natural world. Therefore, universe is governed by an intrinsic whole-making or “holistic factor,” and holism is the term coined to describe from a philosophical point of view this tendency to create novelty and organization. Every natural element, even an atom, is a whole, with specific internal organization and self-direction. Holism expresses an evolutionist paradigm. Evolution is properly the progressive development of wholes in different stages, from the inorganic to the most organized phenomena, like the human mind and the social organism.

A critical issue in holism as regards “science and religion” is the notion of personality and subjectivity (Caporali et al. 2008). Subjectivity includes the individual perception of the outside world and the own body as well as the self-consciousness, or experience of the self. The personality is based in the experience of the individuality as a whole capable of reasoning and valencing. Holism is a vision which supports a coevolutionary relational ontology of personhood, an integrated model of the different aspects of reality in which ethical and spiritual values have their role and dignity. Human values are treated as not eliminable causal factors. In this sense, subjective values have objective consequences in the brain. This holism implies an emergent evolution of the human personhood

that is not governed merely from the lower level of the gene but from a purpose, values, and meaning. In this way, it is possible to restore the human dignity, freedom of choice, and the inner creativity against the reductionistic, dualistic, and materialistic approach. For these reasons holistic reflections pertain to the gap between science, philosophy, as well as religion.

Cross-References

- [Complex Systems](#)
- [Freedom](#)
- [Life](#)
- [Ontology](#)
- [Religiosity](#)
- [Spirituality](#)

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Hominins

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All the species that emerged along the evolutionary branch that diverged from chimpanzees about 6 million years ago and ultimately produced

anatomically modern humans. These species include all the Australopiths (e.g., *Australopithecus ramidus*, *A. anamesis*, and *A. africanus*) and the members of the genus *Homo* including *Homo habilis*, *H. erectus*, *H. neanderthalensis*, and *H. sapiens*. The Australopiths emerged about 5 million years ago and went extinct about 1 million years ago. *Homo* emerged about 2½ million years ago with *Homo sapiens* emerging about 150,000 years ago. The last non-*sapiens* members of the genus *Homo* (Neanderthals and some derived forms of *Erectus*) died out between 30,000 and 20,000 years ago.

Homunculus

► [Robotics and Religion](#)

Hope

► [Hope, Theology of](#)

Hope (Life After Death)

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Related Terms

[Afterlife](#); [Life after death](#)

Human beings die and their bodies decay. But could it be that humans will still continue to live in some form after death or return to life? There is a widespread belief in a life after death, and all major religions provide their own views on the subject (Obayashi 1991). It has traditionally been thought that the question of life after death cannot be studied by science. However, science has emerged as an important dialogue partner for

religion and philosophy even in this area. Of particular interest for science are people's experiences at the border of life and death.

► [Near-death experiences](#) (NDEs for short) are life-transforming experiences which sometimes occur when a person is near death. NDEs have been the subject of much scientific interest ever since the publication of Raymond Moody's study *Life After Life* in 1975 (Moody 1975). Research has been carried out, for example, to determine the common features of such experiences and whether they can be explained naturalistically (Bailey and Yates 1996; Holden et al. 2009). Near-death experiences typically involve hovering over one's body in immaterial form, traveling through a tunnel, seeing a light, experiencing a sense of peace, meeting deceased persons, and a life review. Research has focused mostly on positive NDEs which leave a feeling of peace and have positive aftereffects, but there are also negative NDEs which include feelings of aloneness and judgment. There have been many attempts at explaining NDEs naturalistically, but this has proven difficult. No positive correlation of NDEs with medication or mental illness has been discovered, and proposed physiological and neurochemical explanations do not account for the details of the experiences or fit the diverse situations in which they occur. Furthermore, there are many intriguing accounts of NDEs that contained accurate information, for example, about doctors' and relatives' behavior from the time the experiencer was clinically dead. Many researchers believe that near-death experiences give at least some reason to hope for life after death (Moreland and Habermas 1998). There have also been studies on, for example, people's deathbed visions (Osis and Erlendur 1997) and cases where people claim to have memories of earlier lives (Stevenson 1980).

The possibility of life after death is dependent on the nature of the human person. Assuming ► [dualism](#) of the mind (soul or spirit) and the body, it seems easy to conceive of life after death. However, if human persons are completely material, many feel that conceiving of survival without a body is more difficult. Even supposing that a completely identical human person were

created later, there does not seem to be anything to bridge the spatiotemporal gap between the body that died and the resurrected body. If this understanding of the problem is correct, then scientific evidence in favor of a materialistic understanding of human persons would also count against the possibility of life after death (Hasker 1999).

As a materialistic account of human persons has gained ground, many hope that in the future science will allow us to prolong our lives indefinitely. Supposing that consciousness can be understood in fully materialistic terms, ► [mind uploading](#) should be theoretically possible. This means uploading one's consciousness into a computer or a mechanical brain to ensure survival. Perhaps in the future, it will also be possible to stop the process of aging and heal all physiological conditions (Kurzweil 2005). Cryonics is the practice of low-temperature preservation of human bodies or at least brains in the hope that just such ways to prolong our lives will be found, as well as some way to bring people out of cryopreservation alive (Ettinger and Tanly 2005). While this possibility still seems very far-fetched, it is an interesting example of the way the hope for life after death is expressed through both religion and science.

Cross-References

- [Hope, Theology of](#)
- [Near-Death Experiences](#)
- [Philosophy of Mind](#)
- [Soul](#)

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Hope, Theology of

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Related Terms

[Faith](#); [Hope](#)

Description

The term “Theology of Hope” is associated with Jürgen Moltmann and his book *Theology of Hope*. In this seminal publication, Moltmann defines eschatology as the doctrine of Christian hope “which embraces both the object hoped for and also the hope inspired by it” (Moltmann 1967, p. 16). He no longer wants to confine ► [eschatology](#) to a discourse about the so-called last things which will happen in the end but to consider the whole cause which drives toward this end. This book signalled the change from a static to a dynamic eschatology, from one that waited for the end to one that, inspired by the future promise, attempted to inaugurate some of that hope in the present. During the social unrest of the 1960s, this book spawned a whole movement of theological reflection on social involvement such as *Theology of the World*

(Johannes Baptist Metz 1967), *Theology of Liberation* (Gustavo Gutiérrez 1972), and even a *Theology of Revolution* (late 1960s with various authors). Today, it is widely accepted that the Christian hope is not just otherworldly but has (social and ethical) implications for the present.

Self-identification

Science

Insofar as theology has traditionally been understood to be an academic discipline, theology of hope is an academic discipline too. In the German context out of which the theology of hope originated, one distinguishes between the *Naturwissenschaften* (natural sciences) and the *Geisteswissenschaften* (intellectual sciences). In this way, a theology of hope is part of the intellectual sciences and therefore a science. Moreover, a theology of hope employs exegetical and historical studies which aim at scientific rigor. With regard to its societal implications, one should not forget that precise social analysis is required which again points in a scientific direction. Wolfhart Pannenberg has pointed out in his book *Theology and the Philosophy of Science* that especially in its eschatological direction, theology fulfils the three minimal criteria which Heinrich Scholz has adduced for a discipline to be regarded as scientific: (1) It makes assertions which are regarded to be true, (2) these assertions must be related to the object matter with which this science is concerned, and (3) one must be able to examine the truth-value of these assertions.

Religion

Theology of hope is a theological discipline and therefore is part of the intellectual exercise of the study of the Christian religion. More narrowly defined, the theology of hope is part of systematic theology. It has been promulgated by Christian theologians, especially in Germany, of both Protestant and Roman Catholic persuasion.

Characteristics

Distinctive for the theology of hope is the rediscovery of eschatology as a dynamic category which allows anticipating *proleptically* something of the envisioned goal on account of the resurrection of Jesus Christ. Moltmann distinguishes between the Israelite religion of promise and the static epiphanic religions in the environment of Israel. After the Israelites' conquest of Palestine, Yahweh still appeared as the promising God who pointed to a new future. This meant that the Old Testament promises were never superseded by historic events but were constantly modified and expanded. Of course, some were realized in history. These "fulfilled" promises to which Israel owed its existence (the Exodus, the Promised Land, David's kingship) proved, amid all the upheavals of history to be a *continuum* in which Israel was able to recognize the faithfulness of its God. Yet, the promises were not completely resolved in any event, but there remained an overflow that pointed to the future. Moltmann declared: "The tension between promise and fulfilment was not left behind by the simple progression of Israel's history, but was much more strongly creative of Israel's historic progress" (1967, p. 111).

Moltmann sees the same feature in the New Testament because the revelation in Christ is at the same time good news and promise. This revelation presupposes the law and promise of the Old Testament since Yahweh (the God of Abraham, Isaac, and Jacob, the God of promise) resurrected Jesus and Jesus was a Jew. This is taken to mean that Jesus is not to be understood as a particular case of humanity in general but rather from the perspective of the Old Testament history of promise and in conflict with it. Jesus is not understood as a *theios aner* (divine man) who descended from heaven and whose life on earth is only a temporary episode. On the contrary, Jesus' life, work, death, and resurrection have utmost significance and are described in the categories of expectation appropriate to the God of promise.

The Old Testament history of promise does not simply find its fulfilment in the gospel, but it

finds its future in the gospel. Because the gospel is promise, it is a guarantee of the promised future. Here, the centrality of Christ's resurrection for the Christian faith becomes evident. The resurrection of Christ is a "history-making event" from which all other history is enlightened, questioned, and transformed (Moltmann 1967, p. 180). Pannenberg claims that in the resurrection of Christ, the end of history has occurred in proleptic anticipation. This means that what had been anticipated as the end and fulfilment of history, the resurrection of the dead, in fact happened in a proleptic way in and with Jesus. At the end of the world, there will only occur on a cosmic scale what happened in and with Jesus on an individual scale. According to Moltmann, the stories of the resurrection stand in the line of prophetic and apocalyptic expectations, hopes, and questions about what is bound to come according to the promises of God. Cross and resurrection point toward the future in promising the righteousness of God, the new life as a result of the resurrection from the dead, and the kingdom of God "in a new totality of being" (Moltmann 1967, p. 203).

Moltmann understands the Easter experiences as call appearances in which recognition of Christ coincides with the recognition of his mission and his future. He concludes that for theology, the reality of the world becomes historic in that its mission to the world is seen to be the field of the missionary charge and is examined in a search for real possibilities for the world-transforming missionary hope. Moltmann claims that "the call to obedient moulding of the world would have no object, if this world were immutable" (1967, p. 288). The world must be open to the future for good or ill. Secularization has realized these Christian expectations in the field of world history and has outstripped the Christian hope in a ► [chilastic](#) way. Thus, we cannot reject the evolutionary progressiveness of the modern age; we must incorporate the open horizon of modern history into the true eschatological horizon of the resurrection and thereby disclose to modern history its true historic character. The church cannot confine itself to serving individuals and acting as a conservative force, as society

might expect it to. The task and the mission of the church is determined by its own peculiar horizon – the eschatological expectation of the coming kingdom of God, the coming righteousness and the coming peace, and the coming freedom and dignity of all humanity. This means, according to Moltmann, "the realization of the eschatological *hope of justice*, the *humanizing* of man, the *socializing* of humanity, *peace* for all creation" (1967, p. 329).

Relevance to Science and Religion

Jürgen Moltmann as the progenitor of the theology of hope was not interested in the science and religion dialogue since his main interest was not nature but history. Moreover, his philosophical roots were in Hegelian progressive dialectic and in Ernst Bloch's neo-Marxist analysis of history and society as put forth especially in Bloch's magnum opus *The Principle of Hope*. Relevant for the science religion dialogue, however, is one aspect of the theology of hope which Moltmann put forth against Marxist varieties of hope: "All utopias of the kingdom of God or of man, all hopeful pictures of the happy life, all revolutions of the future, remain hanging in thin air and bear within them the germ of boredom and decay – and for that reason also adopt a militant and extortionate attitude toward life – as long as there is no certainty in face of death and no hope which carries love beyond death."

The physicist Frank J. Tipler vigorously, albeit quite speculatively, addressed the question of life beyond death in his book *The Physics of Immortality*. Tipler asserts that "theology is a branch of physics, that physicists can infer by calculation the existence of God and the likelihood of the resurrection of the dead to eternal life in exactly the same way as physicists calculate the properties of the electron" (1994, p. ix). He also assumes that all forms of life, including human life, are subject to the same physical laws as electrons and atoms. A human being is nothing "but a particular type of machine," the human brain only "an information processing device," and the human soul

“a program run on a computer called the brain” (1994, p. xi). Tipler wants to describe in this book the omega point theory, which he calls a testable physical theory entailing that one day in the distant future an all-present, all-knowing, and all-powerful God will resurrect each of us to an eternal life which in all its essential features will correspond to the Judeo-Christian heaven. This God will exist primarily at the end of time.

Tipler knows that the future course of the universe is such that life as an information process cannot continue forever in its present form, that is, as a carbon-based organism. If life as an information process that can sustain communication is to continue at all, it must continue to exist on some other basis. Tipler is convinced that in the not too distant future computers will possess the capability for autonomous information processing and communication and finally will even be able to reproduce themselves. Since Tipler understands a person as an entity capable of autonomous information processing and communication, and since computers will be able to assume these functions, he sees the only possibility of future “life” on the basis of computers.

On this premise, the physical mechanism of the individual resurrection is the emulation of all persons who have long since died, including their worlds, in computers of the distant future. The dead will be resurrected as soon as the capacity of all computers in the universe is so large that the capacity required for the storage of all possible human simulations is only an insignificant fraction of the total capacity. Tipler sums up his argument: “The Omega Point-Theory is the first physical resurrection theory to be fully consistent which totally agrees with the Christian resurrection theory. It is also the first redemption theory justified by reason, not by faith” (1994, p. 247). Pannenberg pointed out that “Tipler’s exposition of a future resurrection of the dead is particularly worthy of note in a time when the Christian expectations concerning the future are most often judged to be irreconcilable with the modern scientific worldview” (Pannenberg 1995, p. 477–78). Yet others accused Tipler of advancing physical reductionism because he reduces

human beings to information-processing entities. Yet his position showed that a theology of hope can also be relevant to the science and religion dialogue.

Sources of Authority

God’s word and actions understood as reflected upon in Scripture are the sources for the theology of hope. In his widely discussed “Dogmatic Theses on the Doctrine of Revelation” (1961), Pannenberg claims that God’s self-disclosure, as reflected in the biblical documents, does not occur in a direct way as a theophany but indirectly through God’s acts in history. Furthermore, Pannenberg observes that “revelation is not comprehended completely in the beginning, but at the end of the revealing history” (1968b, p. 131). History discloses its full meaning as God’s history only at the end. This is due to the fact that the individual historical acts are transparent for God not in themselves but only if perceived in the universal historical context. This can be seen especially well in the Old Testament when, in the course of history, the content of revelation ascribed to various historical events had to be developed and expanded according to the historical progression.

Pannenberg rejects a historical relativism that might result from the simple progression of history and the necessary revisions of our perception of God’s self-disclosure derived from history claiming that the universal revelation of the deity of God is not yet realized in the history of Israel but first in the destiny of Jesus of Nazareth insofar as in him the end of history has occurred in proleptic anticipation. What had been anticipated as the end and fulfilment of history, the resurrection of the dead, in fact *happened* in a proleptic way in and with Jesus.

One might question why Pannenberg attributes so much significance to the resurrection of Jesus since up to now it has been an exceptional event without any precedent or consequence in other resurrections. Pannenberg responds that one must perceive it in its proper context, the time of ► [apocalyptic](#) and the

expectation of the resurrection of the dead prevalent during that time. If we consider Jesus' resurrection in the apocalyptic context in which Jesus lived, it becomes clear that the resurrection must bear the significance of foreshadowing the eschaton. It is, on the one hand, the validation of the claim Jesus is understood to have made before Easter that he represents and carries the authority of God. But it also means that in his destiny, the end has started and God is revealed in him. Jesus therefore becomes the focal point for our understanding of eschatology. He is the paradigm and the anticipation of our own future and at the same time the inspiration and possibility of living toward that future.

Yet how much credibility does the statement carry that Jesus was resurrected? In his first major work, *Jesus – God and Man*, Pannenberg claimed that the resurrection of Jesus “is a historical event” (1968a, p. 97). The reason for this claim is that the origin of early Christianity can be properly explained only in the light of the eschatological hope in the resurrection from the dead based on the appearances of the resurrected one. For Pannenberg, Christ's resurrection is not a faith statement but one based on historical research insofar as historical research can ascertain the truthfulness of events like those involving resurrection.

Ethical Principles

The events from which the theology of hope draws its inferences are events within the universal historical horizon of humanity. Especially Wolfhart Pannenberg argued that the distinction between a special salvation history and the rest of history is obsolete. “God's redemptive deed took place within the universal correlative connections of human history and not in a ghetto of redemptive history” (1970, vol. 1, p. 41–42). Consequently, Pannenberg affirms: “In contradistinction to special appearances of the Godhead, revelation in history is open to everyone. It has universal character” (1968b, p. 135). The material with which the theology of hope deals and the conclusions it draws from them

are accessible to everyone. The peculiar ethical emphasis of the theology of hope is that the hope for eschatological completion allows and engenders a present lifestyle congruent with the expected completion.

Key Values

The theology of hope brought eschatology from the theological periphery back to the center stage of theological reflection. Moltmann claimed that Christianity in its totality is eschatological. Moreover, through the emphasis on proleptic anticipation of the goal of history, theology of hope made eschatology relevant for present-day life. Moltmann and Pannenberg made clear that eschatology is not some pipe dream about something that might occur somewhere in the distant future but that in the Christ event, the end had already occurred in a proleptic way without nullifying the hoped for universal completion. In discerning the newness of the Christ event, that is, Christ's resurrection, we can inaugurate something of this in the present. In his later book, *The Coming of God*, Moltmann still insists that Christian eschatology is not about apocalyptic final solutions because its subject is not the end at all. “On the contrary, what it is about is the new creation of all things” (1996, p. xi). Eschatology does not focus on some kind of cataclysm but again on hope, hope for eternal life, for the kingdom of God, for a new heaven and a new earth, and for the glory of God and what this hope effects. The eschatological goal is the cosmic indwelling of God in his creation. Therefore, Moltmann puts forward “Advent as eschatological category, and the category *Novum* as its historical reverse side” (1996, p. 6). This means that the emphasis is not on what is going to happen somewhere in the future, but the decisive facet is God's coming and his arrival. God's future coming enables a new human becoming. The arriving kingdom of God makes possible the conversion to this future. We notice here a summons to action yet a summons contingent on God's initiative. It comes as no surprise that this theology of hope not only instilled hope in Christian believers

but also proved fertile for further theological reflection. Therefore, Latin American *theology of liberation*, *feminist theology*, and *black theology* is directly or indirectly related to and influenced by the theology of hope.

Conceptualization

Nature/World?

The world including nature is seen as God's creation which is subjected to finitude, decay, and death. Especially in living beings, one can discern a yearning to be freed from the bondage to decay. Theology of hope affirms that there will be a new creation which entails a total transformation of this world. As Pierre Teilhard de Chardin contends: The whole evolutionary process is directed toward and finds its fulfilment in the parousia (advent) of Christ, in the creation of a new heaven and a new earth.

Human Being

A human being is seen as part of the world and therefore subjected to the same conditions as the world. The hope which is set forth for the world is also given to humans. Moreover, since as Christians they know about the new world to come, this hope incites them to inaugurate already now something of that hope. They are encouraged not to let things go their usual ways but to strive for a new world and a new liberated social arrangement though mindful that the new world to come is not a human achievement but a divine gift.

Life and Death

Life is not a human possession but a divine gift. Because of the fallen character of creation, life is bounded by death. Since the resurrection of Jesus Christ death is no longer the inevitable boundary. There is the prospect and promise of new everlasting life beyond death.

Reality

Reality is not just that which is located within our space-time continuum. Since God is not a phenomenon of space and time but the creator of that which is expressed by these categories,

God is a reality both in and beyond space and time. As Pannenberg affirmed, God is the all-determining reality. The theology of hope insists that reality transcends all possible rearrangements of our space-time continuum. This includes the hope for a totally new creation. The basis for talking about this as reality, and not as a projection of the human mind, is seen in the resurrection event. There, the possibilities of this world were transcended through the dawning of a new reality.

Knowledge

Knowledge is gained through the study of reality. Since history is continuously progressing and new insights are gained, all knowledge whether in the natural sciences or in the humanities is provisional. It can be superseded by new insights, and it must wait for its eschatological verification at the end of time.

Truth

For humans, full truth is unattainable. As the Apostle Paul asserted: "For now we see in a mirror dimly, but then we will see face to face" (1 Cor 13:12). The attainment of full truth is an eschatological promise to be fulfilled when we will see God, the all-determining reality, face to face. This eschatological proviso holds for all facets of truth both religious and nonreligious.

Perception

The perception of reality is restrained by the eschatological proviso (see: truth). It is restricted further by the respective socio-geographic stance of the one who is engaged with the theology of hope. For instance, someone in Latin America will perceive reality different from one who is engaged with it in Western Europe. Even the social analysis constitutive of perceiving the present reality will yield different results depending of the social locus of the one who conducts and applies this analysis. Since the theology of hope is not only focused on the reality of this world but perceives it in the wider horizon of God's eschatological promise, the varying perceptions are relativized or rather brought and bound together

by the common hope of the new world to come and its proleptic anticipation in the present.

Time

Time is one of the important categories of the theology of hope. Time is not circular and repetitive but linear. Since time is fleeting, it shows the transitoriness of the present age. At the same time, it beckons us to the future, a future enabled by God's redemptive activity. Time is not a never-ending configuration but will find its completion in God's eternity. The so-called last day "is at the same time the beginning of eternity: a beginning without end. That is the 'fulfilled time', the aeonic time, the time filled with eternity, the eternal time," says Moltmann in *The Coming of God* (p. 295).

Consciousness

Especially Paulo Freire in his classic *Pedagogy of the Oppressed* emphasized consciousness, raising as an important facet of liberation theology. The oppressed people must first perceive the actual situation in which they live in order to evaluate steps and possibilities in which direction they could change that situation. The actual consciousness then leads to potential consciousness.

Rationality/Reason

Reason is the primary mental tool with which the investigation of the present reality is conducted and with which the future hope is elucidated on the basis of this reality. Faith does not replace reason, but it is the trust that the one, that is, God, who has proven to be trustworthy in the past, will also be trustworthy in the future.

Mystery

Mystery is a term which is not used in the theology of hope. The only mystery, meaning something unexplainable, would be the reason why God has always been faithful to humanity regardless of its alienation from God, with God demarking a history of promise including the promise of a totally new creation including a redeemed humanity.

Relevant Themes

Since the theology of hope is fundamentally concerned about the future and the present arrangement of creation, ecological issues cannot be avoided. Liberation does not just pertain to humanity but to all created beings. Creation or nature is not viewed as something static but as a dynamic arrangement projecting itself toward the future. One can even speak of a historization of the cosmos. A strictly naturalistic interpretation of the cosmos is no longer possible.

Cross-References

- ▶ [Altruism](#)
- ▶ [Anthropic Principles](#)
- ▶ [Biblical Studies](#)
- ▶ [Christianity](#)
- ▶ [Faith and Belief](#)
- ▶ [Hope \(Life after Death\)](#)
- ▶ [Physics in Christianity](#)
- ▶ [Self](#)

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Hope-Healing Communities

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The concept of hope-healing communities is used by the present author elsewhere [9b] to refer to those interfaith (Christian) prayer-healing ministries aimed at using the power of the Christian prayer and other rituals of religion to bring God's intervention and healing to the needy. The bulk of the members of those communities are the sick, the disabled, the poor, the jobless, the childless, the old, and the other categories of the general society who are deeply troubled by how their lives have been going. The leaders/organizers of such communities are typically ordained religious ministers, most of them well trained in the ramifications of African thought and culture and in the art and practice of the healing sciences. They include some charismatic Catholic priests as well as bishops and other ordained ministers of the African Independent/Pentecostal churches. Others, particularly those popular in the rural areas, are lay members (some of them well trained in the science of modern counseling practice) who claim to have received the "call" to intercede and act as a channel of healing for the sick.

Hopi Religion and Anthropology

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Related Terms

[Indigenous religions](#); [North American Indian religions](#); [Pueblo Indian religions](#)

Description

The Hopi Indians have a Pueblo culture in Southwestern United States, at the northeastern corner of Arizona, east of the Grand Canyon in the Painted Desert Region. Approximately 12,000 Hopis live in 12 villages on the southern edge of Black Mesa, which is a part of the Colorado Plateau. With the exception of one town near Tuba City, the villages rest on or at the base of three mesas called First, Second, and Third mesas. In the fertile sand valleys, the Hopis grow a variety of crops, primarily maize, beans, melons, and squash using floodwater farming methods. In the grassy areas, they herd sheep and cattle as well. Many have jobs on and off the reservation, but they still supplement their economy and subsistence with farming and gathering.

The Hopis speak a language belonging to the Uto-Aztecan language family. Today most Hopis also speak English. They have been living in the area at least since 1000 A.D. The villages of Songoopavi and Orayvi both claim to be the oldest continuously inhabited villages in North America. They were under the influence of Spain from 1600 to 1700, independent until a brief period under Mexico (1821–1848) and since 1849 under the United States. The Hopi Reservation was established in 1882, and in 1935, the Hopis established a Tribal Council. The Council was disbanded in 1940, but reestablished in 1951 in order to receive monetary compensation under the Indian Claims Commission Act.

The Hopi social system is based on matrilineal, exogamous totemic clans grouped in phratry coalitions. Children are members of their mother's clan by birth. Clans are subdivided into lineages, and the core social group is the household which consists of the mother, her children, her husband, and elderly grandparents. Each clan has its own oral tradition, ritual practices, and property with privileges related to special places and (animal and/or supernatural) creatures in the environment. The clan performs rituals and ceremonies that are conducted in the kivas (buildings that serve as chapels as well as men's clubs) that are the men's domains. The ceremonial year is orchestrated by a large number of secret sodalities. The leaders of sodalities and leaders appointed by the clans govern the village under the guidance of the village chief.

The Hopis still practice their traditional religion; however, only one village (Songoopavi) performs the entire ceremonial calendar. Remnants of ceremonies and rituals are still performed at the other villages. The popular masked dance ceremony (Katsina) is performed at virtually every village. All children must be initiated into either the Katsina or the Powamuy sodality in order to perform the Katsina celebrations when they grow older. The other sodalities are more restricted and require their own initiation rituals. The Hopis are well known for their colorful and elaborate ceremonies which consist of at least 12 major and a number of minor ceremonies. They are conducted in sets of 4 days (4 being a sacred number), thus: 4, 8, 16, and exceptionally 20 days.

One of the most spectacular ceremonies is the Snake Dance, celebrated in August, during which the Snake priests dance with live snakes in their mouths. Since these are dangerous rattlesnakes and bull snakes, the Hopis have been inundated with curious tourists ever since the end of the nineteenth century. During the middle of the twentieth century, the Hopis began to bar the presence of non-Indians, although the Tribe is split on the issue. In 1906, the village of Orayvi split over the issue of whether to accept Anglo-American ways (Titiev 1992; Whiteley 1988). The conservative element was forced out of the

village and they established the villages of Hotvela and Paaqavi. Since the late 1940s, the conservative elements started a neo-traditionalist movement which led to a lot of factional strife on the reservation. The Traditionalists were often supported by outside Anglo-American fringe groups and new religious movements who have unwittingly but consistently misrepresented Hopi religious traditions in terms of their own romantic notions. Today, many wrong ideas about Hopi religion are being promulgated by New Age and other groups, especially on the Internet (Geertz 1994). The Hopi Tribe has implemented an aggressive policy to correct such ideas and prevent further interference from outside groups. They are also adamant about regaining all Hopi ritual and funerary items found in museums around the world.

Self-Identification

Religion

The Hopis identify themselves as a religious and cultural group and practicing the Hopi way of living (*hopivewa*) as dictated by their tutelary deity Maasaw in primordial times. For the Hopis, the ideal way of life is the ritual way of life (Geertz 1986).

Characteristics

Hopi religion is only practiced by the Hopis. Some Hopis are members of other traditions, such as Mormonism, Jehovah's Witnesses, and various Christian denominations, but by far, the majority are either passive participants or active practitioners of the Hopi religion.

Relevance to Science and Religion

The Hopi Tribe is not interested in the scholarly area called science and religion. The Tribe is in fact very much against scholarly interest in their religion and have attempted to prevent scholarly studies of their culture and religion, although individual Hopis may be interested in such

studies (Geertz 1996). The Tribe is, however, interested in the sciences, especially where the sciences can help improve conditions on the reservation. The Hopis have their own anthropologists and archaeologists who take care of Hopi needs on the reservation in a culturally sensitive fashion. There are also Hopi anthropologists and linguists employed at American universities who serve as cultural resource persons for scholars interested in Hopi culture. The Hopi dictionary project was an excellent example of collaboration between cultural resource persons, other scholars, the Hopi Tribe and elders, and specialists among the Hopis (The Hopi Dictionary Project 1998).

Sources of Authority

The sources of authority are either Maasaw or the ancestors. Each clan has a special relationship with a particular creature or deity. For instance, the Bear Clan, which controls the Village Chief office, has a special, that is, ritual relationship with the bear, bear spirits, and a mythical person called Matsito. Tradition, however, is generally passed down from generation to generation by nameless ancestors. The traditions concern the wanderings of the clan after the emergence of mankind from the earth (physically located by the Hopis in a tributary channel of the Grand Canyon), who they met, and where they stayed on their travels to Hopiland. Upon approaching Hopiland, they were given permission by the Chief to move into the village and allotted portions of farmland on the condition that they contribute to the collective ceremonial calendar with their ritual knowledge and songs. All the clans, furthermore, share in the expectation that their White Brother, who left them shortly after the emergence, will return and signal the onset of the end of the world, a day of purification effectuated by Maasaw (Geertz 1984).

Ethical Principles

Hopi ethics can be summed up in their name: Hopi means “a person who behaves properly,”

in other words, a person who follows Hopi precepts, is hardworking, industrious, peaceful, and kind. Such a person is also initiated into clan and sodality knowledge and is thus able to perform the rituals necessary to maintain life and social harmony. There are people who try to destroy social harmony. They are the wizards and witches, called *powaq* (*pl. popwaqt*) (Malotki and Gary 2001).

Key Values

The Hopis place great emphasis on family and clan. The elders often identify themselves with their mythical ancestors. For example, during a BIA commission visit to the reservation in 1955, a leading clan member addressed the commission chairman as if both the chairman and he were the original White and Hopi brothers just after the emergence of mankind. The Hopis place great value on their land. They have intimate knowledge of the land and identify with it.

Conceptualization

Nature/World

As mentioned, each clan has a special relationship with creatures, animals, and natural phenomena. Thus, there are clans such as Bear, Badger, Antelope, Spider, Snake, Sand, Cloud, Water, and Corn. Each clan has ritual responsibilities to their particular totem. By performing rituals and ceremonies, the Hopis feel that they can influence the weather and other aspects of the world.

Human Being

The ideal human being is a ritual human being – a person who has a good heart and purpose, who serves as ceremonial host, and who “works for life” (*pam qatsit aw hintsaki*); a person who lives a good life, passes through the four life stages, and ideally dies peacefully in his or her sleep. The ideal human being through his or her personal behavior can also influence the weather.

Life and Death

There are no known creation myths. Those that have been published in the early ethnographic literature are most likely influenced by eastern Pueblos. There is, however, an overwhelming number of emergence myths, in other words, myths about how humans have lived inside the earth and emerged through three prior worlds to this fourth world. Usually each world begins as a paradise, but ends by destruction ultimately caused by evil humans, thus forcing the population to travel up to the next world level.

Reality

There are no specific notions about reality, despite Benjamin Lee Whorf's claims that the Hopi cosmic forms "manifested/manifesting" replace our notions of space and time (see below on time).

Knowledge

Knowledge is a key notion in Hopi thought. As mentioned above, clans have in their possession knowledge about their origins, the world, various creatures and beings in the world, as well as specific rituals, songs, and paraphernalia which serve as Hopi social currency. Knowledge is in a fundamental sense, the basis for social status.

Truth

The Hopis are not particularly interested in "truth" in a philosophical sense. Their knowledge of the world has been truthfully passed down through generation after generation.

Perception

Perception plays no particular role in Hopi thought.

Time

The study of Hopi culture and language was greatly influenced by the primitivism of the first decades of the twentieth century. One of the main contributors to romanticized ideas about the Hopis was philosopher and linguist Benjamin Lee Whorf. His theory of linguistic relativity led him to make absurd claims about the Hopi language, which are still with us in popular and

semi-academic publications. His major claim was that the Hopi language is timeless. He wrote that the Hopis have no general notion or intuition of time and that their language contains "no words, grammatical forms, constructions or expressions that refer directly to what we call 'time,' or to past, present, or future, or to enduring or lasting" (Carroll 1956, 57). He made similar claims about Hopi conceptions of space and of reality, all of which have been directly disproven with thousands of examples by linguist Ekkehart Malotki (1979, 1983).

Consciousness

The Hopis are not philosophically concerned with consciousness.

Rationality/Reason

The Hopis are not philosophically concerned with rationality or reason.

Mystery

The Hopis have a very clear idea of the forces that influence the course of events in the world. The worlds of nature and society are under the influence of deities controlling death, fertility, and the earth. They also conceive of approximately 250 beings called Katsinas, which particularly influence the weather and are performed by costumed and masked dancers during the growing season. The Hopis also place great emphasis on their ancestors. There are also a variety of lesser creatures that influence Hopi life to a greater or lesser degree. Sodality priests and medicinemen and medicinewomen attempt to control or influence these nonhuman beings.

Cross-References

- ▶ [Myth](#)
- ▶ [Native American Religions](#)
- ▶ [Native American Studies](#)
- ▶ [New Age Religions](#)
- ▶ [Polytheism](#)
- ▶ [Ritual](#)
- ▶ [Space and Time](#)
- ▶ [Worldview](#)

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Hormesis

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While stress is generally considered to have harmful effects, in small doses it may have positive effects. For example, flatworms exposed to sublethal heat are better able to withstand subsequent heat exposures, including ones

which are lethal to non-exposed flatworms. Similarly, plants which are slowly exposed to cold (a process called “hardening”) become inured and can withstand temperatures which would kill indoor plants. This process may be generalized to stress in mammals as well. While still controversial, the evidence is growing that exposure to moderate levels of stress, combined with rest periods, can result in what Dienstbier called “physiological toughening.” Indeed, a growing number of researchers have demonstrated this physiological toughening in humans – especially those who report psychological stress-related growth.

Horoscope

- [Astrology](#)

Hostility

- [Violence](#)

Human Brain

- [Transcranial Magnetic Stimulation](#)

Human Development

- [Ecological Psychology](#)

Human Genetics

- [Medical Genetics](#)

Human Intelligence

- [Intelligence](#)

Human Limits

► Sin (Vice, Human Limits, Negativity)

Humanism in Islam

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Related Terms

Sanctity of the individual; Qur'an

Like the other Abrahamic religions, Islam makes strong moral claims, rooted in the sanctity of the individual and in the bonds that unite a community not only synchronically but historically, linking past and future generations with the living present. Muhammad's revelatory experience, articulated in the Qur'an, is rooted in such moral claims, his God commanding allegiance but also rectitude. Beyond the obligation of support for one's brethren in the umma, the nexus to a transcendent God fostered reverence for nature and gratitude for culture, conceived as gifts of God's benevolence. Greek science, philosophy, medicine, and other arts were welcomed as the heirs of the Muslim conquerors settled down. So was the Hebraic heritage that illuminated the Quranic backstory. Also welcomed were Indian mathematics and astronomy; Byzantine art and engineering; Persian epic traditions and administrative practices; Christian and Hellenistic moral, mystical, and ascetic ideas and practices; and even the making of paper, first learned from Chinese prisoners of war after the Battle of Talas in 751. From China too came sericulture. Silk garments challenged the puritan side of the faith. But paper posed a subtler challenge; as works of Greek and other cultures were increasingly and eagerly translated into Arabic in the ninth and tenth centuries, their contents

were absorbed as part of the booty of conquest. There was useful medical and alchemical data and astrological technique. But with this came challenging ideas, thoughts about naturalism, free will, the eternity of the world.

Arabic culture, of course, had native sources of humanistic thinking – in the traditions of tribal councils, the desert and the hunt, the experiences of love and loss, and the odes of the sensuous and spirited pre-Islamic poets who celebrated such themes and often pictured their joys, their pride, and their hopeless struggles with fate. Nor was all that issued from Byzantium, Damascus, Alexandria, or Iran unequivocally humanistic: Greek antiquity could condone and encourage infanticide and pederasty in ways jarring to the sensibilities of prophetic moral monotheism. The monarchies and satrapies of ancient Iran and the East, the castes of India, the resignation of Buddhism, and the metempsychosis of Hinduism would not settle perfectly comfortably into a Muslim soldier's, merchant's, or Sufi's saddle. But conquest *was* broadening, and it was not long before Muslim, Jewish, and Christian physicians, under the aegis of an Islamic state, were exploring and enlarging the boundaries of Platonic and Aristotelian philosophy and logic, Galenic physiology, Ptolemaic cosmology, Euclidean and Apollonian geometry, and the sciences that underlay the useful arts of medicine, astrology, architecture, and mechanics.

Here the conquests were intellectual. The casualties were the commitments of an unexamined faith. Thinkers in the nascent Islamic civilization needed logic if they were to debate successfully with Greek thinkers in Damascus. They needed mathematics for all sorts of practical purposes. But logic and mathematics opened vast new potentials for understanding. Here the motto that Bacon would frame in the English renaissance proved effective in reverse: Power was knowledge! But knowledge brought with it issues of intellectual honesty and responsibility: the historian's dedication to fact, the belle lettrist's love of significant detail, the philosopher's commitment to accept truth where one could find it and follow where the argument might lead. Muslim thinkers

and scholars became not just men of letters and learning or practitioners of technique but intellectual explorers and adventurers for whom the world was a laboratory and man himself was both the problem and the solution, the inquirer and the repository of many a hidden answer and discovery.

Among the great figures of Islamic humanism were al-Khwarizmi (ca. 800–850), the mathematician who had worked in the Bayt al-Hikma (House of Learning) founded by the Caliph al-Ma'mun as a center of scholarship and translation and went on to lay out the scheme of arithmetic using what we now call Arabic numerals and to found key tools of algebra, bequeathing to posterity not only the name *al-jabr*, literally “forcing into place,” but also his own name, the root of our word algorithm, a mathematical procedure; al-Farabi (d. 950), the brilliant logician and social theorist who asked himself how scripture could argue cogently by way of threats of retribution and came to understand prophecy as the mediation of the higher truths of reason to a mass audience by way of the symbols that imagination could supply to rhetoric and law under the name of religion; the Ikhwan al-Safa or Brethren of Purity (fl. ca. 970), whose collection of encyclopedic essays popularized the new learning and embedded there a fable, *The Case of the Animals vs Man before the King of the Jinn*, as the vehicle of a trenchant Aesopian critique of human institutions and pretensions and a call to a higher, more cosmopolitan vision of human potential; Hamadhani (d. 1008), literary virtuoso and satirist, the self-styled “Innovation of the Age” who invented the *maqamah* or “encounter,” a mixed genre of poetry and prose, centered on the japes of a trickster antihero whose verbal pyrotechnics and irreverences light up the dark corners of obscurantism and hypocrisy that Hamadhani saw around him; Miskawayh (d. 1030), the historian, minister of state, and ethicist who sought in literature and learning the keys to a cultivated way of life and a mature and humane character; Avicenna (Ibn Sina, d. 1037), the philosopher/physician who sought to resolve the conflict between the contingency of the Qur'anic

world and the necessity of Aristotle's world by viewing nature as contingent in itself but necessary by reference to its Cause; al-Biruni (d. ca. 1050), the mathematician, cosmologist, historian, and mineralogist who learned Sanskrit and wrote a pioneering ethnography of the newly conquered realms of northern India; Ibn Tufayl (d. 1185/6), the Andalusian physician/philosopher who experimented in fiction with the image of a self-taught man, Hayy Ibn Yaqzan, growing up innocent of language, culture, and tradition, who would discover, without the aid or interference of human contact or institutions, the moral and spiritual truths that religions could only shroud in symbols and stud with the most minimal and undemanding norms; Ibn Khaldun (d. 1406), the Maghribi historian, failed politician, and political consultant on tribal affairs, who founded what he called a new science of civilization in seeking to understand the cultural underpinnings of human history.

What is humanistic about the traditions in which such figures as these and many others like al-Kindi, al-Razi, Sijistani, or Tawhidi stand out? These men do not typically resent or reject the religion which they grew up in or even chose. They are not secularists, nor are they liberal for the most part in any typically modern sense. But they pursue the value of personhood that they find in their religion, and they balance its asperities with a lambent commitment to intellectual freedom and personal creativity. Their values, literary, intellectualist, scientific, courtly, medical, even mercantile, leaven their spiritual heritage and allow them to interpret the obligations of the faith in ways affirmative of humanity. They and their achievements represent powerful alternatives to an outlook that has today made itself all too prominent as a reading of Islam and its relation to other faiths and practices, the salafist movement that seeks to recapture Islamic hegemony by returning to the practices of an imagined past.

Cross-References

- [Ethics](#)
- [Historiography \(Classical\)](#)

- [History of Ideas \(Intellectual History\)](#)
- [History of Medicine](#)
- [Judaism: An Overview](#)
- [Mathematics, Early](#)
- [Monotheism](#)
- [Mysticism](#)
- [Qur'an](#)

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Humanistic

- [Humanities](#)

Humanistic Movement/Values

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A movement in American Psychology popularized in the 1960s and 1970s, humanism emphasized the realization of the full potential of the self by healthy persons. The movement arose as a reaction against the deterministic and pessimistic approaches of the behaviorist and psychoanalytic camps, which reigned in the field for much of the twentieth century prior. The humanists emphasized human freedom, choice, potential, and self-actualization.

Humanities

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Related Terms

[Humanistic](#); [Paideia](#)

The “humanities” is a term that can be traced all the way back to the ancient Greeks, where it originated as a method of educating youth, known as *paideia*. In antiquity such education centered on seven major subject areas, which consisted of grammar, rhetoric, and logic (known in Roman times as the “trivium”) and geometry, arithmetic, music, and astronomy (referred to as the “quadrivium”). Whereas *paideia* was almost exclusively practical in nature, later these seven fields came to be considered the core of what we now term the *liberal arts*. The first formulation of what later came to be dubbed the humanities can be found in Cicero,

a Roman philosopher and political thinker who lived and wrote in the first century B.C. A prolific scholar and translator of the Greek legacy into Latin, Cicero promoted the notion of the *studia humanitatis*, or “study of all things human,” as a means of achieving the ideals of intellectual and moral perfection ensconced in the strategies of *paideia*.

At the same time, the concept of the humanities per se did not really crystallize until the Renaissance, when it came to connote the totality of the new “humanistic” knowledge that had been recently discovered in the multitude of newly translated ancient texts. This new knowledge at times challenged, and routinely expanded, the medieval worldview, founded largely on the authoritative teachings of the Catholic Church and the opinions of the ancient clerical fathers. Renaissance humanism encompassed not only literature and language studies but as much of scientific knowledge and speculation – whether ancient or contemporary – that was either plausible or feasible at the time. What we now understand as “science” per se was then considered “natural philosophy,” a term that endured up through the nineteenth century. Natural philosophy was not separate from humanistic learning, but an integral branch of it.

It was only with the rise of empirical science in the waning years of the Renaissance, first outlined as a radical new approach to the study of nature and to philosophy itself by the English philosopher Francis Bacon in his *Novum Organon* (1620). Bacon proposed that science should not proceed by deductive syllogism, as it had in the past, but by an “inductive” method of examining a variety of situations or circumstances in which a phenomenon could be observed, then by inferring the nature or behavior of the phenomenon by comparing these situations or circumstances. These now obvious principles became the cornerstone of what today we would deem the “scientific method.”

Because Bacon focused on the practical or worldly outcomes of scientific inquiry, as opposed to their purely theoretical value, his “new organon” inspired the close alliance between scientific discovery and technological

innovation, which laid the groundwork for the industrial revolution over two centuries later. In the wake of the Baconian transformation of the scientific enterprise, the humanities rapidly evolved into a separate domain of study, focusing primarily on history, philosophy, literature, drama, rhetoric, and study of the arts. By the late eighteenth century, the divorce was virtually complete, except in countries at the time that were relatively backward technologically such as Germany, where so-called *Naturwissenschaft* (the speculative “philosophy of nature”) played a significant role in the flowering of what came to be known as “German idealism.”

German scholars, however, were also instrumental throughout the nineteenth century in reviving from the Renaissance the technical study of languages and word origins. This intensive preoccupation led to the rise of the field of linguistics, which from its inception has generally be considered both a science and a discipline within the humanities. Linguistic studies of many non-European and ancient, but nonclassical, sacred texts by these scholars sparked about the same time both the emergence of the so-called higher criticism of the Bible, concerned with the historical rather than the theological meaning of passages from Judeo-Christian Scriptures, and the systematic study of non-Western religions. The latter was known in the nineteenth century as *Religionswissenschaft* (literally, “the science of religion”) and eventually grew into what is now one of the major disciplines in the humanities – “religious studies.”

In addition, the linguistics revolution has had a powerful influence on the humanities in general in the twentieth century. The impact initially was felt in philosophy, which became concerned almost exclusively with problems of language and logic after the First World War. The influence pervaded not only in the English-speaking world, where it dominated what came to be known as “analytical” philosophy, or “language philosophy,” but on the continent of Europe where it left its mark on the movements known as “phenomenology” and “structuralism,” the latter deriving from the school of “structural linguistics” pioneered by the French thinker Ferdinand de

Saussure. By the 1960s, structuralism and its rebellious stepchild “post-structuralism” had begun to make major inroads into literary criticism, which by a decade or so later had colonized most of the humanities. Both structuralism and post-structuralism, which soon came to be identified with the technical strategy of reading texts invented by the French philosopher Jacques Derrida known as *deconstruction*, had no interest in either the historical-critical context, or content, of the humanities as a whole. So-called deconstructive readings of unfamiliar as well as familiar texts were all the rage. They often combined highly arcane and jargon-ridden discourse lifted from post-structuralist theories of meaning and signification with Marxist and other kinds of trendy academic forms of political critique. The popular stereotypes of the new “deconstructionist” humanists promoted in the media and by newly enfranchised conservative critics throughout the 1980s were either that of aging political radicals left over from the 1960s, who had turned their “nihilistic” contempt for the social order into a siege of the genteel traditions of liberal learning, or that of self-indulgent intellectual poseurs who sought to dazzle the public with what was in reality pure nonsense.

The stereotypes were grossly misleading and reflected in huge measure the right-wing, anti-intellectual backlash of the period. But like all stereotypes, there was a kernel of truth in them. Today the general consensus among humanists is that the post-structuralist (or what eventually was referred to as “postmodernist”) revolution in the humanities is over and that in retrospect it did more damage than good to the reputation of the field. Nevertheless, because of the de facto convergence of technical linguistics, Marxist-tinged “materialist” social science, and traditional inquiry into the meaning and values of culture that the deconstructionist movement sealed, the humanities as a result were far more prepared to engage in conversation with the sciences. The English physicist and novelist C.P. Snow’s famous distinction, pronounced in the late 1950s, between the “two cultures” of the science and the humanities had sustained

a dualistic mentality about the nature of knowledge for almost two generations. But at the turn of the millennium, the distinction was finally breaking down. In the past decade, many leading-edge theorists in the humanities have somewhat gingerly sought an alliance between certain seemingly relevant scientific subdisciplines, including sociobiology with its Darwinist emphasis on the random and evolutionary nature of moral values and spiritual ideas and cognitive and neuropsychology with their fresh perspectives on how key problems of mind, historically the province of philosophy, can be investigated. The swift decline in the prestige of Marxist theory as a consequence of the worldwide collapse of communism during the last quarter century has prompted many younger humanities scholars, who yearn for some kind of social legitimacy and broader academic respectability for what they do as a matter of course, to seek out new kinds of partnership with presently fashionable strands of materialist science.

Ironically, it has been this flirtation with those subfields of the sciences that has been used or is currently used to downgrade the importance of or to explain away religious phenomena and religious experiences that have propelled a renewed interest for the humanities in the relationship between science and religion. A century ago, it was the hope that advances in the sciences might serve to sustain rather than undermine common religious assumptions and theological surmises. But today the same interest seems to be motivated by the suspicion that many of the so-called transcendental or semireligious presuppositions of the humanities, particularly the claim that canonical texts, works of art, and ethical reasoning have a peculiar spiritual or irreducible significance in their own right, all add up to something like the Wizard of Oz, who commandeers a grand machinery of pretense and illusion to mystify, if not entertain, the breadth of humanity. Many humanities scholars have come perhaps to secretly see themselves as the little dog Toto, innocently sniffing behind the screen with the hope that they might at least serendipitously reveal the humanities for the hoax that it has always been. Such views in

many cases may be born of a sense of doubt, and low professional self-esteem for which the recent hollowing out of the humanities by Marxist critical theory is largely responsible. But there is also a positive curiosity as to how the religious and spiritual qualities of humanistic thought might be reconciled with new scientific discoveries. What might be considered strong “Manichean” perspective about the irreconcilability of the sciences and the humanities arose in an era when a triumphal scientism had basically made such a rapprochement well-nigh impossible. Snow’s views found a receptive audience among that learned segment of the culture who did not acquiesce in the age of Sputnik to the dogma that scientific and technical advance was the end-all and be-all of human aspiration. But now that the rabid anti-scientism that set in as a response to the Vietnam debacle a decade later has long since run its course, humanities scholars as a rule are far more open to the Renaissance vision of the unity of all knowledge.

Since the humanities historically have always been preoccupied in different ways with the question of the health and integrity of the human “soul,” it is only natural that today it would continue to keep a close eye on what the cognitive and neurosciences tell us, especially about the wonders of the brain and the mysterious production of the phenomenon we call “mind.” From the late nineteenth century up until the mid-twentieth, science by and large had for its own reasons excluded the contributions because of its dubious conviction that conscious processes are nothing more than perturbations of an easily definable material reality. The so-called *mind/brain duality*, first characterized by the French philosopher René Descartes in the 1600s, has propelled the modern prejudice that we must understand thought and cognition either as an “epiphenomenon” of the brain’s machine-like operations or as something entirely independent of the laws and regularities of the material world, which science scrutinizes. Science of course preferred the former approach. Such a “mechanistic” psychology, which reached its high water mark in the radical behaviorism of B.F. Skinner during the

mid to late twentieth century, was founded on the paradigm of material reality as matter in motion originating with Newtonian physics in the early modern era.

Yet, in the wake of Albert Einstein’s theories of relativity and the advent of quantum physics during the last century as well, Newtonian mechanics seemed less and less relevant to the effort to apply scientific method to the study of human cognition. The quantum paradigm of a universe unfolding in accordance with indeterminable and at times incalculable subatomic fluctuations that seem almost “random” has in recent years engendered a suspicion that the brain does not obey iron-clad laws of matter in motion, but can only be comprehended as following similar nondeterministic precedents. What is now known as *quantum mind theory* has evolved from both empirical research and higher-order speculation on the part of such well-respected scientists as David Bohm, Roger Penrose, and Henry Stapp, who argue that known neurological interactions and phase changes in the brain evidence something that is not reducible to these interactions and changes. Bohm calls this irreducible *x* the “implicate order” of the universe. The implicate order is a postulate Bohm offers to explain the feedback loops between the different levels of structural manifestation in what we deem material reality and cognitive and symbolic interventions.

While many scientists during the last quarter century, therefore, have developed models that can accommodate humanistic notions of mind, or the nonmaterial order of things, certain thinkers in the humanities have started to challenge the traditional notion that what they study is purely corporeal. This movement has its roots in the German scholarship of the nineteenth century, which consistently preserved remnants of the Renaissance ideal that the humanities and the sciences comprised an integral synthesis, if not a unity. One of the reasons for this fidelity to the Renaissance prototype is the expansive meaning of German word *Wissenschaft*, which can be translated not only as “science” in the technical sense but as the “pursuit of knowledge”

in the broader sense. German thought has never been bedeviled by Cartesian dualism in the same way that Anglo-Saxon letters have been, perhaps because of this very linguistic discrepancy.

Modern German philosophers for centuries have emphasized the inseparability of the body-world from conscious subjects. The nineteenth-century thinker Wilhelm Dilthey, who located the discipline of the humanities in the historical imagination and its ability to discern the interconnection between material and spiritual factors, and the twentieth-century philosopher Martin Heidegger, whose concept of human existence as *Dasein* implied consciousness as a non-dualistic relationship between subject and world, are examples that come immediately to mind. A third recently influential figure is the French phenomenologist Maurice Merleau-Ponty, whose notion of mind and body not as a disjunction but as what he named a *chiasmus* (in rhetoric, a cross structuring of equally codependent clauses or variables) has had a major impact on contemporary gender studies, cultural studies, and what are known as “body studies.” The German word *Geisteswissenschaft*, commonly translated as “the humanities,” derives from the nearly untranslatable term *Geist*, which can mean “spirit” in the disembodied sense but also the entirety of intellectual capacities and functions. With the decline of post-structuralism in the humanities as an enterprise preoccupied with texts and semantic configurations, the old impulse of *Geisteswissenschaft* has been taken up anew with implicit attention to the latest developments in the somatic, cognitive, and neurosciences.

The French social theorists Bruno Latour and Pierre Bourdieu represent two prominent critics of post-structuralism, who have laid the groundwork for a realignment of the humanities with the sciences. The growing significance of cultural studies, which approaches familiar questions in the humanities with hybrid methodologies drawn from the conventional social sciences, has provided an important context for this realignment. Figures like Latour and Bourdieu can be

considered neither materialists nor “idealists” in the classic sense. Nor have they stuck with the now overworked template of neo-Marxist *social constructivism* that has also been dubbed “cultural Marxism” – the view that the objects of investigation within the humanities are always best interpreted as projections of underlying social formations, whether those be class interests, patterns of social domination, or ethno-cultural competition.

The intermingling of cultural Marxist and post-structuralist rhetoric in the discourse of the humanities throughout the last quarter of this century has created a certain confusion concerning whether the humanities are something special in their own right or a mere extension of the social or linguistic sciences themselves. But these new cultural theorists, taking up where Latour and Bourdieu have left off, who are recognizable, at least on Anglo-American grounds, neither as social scientists nor as “humanists” with the grand, almost Ciceronian connotations that the expression conjures up, have less of an interest in culture as a general anthropological category within a general theory of social organization, behavior, and transformation than as the key to how mind itself is subtly and effectively “embodied.” The exploding science of complexity theory has also had tremendous repercussions for this kind of undertaking.

Edward Slingerland, whose training is in the humanities, has been one of the most vocal advocates of both an embodied science and a new horizon for a scientific humanism. In his *What Science Offers the Humanities* (2008), Slingerland argues that both the humanities and sciences have always confronted a “grounding problem” which they can never resolve without serious cross talk between the two. The older conundrum of embodied mind ultimately boils down to “how ‘symbols in the head’ can connect with things in the world (Slingerland 2008, p. 17).” Slingerland traces the trajectory of evolving theories of how these connections take place from philosophical pragmatism through Jean

Piaget's "genetic psychology" to the subdivisions of cognitive science known as "mental space," "conceptual metaphor," or "conceptual blending" theory. These theories do not regard cognitive processes, including the symbolic imagination, either as an autonomous series of events that adhere to their own internal logic, as structuralism and post-structuralism might presume, or as what the philosopher Gilbert Ryle once called the "category mistake" of confusing mind with the material organization of the brain. Instead they look upon them as discrete types of dynamic and fluctuating spatial mappings, which depend on changes in the physical location, orientation, agency, goal directedness, and movement of human bodies in their environments. Cartesian "parallelism" is therefore replaced with a sophisticated kind of interactionism. Linguistic and cultural differences, including varying worldviews among human groups, can be thus seen at the same time as unique in some sense and also as the immediate or long-term consequence of distinctive environmental circumstances.

Material culture thus becomes as important as its symbolic counterpart. Slingerland himself gives special consideration to Jared Diamond's exploration of what might be dubbed "cognitive geography" in his award-winning book *Germes, Guns, and Steel: The Fate of Human Societies*, published in 1997. Diamond argues that such seemingly minor factors, as whether certain human beings in certain parts of the world domesticated animals early or whether they lived in relative isolation from other societies, over time have had an enormous influence on how cultures developed, what symbolic productions they retained or were responsible for, which conceptual metaphors they used, whether they prospered, and how they fare in the political and economic pecking orders of civilization. Diamond's theories are neither reductionist nor deterministic in the strict sense, but go a long way toward showing how cultural diversity and environmental variation interact closely and fatefully with cognitive efforts at explaining and living in

harmony with the world around us. Slingerland, a Sinologist and Chinese linguist by training, offers his own distinctive theory of how East Asian culture and thought unfolded through what he refers to as the "vertical integration" of cultural, historical, and religious studies with cognitive psychology and material geography.

Prior to the post-structuralist revolution, the humanities were more interested in celebrating the way in which their field served as a gatekeeper to those relatively privileged forms of symbolic communication that fostered appreciation of what was most distinctively "human." Humanities scholars often relished the "impractical" nature of their field, following the hierarchy of intellectual values and pursuits defined in the ancient world by Aristotle and revered as the mainstay of the truly contemplative life. Post-structuralism and cultural Marxism sought, however, to stress the humanities as an avant-garde strategy of sophisticated theory and praxis concentrating on a sustained critique of power relationships and ideological formations with the aim of engendering, or at least abetting, meaningful social transformation.

The new "embodied humanities" has more complex and not so obvious goals, insofar as it appears to have a clear idea for both upgrading the social prestige and intellectual relevance of the field while offering it up as an occasional handmaiden to the medical, social service, and helping professions. Thus, the general venture of practical and professional ethics has become a guiding thread for the new generation of humanists. While scientists ask the question of "what is going on," humanities scholars pose the accompanying query: "why is it important to know?" The humanities continue to propose larger questions or, as Derrida puts it, the "question of the question," involving the meaning of life and death in ways the sciences cannot or should not. But it has begun to recognize that these questions cannot really be addressed without the knowledge supplied by the sciences themselves. The ultimate question of what is real, or "what is the meaning of Being" in Heidegger's

argot, is the kind of *metaquestion* that neither the sciences nor humanities can answer on their own. On the contrary, they can only begin to approach such a metaquestion through close collaboration, mutual respect, and fine-tuning of their respective argots and vocabularies in such a manner that the Renaissance vision of a convergence of the totality of knowledge pathways that ultimately give us a glimpse of the *sumum bonum*, the highest good for humanity itself.

Cross-References

- [Critical Theory](#)
- [Cultural Studies](#)
- [Physics](#)
- [Physics in Protestantism](#)
- [Semiotics](#)

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Hyperstructures

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Many functions in bacteria are performed by large structures (known as *hyperstructures* (Norris et al. 1999), *modules* (Hartwell et al. 1999), *metabolons* (Srere 1987), *SOWAWN* (*self-organizing-when-ever-and-where-ever-needed machines*) *machines* (Ji 2012), etc.) in which small molecules, macromolecules, and ions are physically associated (Norris et al. 2007). In the case of *Escherichia coli*, *Bacillus subtilis*, *Caulobacter crescentus*, and other model bacteria, examples of such *hyperstructures* include: the array of chemotaxis-specific receptors (Tar, Tsr, Trg, Tap, and Aer); dynamic, coupled transcription-translation and transcription-translation-insertion (transertion) *hyperstructures* comprising active RNA polymerases and ribosomes along with the nascent mRNAs and nascent proteins and indeed the highly expressed genes themselves; the cytoskeletal filaments MreB, CreS, and FtsZ; filaments of elongation factor EF-Tu; filaments of the degradosome (comprising RNA helicase B, polynucleotide phosphorylase and enolase) (Taghbalout and Rothfield 2007); *metabolons* of glycolytic enzymes (Velot et al. 1997); foci of the enzymes E1 of the phosphoenolpyruvate: sugar phosphotransferase system; clusters of secretion enzymes such as SecA; nucleofilaments of recombination enzymes such as RecA; the cell division machinery (comprising a lipid domain and proteins such as FtsZ, FtsA, FtsI, FtsK, and AmiC); the DNA replication factory (comprising enzymes such as PolC, DnaB, DnaG, and DnaE as well as enzymes responsible for the synthesis of precursors such as ribonucleoside diphosphate reductase); cellulosomes (massive assemblies of enzymes on the outside of the bacterium that digest molecules such as cellulose) and polycellulosomes. *Ambiquitous* enzymes can occupy two different positions in the cell

Human-Machine Organism

- [Cyborgs](#)

(Nemat-Gorgani and Wilson 1980) and some hyperstructures depend on such enzymes and are functioning-dependent *structures* that assemble only when functioning and that disassemble when no longer functioning (Thellier et al. 2006). Other hyperstructures are equilibrium or quasi-equilibrium structures that remain even in the absence of a flow of energy or nutrients. It has been proposed that hyperstructures constitute a level of organization intermediate between macromolecules and the bacterial cell itself (Norris et al. 2007). Communication between hyperstructures would then take the form of changes in: DNA supercoiling, ion condensation on charged filaments, signaling molecules, water structures, and distribution of membrane domains. At this intermediate level of organization, hyperstructures would control the phenotype and, in particular, the bifurcations that occur, as during the cell cycle, so that events take place in the right place, at the right time and in the right order. Exploration of the hyperstructure concept may also prove useful for understanding eukaryotic cells and, for example, interactions between hyperstructures have also been invoked to explain the structure and functioning of mitochondria and to explain the existence of mitochondrial DNA (Trinei et al. 2004).

Cross-References

- [Biology](#)
- [Biology, Theoretical](#)
- [Complex Systems](#)
- [Dualism](#)
- [Evolution](#)
- [Hyperstructures](#)
- [Medical Microbiology](#)

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Hypnosis

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Related Terms

[Absorption](#); [Animal magnetism](#); [Hypnotisability](#); [Mesmerism](#); [Suggestibility](#); [Suggestion](#); [Trance](#)

Description

In a report on hypnosis for the British Psychological Society, hypnosis was defined as:

An interaction between one person, the “hypnotist,” and another person or other people, the “subject” or “subjects.” In this interaction, the hypnotist attempts to influence the subjects’ perceptions, feelings, thinking, and behavior by asking them to concentrate on ideas and images that may evoke the intended effects. The verbal communications that the hypnotist uses to achieve these effects are termed “suggestions” (Heap et al. 2004). Autosuggestions refer to suggestions that are self-administered, while the “classic suggestion effect” entails that responses elicited by suggestions are experienced as involuntary and effortless (Heap et al. 2004).

Verbal suggestions to relax and focus attention, typically administered in a standardized way as a “formal induction procedure,” are used to establish a hypnotic state or “trance.” In keeping with the content of commonly used suggestions in the induction procedure, the hypnotic trance is characterized by attentional absorption, disattention to extraneous stimuli, and relaxation. However, “active-alert” inductions conducted during physically active states such as riding a stationary bicycle indicate that suggestions of physical relaxation per se are not necessary for a state of absorption and suggestibility to be established (Heap et al. 2004). Hypnotic trance is similar to other more everyday states of absorption, such as immersion in reading, a film, or music, but the focus of attention is directed by the content of the relevant suggestion – for example, sensory foci (a spot on the wall or the voice of the hypnotist) or imagery (walking down steps into a garden), while the “depth” (intensity) of the experience is often profound in highly suggestible individuals.

A variety of scales have been developed to measure individual responsiveness to suggestions, such as the Harvard Group Scale of Hypnotic Susceptibility (Shor and Orne 1962). These scales generally include a hypnotic induction followed by test suggestions and an assessment of the subject’s response to each. “Hypnotisability” or “hypnotic suggestibility” is typically defined as the number of suggestions that an individual responds to on a standard scale of this type. A distinction is drawn between

different types of suggestion – ideomotor suggestions involve automatic movements (e.g., arm levitation), challenge suggestions involve an inability to complete an action when instructed to do so (e.g., eye opening), while cognitive suggestions involve significant alterations in experience (e.g., hallucinations, amnesia, anesthesia). Most suggestions are intended to be effective at the time of their administration, but posthypnotic suggestions influence behavior at a later time (e.g., the suggestion in the Harvard scale that the participant will touch their ankle when hearing a tapping sound but will forget having been given the suggestion).

Induction of the hypnotic state appears to facilitate responses to further suggestions (e.g., of arm levitation), although some individuals respond to the same suggestions without a formal induction procedure (Nash and Barnier 2008). Nevertheless, the associations and expectancies built up around the term “hypnosis” in societies familiar with the term appear to be suggestive in their own right. For example, labeling an induction procedure as “relaxation” produces a modest increase in suggestibility, while labeling the same procedure as “hypnosis” significantly increases suggestibility (Nash and Barnier 2008). This suggests that the term and concept of “hypnosis” should be regarded as a “cultural representation” with its own history and cognitive effects (Deeley 2006).

At the present time, hypnosis is principally employed in the treatment of medical and psychological disorders and in psychological research (Nash and Barnier 2008). Intrinsic hypnosis research investigates the nature of the hypnotic state or trance. By contrast, instrumental hypnosis research employs suggestions to create experimental models of phenomena of psychological interest, such as analgesia, hallucinations, or limb paralysis (Nash and Barnier 2008).

Different theories of hypnosis or suggested effects can be broadly labeled as either “special state” or “sociocognitive” theories. “Special state” (or “state”) theories consider responsiveness to suggestions to be explained by the distinctive properties of the altered state of

consciousness, hypnotic condition, or “trance” produced by the induction procedure. Recent “state” theories based on neuropsychological models of executive function (such as “dissociated control” or “neodissociation” theories) emphasize the role of “high-level” processes in the control of action, particularly in circumstances where novel, complex, or flexible responses are required. Executive processes include attention, working memory, planning, response selection, and inhibition, while their engagement in the generation of controlled action is typically accompanied by awareness and a sense of voluntary control. The key claim is that hypnosis involves an inhibition of executive function and corresponding overreliance on situational cues (particularly those conveyed by suggestions) for the control of behavior. The inhibition of high-level executive control is held to account for the lack of awareness or involuntariness of suggested effects (with theories differing as to how or in what respects this occurs). By contrast, sociocognitive theories reject the idea that a special state of executive inhibition is required for suggested effects to be generated, citing evidence of hypnotic responding in the absence of trance induction in some high hypnotizables. The broad thrust of sociocognitive approaches is to emphasize the role of normal psychological processes and influences to account for hypnotic responding, such as imagination, motivation, expectancy, role playing, compliance, and attributions which reframe the active contribution of the subject to the suggested effects to diminish the sense of agency in their generation. These processes are also considered relevant to the very establishment of the “hypnotic state” itself in response to the suggestions in the induction procedure, with increase in responding to suggestions after induction attributed to changes in expectancy and motivation rather than a uniquely altered state of consciousness involving executive inhibition (Heap et al. 2004; Nash and Barnier 2008).

The history of hypnosis is relevant to understanding current debates about the nature of hypnosis, as well as the relationships between hypnosis and religions.

Firstly, a distinction can be drawn between the use of suggestions or suggestive processes to influence experience and behavior and theories of hypnosis. Indeed, individuals can effectively employ what from the perspective of hypnosis theory and practice are suggestions without interpreting them as such. For example, a report from 1775 about the Austrian exorcist Father Johann Joseph Gassner (1727–1729) describes how he asked a nun suspected of possession whether she agreed that anything he should order would happen. She agreed, and then, he ordered any possessing spirit to manifest itself – which it did (Ellenberger 1994). Gassner’s writings make it clear that he believed these effects were supernaturally caused, but his practice resembles nonreligious applications of hypnosis in which a subject hands over executive control to a special agent (the “hypnotist”) and conforms their behavior to expectations established within the hypnotic context (Oakley 1999). Similarly, Gassner’s contemporary Anton Mesmer (1734–1815) developed many suggestive techniques for the purpose of healing, such as passes of the hand over the patient’s body to produce “crises” (swooning, convulsions, shaking, crying, hysterical laughter, among other signs), followed by a stupor. However, Mesmer interpreted these effects in terms of his quasi-physical theory of “animal magnetism.” He even believed that Gassner had unwittingly used animal magnetism to effect his cures, confiding to an associate that “Gassner possessed magnetism to an extraordinary degree and his own powers were not so great” (Ellenberger 1994). Successors such as Marquis de Puysegur (1751–1825) adopted and developed Mesmer’s techniques, while rejecting the quasi-physical theory of animal magnetism in favor of psychological theories which are the precursors of contemporary theories of hypnosis (Ellenberger 1994). Puysegur dispensed with the dramatic crises of Mesmer, producing a more quiescent “perfect crisis” or “artificial somnambulism” comprising apparent wakefulness, obedience to the commands of the magnetizer, and then amnesia after being “disenchanted” by kissing a tree (Ellenberger 1994). The wakefulness and obedience (suggestibility) of “artificial

somnambulism” are prototypes of subsequent hypnotic conditions, although the induction and deinduction techniques, presence of subsequent amnesia, and interpretations of the condition have changed with time. For example, Abbe de Faria (1756–1819) produced the related condition of “lucid sleep” with the command “sleep!” rather than mesmeric passes (Ellenberger 1994). The term “hypnosis” was coined in 1832 by James Braid (1795–1860), who viewed it as a distinct physiological state characterized by fixed stare, relaxation, suppressed breathing, and fixed attention to the words of the hypnotist (Heap et al. 2004). Despite these and subsequent changes in both the theories and practices of mesmerism and hypnosis, their advent brought increasing awareness of the existence and possibilities of suggestions, to the extent that in contemporary practice, suggestions are explicitly designed to produce specific effects – for example, as part of psychological treatment or research (Nash and Barnier 2008). Further, historical variations in the hypnotic condition illustrate the extent to which it is constituted by specific suggestions which vary with the hypnotist and the “school” to which they belong, in conjunction with the social learning and expectancies of the subject. Nevertheless, the responses elicited by suggestions in these diverse hypnotic conditions are experienced as involuntary, effortless, and realistic in keeping with the “classic suggestion effect.”

Familiarity with religious practices and pre-suppositions appears to have influenced developments in hypnosis theory and practice in different ways in the late eighteenth and throughout the nineteenth centuries. For example, Mesmer’s “crisis” recalled the convulsive crisis attending the onset of possession (Ellenberger 1994). Mesmerism and hypnosis were also often conceived as giving access to special knowledge in “lucid” subjects – such as the diagnosis and cure of illnesses and clairvoyance – resembling the disclosures previously called forth from the interrogation of possessing demons. The special knowledge made possible through mesmerism and hypnosis inspired an “experimental metaphysics” among German Romantics, in which

extrasensory perception; knowledge of the past, future, and “world soul”; and other exalted noetic states could be attained (Ellenberger 1994). The boundaries between hypnosis, spiritualism, mysticism, hysteria, and possession were – in some cases – very fluid. For example, the German physician Justinius Kerner (1786–1862) considered possession a “demonic-magnetic disease” and treated it with a mixture of exorcism and magnetism (Ellenberger 1994). The appropriation of hypnosis or suggestive techniques by new religious or spiritual movements and view that it gives access to special knowledge (such as knowledge of past lives) has continued to the present day.

An alternative trajectory saw hypnosis employed as a secular method of medical treatment and object of scientific inquiry. This trend was reinforced by the rise of positivism and scientific rationalism in the mid-nineteenth century and forms the background to the contemporary scientific study and clinical applications of hypnosis (Ellenberger 1994). Surgery under magnetic anesthesia was employed by Recamier as early as 1821 (Ellenberger 1994). The neurologist Jean Martin Charcot (1825–1893) and the philosopher and psychiatrist Pierre Janet (1859–1947) used hypnosis as a way of understanding and treating hysteria (quasi-neurological signs and symptoms in the absence of tissue pathology that could adequately explain them) (Bell et al. 2010). In particular, it was noted how hysterical (dissociative) symptoms such as paralysis, amnesia, anesthesia, involuntary movements, convulsions, and hallucinations could be produced by suggestions, while suggestions could also be used to remove hysterical symptoms. Charcot and Janet considered both hysteria and hypnotic effects to result from unconscious “fixed ideas” that were the result of (auto)suggestions, with Janet postulating “narrowing of the field of consciousness” as the basis of dissociation of normally integrated cognitive functions in both hysteria and hypnosis (Ellenberger 1994). Drawing on cognitive neuroscience evidence of shared neural mechanisms underlying dissociative and suggested phenomena, Oakley similarly proposed that both dissociative and hypnotic

phenomena belong to a supertype of suggestive processes – in other words, dissociative phenomena are generated by processes of autosuggestion that resemble the processes producing hypnotic phenomena (which are usually allo-suggestive, but can be auto) (Oakley 1999). At a neural level, there is increasing evidence that symptoms in both hysteria (clinical dissociation) and their suggested analogues in hypnosis are associated with increased activity in overlapping prefrontal cortical regions, suggesting that intervention by the executive system in both automatic and voluntary cognitive processing is common to both hysteria and hypnosis. However, comparable brain regions involved in motivation and processing stimuli related to the self may also be engaged (Bell et al. 2010).

Similarities between features of possession trance (identity change with or without amnesia and other dissociative symptoms); sense of altered identity in dissociative identity disorder and method acting, respectively; and suggested effects of identity change, amnesia, and other features in high hypnotizables have led to the proposal that suggestive-dissociative processes may also underlie many instances of possession (Deeley 2003; Taves 2006). By extension, suggestions in high hypnotizables are likely to be relevant to modeling cognitive and neural mechanisms enabling other culturally or religiously recognized forms of experience and behavior – in particular, any alterations in the control, awareness, or ownership of thought, perception, speech, and actions (as in mediumship, prophecy, or other types of inspired speech or writing); states of profound attentional focus and psychosomatic quiescence such as absorptions (Skt. *dhyanas*, Pali. *jhanas*) in concentrative meditation; anesthesia in ascetic mortifications or ritual ordeals such as self-piercing; and vivid visionary experience such as shamanic spirit journeys or tantric visualizations.

Nevertheless, this proposal does not entail that possession or other forms of religious experience are nothing but hypnosis or even due to hypnosis. Rather, the claim is that similar alterations in experience and behavior encountered in distinct contexts (clinicopathological, religious, artistic,

hypnotic) may share the efficient causal mechanisms of suggestive-dissociative processes at a cognitive and neural level. One category (such as clinical dissociation, possession, or hypnosis) cannot be reduced to another because all acquire context- and tradition-specific extended meanings, values, and purposes by virtue of their distinctive histories. Indeed, the meanings, expectancies, and differing local interpretive frameworks of terms such as “possession,” “hysteria,” and “hypnosis” are likely to powerfully shape and differentiate the phenomena in question. For example, most suggestions employed in hypnotic contexts involve ideas that temporarily contravene ideas of reality and would otherwise be regarded as imaginary or false by both hypnotist and subject (such as a suggestion of an arm rising because it is attached to a helium balloon). By contrast, arm levitation in the case of possession would typically be attributed to the action of a truly existent agent such as a god, spirit, or demon, with ramified conceptual, affective, and practical associations that are widely shared by a relevant social group (Deeley 2004). The presence of strongly held beliefs and authoritative social practices as opposed to temporarily imagined scenarios may affect the threshold for experiencing the respective phenomena, quite apart from differences in their attributed significance (Deeley 2003). Similarly, in modern practice, suggestions in hypnosis are predominantly verbal in form, whereas with exceptions (such as the case of Gassner noted above), cues engaging suggestive-dissociative processes in possession trance are more likely to be nonverbal (such as the musical motto signifying the descent of a specific possessing agent in possession rituals, quite apart from expectancies engaged by the overall context). Hence, cognitive or social neuroscience approaches to suggestive-dissociative processes require a more extensive analysis of the prior enculturation and range of cues and contexts that inculcate and/or elicit them (Seligman and Kirmayer 2008). This will involve a continuing dialogue with anthropological and other perspectives on how the forms of experience made possible by suggestive-dissociative processes are interpreted and affect human lives.

Cross-References

- [Buddhist Meditation Practices](#)
- [Neuropsychology](#)
- [Revelation](#)
- [Ritual](#)

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Hypnotisability

- [Hypnosis](#)

I

- [Self](#)

Idea of Holy

- [Das Heilige, Concept of](#)

Idealism

- [Constructivism \(Philosophy of Mind\)](#)

Identity

- [Personality Psychology](#)
- [Self, From a Psychological Perspective](#)
- [Sex and Gender](#)

Identity (Philosophy of Mind)

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In philosophy of mind, a major issue is the relation of mind and brain, with early theories

suggesting that mind and brain are identical. This early identity theory quickly encountered criticism, as every brain is slightly different, and human brains are different from animal brains. If having a pain or computing an addition operation is just a particular kind of brain event, then identity theory was committed to the view that it must be the exact same brain event in every individual. Identity theorists thus argued for what came to be called type-type identity, that is, for every type of mental event there is one and only one type of physical event. An approach to philosophy of mind known as philosophical functionalism came to reject this thesis, arguing instead for token-token identity, which denies that it is necessarily the case that for each type of mental event there is one and only one type of physical event, arguing instead that for any individual mental event (a mental “token”), there is a physical token or set of tokens that are said to realize the mental token. On this view, having a pain always is realized physically, but having a pain can be realized differently in different organisms. Thus, the affirmation of token-identity and the denial of type-identity gives rise to multiple realizability, the view that any given type of mental property can be realized by different physical systems. Multiple realizability arguments have been particularly important in debates about the possibility of artificial intelligence.

Ihsan

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Ihsan (good personal conduct), the third aspect of the Islamic creed (first is Islam itself, second is Iman) is described as the act of worshipping Allah as if you see Him, knowing that even if you do not see Him, He sees you. This goes much beyond the ritual prayers, and every good action performed by a believer is seen as an act of worship. This is commonly expressed by Muslims as doing what is pleasing to Allah, who is present, ever watchful.

‘Ilm al-falak

► [Astronomy in Islam](#)

‘Ilm al-hay’a

► [Astronomy in Islam](#)

‘Ilm al-nujūm

► [Astronomy in Islam](#)

Image of God (About the Human Being)

► [Imago Dei](#)

Imagination

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Related Terms

[Creativity](#); [Faculty of innovation](#); [Fancy](#); [Fantasy](#)

Etymology

The Greek and Latin terms for imagination reveal that imagination, from the beginning of Western thought, has been conceived as a kind of secondary, internal perception or sight. The Greek word *phantasia* is derived from *phainesthai*, meaning “to make oneself visible or seen,” and the underlying assumption seems to be that what makes itself seen through the imagination is something akin to but nonetheless different from sense perceptions. According to Aristotle (384–322), imagination makes images or representations appear, and these images (*phantasmata*) “are similar to objects perceived except that they are without matter” (432a9–10). Aristotle even suggests that *phantasia* (imagination) ultimately is derived from *pháōs* (light) (429a3–4), since nothing, in Aristotle’s view, can appear to the perceiving mind without light. Thus, on this account, imagination is, metaphorically speaking, an internal light that makes mental images appear.

The Latin correlates to *phantasia* and *phantasma* are *imaginatio* and *imago*. These terms emphasize stronger than their Greek counterparts the visual, image-making character of the imagination: the mind is like a screen on which the imagination is able to “paint” its images.

In everyday discourse imagination is often used psychologically to describe the mind of either a particularly innovative or delusional human being, that is, in the most extreme cases, the artist and the madman. Accordingly, there exists a certain ambiguity in ordinary talk about imagination/fantasy. On the one hand,

imagination refers to originality and outstanding inventiveness (i.e., to be imaginative and fantastic), and, on the other hand, it refers to various pathologies of the mind (i.e., “it is only in his imagination”). In both cases, however, imagination is supposed to be a subjective and somewhat excessive phenomenon of no particular importance in the practical life of ordinary people.

History

From antiquity to the enlightenment, the dominant theories of imagination in Western thought have stressed the essentially imitative and reproductive nature of the imagination (Kearney 1988). As a power only capable of imitation, the imagination was regarded as inferior to other powers of the mind, especially those of reason and perception. The implicit danger of any act of imitation is, of course, that it opens up the possibility of serious misrepresentation and distortion of the original (i.e., ideas or sense perceptions) that is imitated. Consequently, the imagination was treated with considerable suspicion by philosophers and theologians alike.

The basic philosophical and theological suspicion of imagination concerns the imagination’s ability to distort reality and trick reason into attending false beliefs. For the main part of the thinkers of both Platonic and Aristotelian orientation, imagination must be controlled by and subdued the judgment of reason, for only through the exercise and cultivation of reason, philosophy (science) will be able to lead us toward truth and trustworthy grasp of reality. In relation to this endeavor, imagination is either unnecessary or, at its worst, a direct threat.

Although theories of imagination seem somewhat varied in the seventeenth and eighteenth centuries (Engell 1981), the enlightenment generally continued the suspicious attitude toward imagination and mental images (Daston 2005, 17 ff.). However, the enlightenment and early romanticism also witnessed two epoch-making shifts in the philosophical appraisal of imagination:

(a) As this period celebrates rationality, autonomy, and freedom as the chief expressions of

human dignity, humans are beginning to be regarded as masters over nature and history and capable of controlling their own fate (Soulen and Woodhead 2006, 8 ff.). This turn toward human potentiality is reflected in the emerging romantic notion of the creative imagination, transforming, as it were, the previously held view that imagination was essentially mimetic and reproductive. Simultaneously, the skepticism of the enlightenment toward imagination was gradually replaced by the romantics’ affirmation of creative imagination as humanity’s most exalted power. S. T. Coleridge (1772–1834) even turns the imagination into a theological concept regarding it as a repetition in the human mind of the divine act of creation (Coleridge 1817, 304 f.). In romanticism, science, art, and religious insight is generally interpreted as expressions of true genius, and imagination, thus, becomes the human locus of divine inspiration and epiphany.

Several modern philosophical theories of imagination are deeply imbedded in this romantic tradition of creative imagination, although the theological and epiphanic associations are left out. In Jean-Paul Sartre’s (1905–1980) existential philosophy, imagination is closely related to human freedom. Freedom is the ability to negate reality, and, according to Sartre, this is exactly what the act of imagining does. It replaces reality with imaginings of something that are not real (Sartre 1940). The hermeneutical philosopher Paul Ricoeur (1913–2005) stresses the linguistic aspect of imagination relating it, as it were, to poetic discourse and the creation of new meaning (“semantic innovation”) through innovative use of metaphor (Ricoeur 1975). Finally, the notion of creative imagination reaches its strongest expression in the philosophy of Greco-French philosopher and psychoanalyst Cornelius Castoriadis’ (1922–1997) concept of “radical imagination.” According to Castoriadis, the imagination is radically creative and as such capable of creating new forms “*ex nihilo*,” “out of nothing” (Castoriadis 2007).

(b) During the period of enlightenment and romanticism, the imagination also undergoes

a change from a one- to a multidimensional concept. The multidimensionality of imagination finds expression in many different ways. The German psychologist Johan Tetens (1736–1807), for instance, distinguishes between perceptive, associative, and creative functions of the imagination (Engell 1981, 118 ff.). Immanuel Kant (1724–1804), whose influence in these matters is unprecedented, understands imagination (*Einbildungskraft*) as both an empirical and transcendental faculty, and he operates with a further distinction between “reproductive” and “productive” functions of imagination. Coleridge, for his part, reinforces and widens the Kantian concept of imagination as he distinguishes between “primary imagination” (creation of ordered perceptions), “secondary imagination” (dissolution of perceptions in order to recreate them through works of art), and “fancy” (mechanical association of ideas) (Barth 2001).

At least two consequences follow from the multidimensionality of imagination. First and foremost, these developments within the philosophy of imagination imply an increased theoretical complexity and a more nuanced approach toward imaginative phenomena in general. Secondly, imagination is no longer seen simply as the mind’s ability to make mental images/representations appear. Although the mental and representational aspect of imagination is still relevant, not least in phenomenology and philosophy of mind, other dimensions and functions of the imagination come to the fore, e.g., creative, social, artistic, critical, etc., which cannot be explained within a merely mentalistic paradigm of reproductive imagination (cf. Robinson and Rundell 1994).

Imagination in Science and Religion

The question of the use and importance of imagination in science and religion is very complicated and can be addressed in many ways. For the sake of systematic clarity, the issue will be discussed under three headings:

- (a) Imagination has no role to play in neither science nor religion. Generally, scientific and religious thinkers have been suspicious of any use of imagination in relation to human attempts to comprehend objective reality and/or religious truths. As earlier noted, the prevailing assumption of imagination in Western thought has been that it belongs to the domain of the unreal, and since both science and religion claimed to reveal the fundamental truths about reality, none of them seemed able to make any theoretical use of the imagination. In science, the suspicion of imagination seems to be based on a fundamental distinction between “fact” and “artifact,” the former understood as the objective parts of reality, that which is “given by nature” (Daston 2005, 18 f.), and the latter understood as that which is made by human art, something invented, and in this sense not related to true discovery. In order “to let nature speak for itself” (Daston 2005, 28), and in order to salvage the epistemic objectivity of scientific method, any influence of human art and imagination must be excluded. Another risk of letting imagination play a role in science is that it could easily lead to pseudoscience, e.g., astrology, alchemy, and magic.

The religious suspicion of imagination closely resembles the scientific one. In Medieval rational theology, reason or intellect is understood as the only organ capable of truly comprehending the eternal and immutable ideas residing in the mind of God (Miner 2004, 7 ff.). Since imagination is closely related to sensation, any use of it will only lead to appreciation of the sensible world and, ultimately, to idolatry – the religious equivalent of pseudoscience. Theology of revelation maintains that human knowledge of God is not accomplished through the exercise of reason but depends entirely on God’s self-revelation. Since human nature is corrupted by sin, any use of religious imagination will only undermine the trustworthiness of God’s revelation. The “demythologization program” of German theologian Rudolf Bultmann (1884–1976) can be seen as an example of such an attempt to secure divine

self-revelation from the contamination of human imagination.

- (b) Imagination is essential to religion, but plays no role in science. This position is intrinsic to the nineteenth century critique of religion of which Ludwig Feuerbach (1804–1872) is an evident representative (Feuerbach 1841). According to Feuerbach’s “projection theory of religion” (Harvey 1995, 229 ff.), the fundamental cause of religion is the imagination. In contrast, science and philosophy use reason in a disciplined manner in an attempt to elucidate the objective nature of reality. Hence, imagination, which Feuerbach understands as the diametrically opposite of reason, reality, and objectivity, plays no part in neither science nor philosophy. In religion, however, imagination is put to the service of human wish fulfillment, that is, a primordial desire to transcend the limits of human subjectivity, and this strong alliance between imagination and emotions may ultimately defeat reason and create illusions, most notably the representation of “God.”
- (c) Imagination plays a central role in both science and religion. This position seems to be widely accepted among contemporary philosophers of religion as well as philosophers of science. It may seem counterintuitive that an enlightenment thinker like Adam Smith (1723–1790) would be able to find any use for imagination in science. However, he did maintain that scientists use “the imagination to give us new insights into the familiar natural world” (Downie 2001, 60). As such, imagination must be seen as playing an important role in scientific discoveries. More recently, Ian Barbour has argued that imagination is necessary in science in relation to the construction of theories and models. Theoretical models, according to Barbour, are “imagined mechanisms or processes postulated in a new domain by analogy with familiar mechanisms or processes” (Barbour 1998, 116). In a similar vein, American philosopher of religion Garrett Green, employing Thomas Kuhn’s (1922–1996) concept of paradigms, argues that

imagination is used in science and religion in much the same way. He defines imagination functionally as “the paradigmatic faculty” (Green 1989, 66) which is used heuristically “to reveal the larger patterns in broad areas of experience that might otherwise remain inaccessible” (Op. cit., 67). Thus, “imagination *is* the taking of paradigms to explore the patterns of the larger world” (Op. cit., 69). In science, paradigms are usually called “theories” or “models,” which are used in the exploration of the patterns of the nonfamiliar world; in religion, a similar function is often performed by normative texts, rituals, and dogmas. So, at least functionally, science and religion are similar practices through which creative imagination attempts to make sense of reality (Barnes 1983, 20).

Cross-References

- [Aesthetics \(Philosophy\)](#)
- [Memory](#)
- [Myth](#)
- [Perception](#)
- [Philosophy of Mind](#)

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Imago Dei

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Related Terms

[Image of god \(about the human being\)](#)

Description

Imago Dei is the Latin translation of “*image of God*,” which is the designation of the human being in Genesis 1:27. The original Hebrew text seems to suggest that implied in this designation are features that give the human a similar function like those of memorial stones in ancient Middle East: The presence of such stones was intended to make people remember who the ruler in a given area was. When this symbolic function is given to the human as an initial characteristic of its

creaturely status, its religious meaning is that the human is the species whose presence on Earth shall be a sign of God as the creator and ruler of the universe.

From a theological point of view, *imago Dei* may be interpreted as a designation of the human that has several different functions: It draws a clear line between God and the human, creator and creature; it separates the human as a species with a specific distinction from and over against other living beings, thereby also suggesting the human’s status in creation as privileged; and it offers the human a specific task: To live in such a way that the function of being a sign of God as creator of the universe is maintained. In the Christian tradition, during the interpretations of Jesus Christ in the New Testament, the notion has been given a further theological relevance when Christ is seen as the true image of God (Col 1,15), but this latter level of symbolic meaning has hardly been of any relevance to the science–religion debate. The enduring theological significance of the notion, which also makes it culturally vital and important still, is its ability to offer a powerful way of interpreting the human’s unique relationship with God and within creation. Thus, its point is not to indicate specific inherent human capacities or features such as a sign of being created in the image of God, but to indicate the specific *relation* between humans and God.

History and Context

During the centuries, the historical and contextual background suggested above often seems to have been lost to different interpreters of the Scriptures or has been developed into more one-sided interpretations of what is the specific character of the human being in creation. Accordingly, the history of the interpretation of *imago Dei* is complex. The interpretation of the notion can thus be seen as a reflection of the different understandings of the human that have been prevalent during the different periods in the course of history. In this way, *imago Dei* has served as a notion that mirrors what one in a given period with a given theological or philosophical context

has taken to be the distinct human feature when the human is compared to other species. Often, *imago Dei* has been understood as an indication of the *rational* character of human existence or the human's capacity for *moral* conduct. Sometimes, it has also been interpreted as a way to designate the human's capacity for religion. After the Enlightenment, *imago Dei* has often been understood as a theological synonym to the more secular notion of *human dignity*. This latter interpretation has occasionally included echoes of the emphasis on the rational and moral capacities of humans. Presently, *imago Dei* is often understood in ways that emphasize the relational and the embodied way of being human, this also indicating that humans are best understood as communal and not as individual beings. This also has bearings on how the notion is employed, e.g., in debates about euthanasia. In sum, we can see the interplay of substantial, functional, and relational interpretations of *imago Dei* during the history of its theological articulations.

Relevance for Science-Religion Dialogue

The notion of *imago Dei* has had most impact in Western thinking. Although all the three Abrahamic traditions have (to a larger or smaller degree) adopted this as a way to describe the human (in Islam somehow disputed, though), it is mostly due to its development in the Christian (Western) tradition that the notion has been relevant for the science–religion discourse. One can identify its present relevance for the science–religion dialogue along the following lines:

1. *Human Uniqueness*. From a theological/religious view, *imago Dei* has been a strong point of orientation and motivation for those who want to emphasize human uniqueness compared to other species. In its rude forms, this has been taken as a theological warrant for rejecting forms of evolutionary thought that suggest that humans are bound to the same natural and evolutionary conditions as is every other species. Presently, in the more qualified science–religion discourse, one is aiming at finding ways of interpreting *imago Dei* and is able to uphold this notion's more relational aspect, without denying neither human evolution nor the fact that many previously assumed unique human capacities are also to be found in the primates (including the capacity for morality).
2. *Human Dignity*. The notion of *imago Dei* has been invoked in order to safeguard human dignity. This has been done in confrontation with types of research on humans, embryos, fetuses, the human genome, etc., that is perceived as attempts to instrumentalize or reify humans as material and objects for research without taking into account human dignity, human freedom, and the personal dimension of human existence. The notion of *imago Dei* has also been invoked in order to support restrictive stands on euthanasia.
3. *The Ecological Debate*. The designation of humans as created in the image of God is in Genesis connected with the notion of humans as stewards and rulers of creation. This is interpreted by some as one of the causes of the present ecological crisis (White 1967). Because understanding themselves as *imago Dei* may lead humans to understand themselves as set apart from the rest of creation, this may in turn lead to objectifying and exploiting approaches to nature. *Imago Dei* is in this way interpreted as an expression of *anthropocentrism*. One could, however, according to the above discussion, also see *imago Dei* as a way to express the responsibility that humans have for the whole of creation.
4. *The Debate About Speciesism and Animal Rights*. Because *imago Dei* is a religious notion that is applied uniquely to humans, it has been seen as one of the roots of speciesism: the understanding that humans have a privileged place compared to other species and should be given specific value because they belong to this group of species. Speciesism based on the assumption that humans as *imago Dei* are superior and can discriminate against other species according to their own interests may back the accusation that religiously based attitudes toward nature may lead to morally unjustified practices over against other parts of nature.

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Immunological Computation

► Artificial Immune Systems

Impermanence (Buddhist)

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Related Terms

Anicca (Pāli); *Anitya* (Sanskrit)

Description

Realizing the impermanent nature of all aspects of subjective experience, including the whole world at large, is a key aspect in the development of insight into the true nature of reality according

to early Buddhist thought. The argument advanced to support the idea that impermanence does indeed reflect the true nature of reality and experience is that on close investigation all aspects of experience turn out to be subject to change and alteration. This empirical approach, together with the conclusions drawn from it, places this aspect of Buddhist thought in considerable vicinity to science and scientific methodology.

From an early Buddhist perspective, whatever exists turns out on close inspection to be but a changing process, whether this be the whole world, which according to ancient Indian cosmology undergoes periodical destruction, or the fleeting mind, which introspection shows to be changing every moment. Thus, early Buddhist analysis concludes – contrary to the stipulations made in many a religious tradition – that a permanent entity or self cannot be found anywhere at all (Feer 1884–1898, III 144).

In the early Buddhist scheme of deliverance, progress to awakening requires insight into impermanence as its central basis (► [Awakening](#)). Such awareness of impermanence has quite literally to penetrate into every aspect of experience, seeing that each and every aspect of it has arisen and will pass away.

Comprehensive insight into impermanence then builds up the basis for insight into what Buddhist thought considers the other two characteristics of reality, namely, unsatisfactoriness (► [Dukkha](#)) and not-self (► [Anattā](#)). The dynamic that relates these characteristics to each other proceeds as follows: What has been seen with insight as impermanent is next understood to be unsatisfactory. In fact, the reasoning goes that it is precisely because of its impermanent nature that it cannot yield lasting satisfaction. What is unsatisfactory is then in turn contemplated as being devoid of a self. Again, it is precisely because it is unsatisfactory that it fails to qualify as a self.

In this way, seeing the whole gamut of experience with insight as being invariably subject to impermanence and therefore lacking lasting satisfaction will ensure that what is subjectively experienced as a solid “I” that reaches out to appropriate various objects as “mine” is instead

understood with wisdom as being merely a process, a product of conditions.

The importance of penetrative awareness of impermanence for the development of insight and wisdom receives a highlight in the last instruction that, according to the traditional account, was given by the Buddha to his disciples on the eve of his passing away: “conditioned phenomena are of a nature to vanish, [hence] strive on with diligence” (Carpenter and Rhys Davids 1890–1911, II 156).

The conception of impermanence found in the early Buddhist discourses describes phenomena not only as arising and passing away, but at the same time recognizes that, as long as they remain, change will manifest as an “otherwiseness of that which persists” (Morris and Hardy 1885–1900, I 152). This mode of presentation thus combines change with continuity.

With later developments of Buddhist philosophy, however, the continuity inherent in this conception becomes less evident. This is particular the case with the theory of momentariness. From the perspective of this doctrine, things disappear as soon as they have appeared. Such a radical conception of impermanence results in the difficulty that the evident fact of continuity is not easily explained.

The difference between these two conceptions – the notion of impermanence in early Buddhism and the later theory of momentariness – can be illustrated by contrasting a flickering lamp to the steady flow of a river. In the first case, the light of the lamp is experienced as disappearing as soon as it appears. In the case of the flowing water of a river, an image in fact used in the Buddhist discourses to illustrate the impermanence of life (Morris and Hardy 1885–1900, IV 137), the flow of the water is experienced as a changing continuity. Another example, taken from the realm of music, would be the contrast between “staccato,” unconnected notes, and “legato,” when notes are connected to each other.

The early Buddhist conception of impermanence does not face a problem in explaining continuity, unlike the doctrine of momentariness, since besides arising and disappearance it

recognizes that phenomena do persist for some time, even though this continuity is marked by change. In other words, the early Buddhist dictum that all aspects of experience are changing only implies that they are processes, not that they must necessarily disappear right away.

Another significant aspect of impermanence in early Buddhist thought is its intrinsic relationship to conditionality. According to a succinct summary of the Buddhist doctrine of dependent arising, the chief underlying principle of this doctrine is that “with the arising of this, that arises” and “with the cessation of this, that ceases” (► [Dependent Arising](#)). Thus, what is conditioned is necessarily impermanent, and what is impermanent is certainly conditioned, these two notions being but two sides of the same doctrinal coin.

Contemplation undertaken in accordance with what the early Buddhist analysis reckons a correct vision of existence – namely, seeing its conditioned and impermanent nature – leads on to the insight that existence is unable to yield lasting satisfaction and that it is devoid of any permanent substance or self. Such contemplation is held to purify the mind gradually from various mental obstructions and will eventually issue in awakening to the experience of Nirvāṇa, unique in Buddhist thought for not being considered subject to change.

Cross-References

- [Reality in Buddhism](#)
- [Space and Time](#)
- [Time](#)

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Implicit Religion

► Theater

In Vitro Fertilization, Stem Cell Research and Ethics

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In vitro fertilization (IVF) is a technique of assisted reproduction in which the fertilization of an egg by sperm is achieved outside the body. Couples seeking IVF treatments may be experiencing either male or female infertility, but is often utilized when the female produces normal eggs (oocytes) but the eggs cannot travel to the uterus due to damaged fallopian tubes. The technique was pioneered in the 1970s by Robert Edwards and Patrick Steptoe in England. Since then, over three million “test tube babies” have been born throughout the world using IVF techniques.

To perform IVF, one must have viable spermatozoa and healthy eggs at a precise stage of maturity – a fleeting condition for the egg that lasts only a matter of hours. To increase the odds of conception, women undergoing IVF take drugs that cause ovarian hyperstimulation, which causes the ovaries to produce larger-than-normal numbers of eggs. In normal reproduction, these eggs would travel through the fallopian tubes and, if fertilized, possibly attach to the uterine wall and establish a pregnancy. However, in IVF, these eggs are retrieved from the surface of the ovaries via laparoscopy

(a less invasive technique than standard surgery) and placed in a lab dish containing culture medium. The oocytes are carefully observed in order to establish the optimum stage of maturation, and then spermatozoa are introduced to the lab dish. About 40 h later, it can be determined whether fertilization has taken place and if so, the fertilized egg(s) is transferred to the uterus in the hope that it will attach to the uterine wall, develop a placenta, and thereby establish a pregnancy.

Because of a relatively low success rate of embryo transfers (currently about 10–20 %, although some fertility clinics claim up to 40 % success rates) it is routine for doctors to transfer several fertilized eggs (embryos) to the uterus at one time in the hope that one or two will result in a normal pregnancy. Sometimes the result is a multiple pregnancy with very large numbers of embryos beginning to develop. This has led to some couples becoming parents to sextuplets and even septuplets, but in most cases, selective abortion is performed to preserve the health of the mother and increase the chances of remaining embryos thriving. In addition, some embryos created this way are never transferred to the uterus because of chromosomal abnormalities, a failure to divide, and other reasons. Such embryos are cryopreserved (frozen at a very low temperature) until the egg and sperm donors decide upon their disposition. The overall low success rate of IVF means that significantly more embryos will be created than will ever result in a pregnancy or a live birth. Consequently, it is common for couples undergoing IVF treatments to complete their family-building goals and have several embryos left over. As a result, it is estimated that there are approximately 400,000 cryopreserved embryos in the USA alone.

The disposition of left-over embryos can include: (1) the couple could decide to transfer them at a later date, leaving the possibility open for another pregnancy; (2) the embryos could be donated to other couples who wish to use them for reproductive purposes; (3) they can be disposed of as medical waste; and (4) they can be donated for scientific research, including human embryonic stem cell research. So far the

most common disposition of left-over embryos is eventually option number three (disposal). Option number one is rarely chosen because most couples undergoing assisted reproduction not only want to have their own genetic children, they want to limit the number of children they have. The second option, donation to other couples, is very rarely chosen, and represents less than one percent of all the frozen embryos currently being preserved by IVF clinics. Reasons that are often cited include the fact that donor couples are reluctant to have their genetic children raised by others, and the fact that parents who are able to have their own genetic children lack the incentive to “adopt” another couple’s offspring. Donation of embryos to research is chosen in a significant number of cases when offered to couples.

It’s important to note that the options for the dispensation of left-over embryos is generally spelled out in a contractual agreement between egg and sperm donors and the fertility clinic providing treatments. In the United States at least, clinics sometimes agree to maintain embryos in their frozen state for 5 years (for a fee of about \$2,000 per year), while the donors make up their minds about what they would like to do with them. Some clinics require a decision by the donors after 5 years, and some have a policy of never disposing of embryos; however, a study reported in 2005 found that over 80 % of fertility clinics routinely dispose of unused embryos. However, the number of frozen embryos is not expected to diminish because new couples are continuously entering the IVF process, creating multiple embryos, and transferring only some of them.

In vitro fertilization practices have been ethically controversial since the first test-tube baby was born in 1980, and the issue began to receive even more attention after the first human embryonic stem cells were isolated from IVF-created embryos in 1998. This development opened the door to the possibility of scientists using excess IVF embryos in research aimed at utilizing the pluripotent stem cells taken from 4- to 7-day-old embryos (blastocysts) to create cures for cell-based diseases.

Pluripotent stem cells contain the genetic blueprint for the entire human body and are able to give rise to any cell type that may be needed to replace dead or diseased cells in a large array of diseases and injuries. This means that specific tissues and organs can be grown in the lab and transplanted into patients, with the hope of restoring lost or impaired functions. Pluripotent cells that contain genetic mutations for disease can also be used to study the genesis of certain diseases from their earliest beginnings. Many scientists hope to be able to clone embryonic stem cells from the cells of patients who have genetic diseases, to provide human disease-carrying cell populations that can be used in the search for new drugs and other treatments. Even without the extra step of cloning, the ability to grow large numbers of many different human cell types (from embryos) in the lab is considered by scientists to be one of the most important biomedical advancements of the twenty-first century. It is expected that the study of stem cells and the differentiated cells they give rise to will dramatically advance the understanding of human development and biology.

Because of their proven pluripotency and their robust ability to proliferate indefinitely in the lab, the cells obtained from the 4- to 7-day-old blastocyst are considered the “gold standard” of stem cells. Other types of stem cells exist, such as adult stem cells (taken from the fully developed human body) and gestational stem cells (taken from umbilical cord blood and amniotic fluid). These cell types have not been shown to be as versatile or as robust as embryonic stem cells, but they nevertheless can provide certain targeted therapies, such as the rejuvenation of the immune system following chemotherapy, or to cure blood diseases such as leukemia. Another advantage to using embryonic stem cells is their availability in the above-mentioned frozen embryos that are not slated for reproductive use. Many embryos deemed not suitable for transfer to the womb (estimated as approximately 60 % of embryos created in the IVF process) could still prove valuable for stem cell research. However, not all sectors of society are comfortable with

using embryos in research, and some are against any manipulation of an embryo whatsoever. These ethical positions, and several others, are outlined below.

Another source of embryonic stem cells is through a technique called somatic cell nuclear transfer (SCNT), or therapeutic cloning. In contrast to the popular conception of cloning (called reproductive cloning), SCNT does not result in the birth of a complete copy of a human being. It is a technique for creating pluripotent stem cells that are genetically matched to an individual. SCNT begins with an oocyte in which the cell nucleus (and hence all of the nuclear DNA) has been removed to render the egg as genetically “neutral” as possible. The egg is then fused with a somatic cell (usually a skin cell) of a specific individual. The nucleus of the somatic cell then provides the nuclear DNA of the cell, and when activated to divide, each new cell will be a near-perfect genetic match to the donor of the somatic cell. Within a few days, an inner cell mass will appear that contains up to 200 undifferentiated, pluripotent stem cells that carry the genetic imprint of the somatic cell donor. Technically, this dividing cell is referred to as an embryo, and if transferred into a woman’s uterus, it is theoretically possible that it could result in the birth of a child who would be a genetic twin (a reproductive clone) of the somatic cell donor. However, in SCNT, the embryo is never transferred, and harvesting the stem cells at the blastocyst stage ends any possibility that a baby could result. The stem cells can then be cultured and driven to differentiate into a particular cell type to be used as a transplant or to be studied for its disease characteristics.

Religious and Ethical Positions. There is a range of religious and ethical positions regarding the status of the lab-created embryo, or blastocyst, and whether it is acceptable to use it in biomedical research. The most restrictive view, held by Catholics and by some Christian evangelicals and fundamentalists, is that the blastocyst should be accorded the same rights as any fully formed human being. This means that any research that would destroy an embryo is unacceptable to those who hold such an

absolutist view. The Catholic Church, in particular, also opposes the creation of embryos for reproductive purposes because it sees assisted reproduction as a violation of the sanctity of the marriage relationship and its role in reproduction. Other views, however, are considerably more nuanced, and balance respect for the embryo with the need to cure disease and ameliorate suffering.

Critical to all other religious views is the concept of ensoulment – when the developing embryo or fetus acquires a soul. Prior to the nineteenth century, the Catholic Church held to the Augustinian belief that the soul emerges at 40 days’ gestation for males and 80 days’ gestation for females. It was only in 1869 that the Church began to take the view that human life begins at fertilization. It is the concept of ensoulment that either directly or indirectly determines whether embryonic stem cell research is acceptable under certain circumstances. Among mainstream Christian Protestants, the research is generally supported. The Presbyterian Church, the United Methodist Church, the United Church of Christ, the Episcopal Church, and the Unitarian Universalist Association all endorse the research as being in keeping with Christian compassion for the sick and suffering.

The United Synagogue of Conservative Judaism and most Jewish denominations believe that the soul of a human being emerges gradually, and they support embryonic stem cell research. The Muslim religion holds that the soul enters a fetus at 120 days after conception, and most Muslims support embryonic research without reservation. The Hindu religion regards the beginning of life as the moment of conception, but the destruction of an embryo must be weighed against the possibility of doing good. If the embryo can be used to relieve suffering, then its destruction is not prohibited. Although Buddhist scriptures say that life begins at conception, Buddhist countries have some of the most supportive policies toward stem cell research. Buddhist ethics are not intended as laws, but as guidelines to which human beings must bring their own rational interpretations to when deciding what are best for the greatest number of people.

It should be noted that some of the objections to doing research with embryos may be based on misunderstandings of the nature of the blastocyst. One frequently cited objection is that the blastocyst is genetically unique, and this establishes its worth as a human being. In reality, a blastocyst exists prior to the stage wherein the embryo could split to form twins, triplets, or other multiples. Another common objection is that the embryo has the potential to grow into a complete human being, but this argument runs into trouble when one considers that each and every cell of the human body, if cloned, has the theoretical potential to grow into a human being. Many people take the pragmatic view that many thousands of blastocysts now exist for which the most likely fate is disposal as medical waste, and hold that the use of these embryos in biomedical research is a more acceptable choice than their destruction.

Cross-References

- [Bioethics in Christianity](#)
- [Body](#)
- [Christian Ethics](#)
- [Ethics](#)
- [Medical Sociology](#)

Inactivity

- [Apraxias](#)

Incarnation

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Related Terms

[Christology](#)

Description

Incarnation is one of the central doctrines of Christianity: Along with the doctrine of the Trinity, it was established in the first ecumenical councils. To be a member of the World Council of Churches, and thereby be considered as a Christian church or a denomination, a church needs to confess to both Trinity and the dual nature of Christ, that is, the incarnation.

The Doctrine of Incarnation

According to the council of Chalcedon (451), that solidified the incarnation dogma, “one and the same Christ, Son, Lord, only-begotten, [is] acknowledged in two natures which undergo no confusion, no change, no division, no separation; . . . the property of both natures is preserved and comes together into a single person and single subsistent being (hypostasis); he is not parted or divided into two persons, but is one and the same only-begotten Son, God, Word, Lord Jesus Christ.”

What incarnation means in its classical formulation, then, is that Jesus Christ can be said to be (in some concrete way, not just figuratively) both God and man at the same time. To be more precise, the incarnation requires that the second person of the Trinity (God the Son) became a human being, retained all the attributes necessary for divinity and gained all attributes necessary for being human. Thus, it would be true to say that God the Son has the attributes of Jesus of Nazareth, a Jewish man who lived in first-century Palestine. Further, the Chalcedonian orthodoxy involves that in Christ there is only one subject, not two, and both divine and human attributes are had by this subject. The traditional formula is usually summarized in the claim that Jesus Christ is both God and man, one single person with fully divine and human natures.

The traditional formulation does not explicate how exactly it is the case that one person, one entity, has both divine and human nature and thus both divine and human properties. Instead, the formulation is designed to rule out several other options regarding the relationship of God and Christ. First of all, it rules out a view according

to which Christ was not really human at all, just a God in a human disguise. Conversely, the view that Christ was simply a man with an extraordinary relationship with God is also ruled out by the Chalcedonian formula.

Another view ruled out by the Chalcedonian orthodoxy is Nestorianism (after Nestorius) who claimed that there are two distinct subjects or persons in Christ, one divine and another human. Thus, the divine Christ does not have the same properties than the human Christ. Nestorius' views were condemned by the Church because it insisted that Christ's human properties, such as being born of Mary, must be attributed to the whole person of Christ, not just to Christ's human nature. Otherwise, Mary would only be, as Nestorius had suggested, the Mother of Christ (Christotokos), not the Mother of God (Theotokos). Since the church maintained that Mary did indeed give birth to God the Son, not just a human person, the human properties of Jesus of Nasareth must be attributable to God the Son as well.

The Chalcedonian formulation also rules out what is normally called monophysitism. According to this view, there is only one person in Christ, God the Son, and only one nature, the divine nature. Fearing that this view would evaporate Christ's humanness and the genuine union between human and divine natures, the orthodoxy rejected monophysitism and insisted that there are indeed two distinct natures without confusion. Finally, the Chalcedonian orthodoxy rejected a view known as monothelitism, according to which, there is only one will (or center of agency) in Christ, namely, the divine will. Against this view, it was affirmed that there are in fact two wills in Christ, the divine will and the human will, but the human will is subservient to the divine will.

Problems

As we can see even from this brief overview, the doctrine of incarnation presents quite tricky metaphysical challenges to its adherents (for criticisms, see Hick 2005). Several questions arise. What are persons? What does it mean to have a nature? How can one person have both divine properties and human properties, since it seems

that at least some of them are logically contradictory? In what follows, I focus on the last question and how it has been dealt in contemporary philosophical discussions on incarnation (for overviews of all the following theories, see Marmodoro and Hill 2011).

The last question is known as the incoherence problem. In short, the problem is that it seems logically contradictory for one person to have divine properties and human properties at the same time. The traditional formulation of the incarnation seems to require that Christ is both, say, omniscient and omnipotent as well as to some extent ignorant and lacking certain powers at the same time. One could argue that properties such as being located in space and time (temporal and physical), being physically bounded and having constraints to one's knowledge and power are essential for what makes something a human being. But such properties are in contradiction with properties that, at least for the classical theist, constitute the essential properties for being God. Traditionally, classical theism has understood God being omniscient, omnipotent, perfectly good and loving, timeless, immutable, and simple. Further, these properties are viewed as essential for divinity (that is, what it is to be God) and are held as perfections that a perfect being (God) possesses necessarily. Therefore, if a being that had these properties lost one, say, omniscience, that being would no longer be, or never could have been, the most perfect being and therefore not God.

There is also another problem here, usually called "the biblical Jesus" problem. The problem is that Jesus, as he is portrayed in the Gospels, seems to lack attributes that are essential to divinity in the aforementioned sense. Sometimes, Jesus seems to be ignorant and powerless. One might object at this point and claim that Jesus only seems ignorant and powerless; in reality, he is truly omniscient and omnipotent. This objection could be addressed in many different ways, but the fact is that even if it is correct, no one in her right mind would deny that Jesus is clearly a temporal, changing, and physically bounded being. The problem is that at least these human properties are such that God cannot possess (in the classical view) and still be God. So, even if it

is the case that being human is compatible with having perfect knowledge and perfect power, being God does not seem to be compatible with being physically bounded and changing. In sum, the coherence problem has to do with the seeming incompatibility of certain properties that seem to be essential for being human and properties that are essential for being divine.

Compositional Theories

The classical solution to the incoherence problem is based on the idea that divine and human properties are attributed to different parts of the whole person of Christ. Such proposals might, therefore, be called compositional accounts of incarnation. In this view, the two natures, divine and human, are seen as proper parts of the person of Christ. Divine properties are instantiated by the divine nature and human properties by the human nature. But since these natures compose one single person, we can truthfully say that Jesus Christ as a single person has both divine and human properties. Such a view was typical for Thomas Aquinas and has been subsequently refined and defended in contemporary debates by, for example, Eleonore Stump. According to Stump, the compositional account of incarnation assumes that a whole can be said to have any given property in virtue of the fact that its proper part has this property. Thus, there can be one whole being, God the Son, who has both divine and human properties ascribed to its two distinct parts, the divine nature and human nature. Both divine and human properties are properly attributed to the whole, but this is in virtue of two distinct natures which are the carriers of both divine and human properties, respectively.

The problem with Stump's view is that it is extremely difficult to conceive of how the divine nature could be a concrete part of anything. Divine nature is supposed to be such that it is shared by all the persons of the Trinity. As such, divine nature looks more like a property, an abstract object, rather than something that can be a part of a whole. Brian Leftow's version of the incarnation attempts to circumvent these worries. According to Leftow, Christ is a whole comprised of not human and divine natures, but

God the Son, human body, and a human soul. Here, the divine nature is not a part of anything. Instead, the part is the divine person, God the Son. The problem in Leftow's proposal is, however, that it is now difficult to see, how God the Son would be the subject of Christ's human properties. In this sense, Leftow's view is very close to Nestorianism. In this view, it is not the case that God the Son is identical with Christ, but rather only a part of Christ along with the human parts of Jesus of Nazareth.

Kenotic Theories

Due to the difficulties in the compositional accounts, several contemporary philosophers have resurrected a somewhat minor tradition in Christology usually called Kenotic Christology. Kenosis (gr. *Kenosis* -"emptying") theorists claim that God the Son temporarily "emptied" himself of his divine attributes when existing in his earthly, incarnated state (for overviews, see Evans 2006). This is supposed to solve both the incoherence problem and the "the biblical Jesus" problem. During his earthly life, the Kenosis theorists think that God the Son willfully and temporarily gave up his omniscience, omnipotence, and other divine attributes. This, it is claimed, is the only way to make sense of how Jesus is portrayed in the New Testament: benevolent and knowledgeable, yes, but not infallible or perfectly powerful.

Kenotic theory is not without its problems. It forces its adherents to either reformulate classical divine attributes or give up the idea that these attributes are essential and necessary for divinity. According to the reformulation view, we should understand any given divine attribute to include a "kenotic clause." In the case of omniscience, for instance, such a clause would be something like this: "a perfect being is omniscient unless it freely chooses to be not-omniscient for a certain period of time." However, divine attributes tweaked in this way are in contradiction with the way in which divine attributes are normally understood in classical theism, that is, that they are modally as strong as possible. Thus, the classical theist would say that it is essential for being God that God is necessarily omnipotent *simpliciter*.

Thus, the critic of the kenotic view would here say that the kenotic tweaking of divine attributes is not only in contradiction with classical theism, but also extremely *ad hoc*.

Two-Minds Theories

One of the most widely discussed theory of the incarnation is the two-minds view developed by Thomas Morris (1986). Morris begins by drawing an important distinction between kind natures and individual natures. Having a kind nature means that an individual has the essential properties of some kind or a class of beings. An individual has a human kind nature when the individual possesses all the properties essential for being human. It is possible that an individual has various kind natures and having one is not essential to identity of the individual. Contrary to this, individual natures are necessary: individual natures are clusters of essential properties that make individuals what they are; they cannot lose any of these properties without ceasing to exist. Given this distinction, Morris can now say that even if individual humans (in virtue of having their individual natures) have limited knowledge and power, for instance, it does not follow that having such properties are necessary for being human (having a human kind nature). In other words, being non-omniscient and non-omnipotent are not necessary for having a human kind nature. Morris can thus formulate his often cited distinction between being merely human and being fully human. We human beings are both fully human and merely human: we are fallible, sinful, lack ultimate power; we exemplify human nature only. Given the aforementioned distinctions, this does not prevent an individual from exemplifying also a divine nature, that is, being fully human (and fully divine), but not merely human. Morris' solution is, ultimately, that there is no logical contradiction for an individual being both fully human and fully divine. This, however, works only with respect to attributes like omnipotence, omniscience or perfect goodness: it seems that even Morris has to leave eternity, immutability, and aseity out of the picture.

If this is the case, then what should we say about the New Testament stories that attribute fallibility and other non-divine attributes to Jesus

himself. To solve "the biblical Jesus" problem, Morris claims that Christ had, as it were, two minds or centers of consciousness and agency, one human and one divine. To be fully human, God to Son had to take on both a human body and a human mind. But this does not eliminate his divine powers and knowledge still preserved in his divine mind. Morris, therefore, argues that, in addition to having two natures, divine and human, Christ also has two distinct minds: the divine mind with its divine powers and the human mind. The human mind of Christ would develop as any other human mind having access to the information present in the first century Palestine context. The relationship between these two minds is asymmetrical: the divine mind has full access to the human mind but not vice versa. The idea is that, most of the time, Christ chose to live his life in virtue of his human mind only, blocking his human mind's access to his divine mind. But sometimes, the human mind would have access to the divine mind and its complete knowledge and power.

Although Morris' proposal has been quite popular, there is a problem as well. It seems that Morris' view leads to the thought that there are two distinct persons in Christ: one divine and one human. Normally, we distinguish persons by way of their minds: two minds equal two persons. Morris, of course, claims that such is not the case with Christ: in Christ there is only one person who has two minds. But if we consider belief ascriptions, the issue becomes quite complicated. If Morris is correct, then the person Christ would have some false beliefs in virtue of his human mind (e.g., that the Earth is flat) and true beliefs in virtue of his divine mind (e.g., that the Earth is a sphere) at the same time. The problem is that beliefs are not ordinarily ascribed to consciousnesses at all, but rather to persons. Further, since God the Son is necessarily omniscient, the divine mind of the divine person cannot have false beliefs. Thus, it seems that there must be another mental subject, another person, that is the subject of Christ's false beliefs. Several attempts to develop and refine the two-minds view of incarnation have subsequently been made by, for example, Richard Swinburne, but they are too detailed to be discussed here.

It seems that current solutions to the coherence problem suggest a move away from classic theistic attributes such as immutability and timelessness toward a more temporal and mutable God. Such a move will, of course, be happily endorsed by those otherwise inclined toward open theism or personalistic theism that are critical of the classical attributes of immutability, eternity, and aseity for other reasons as well. However, many defenders of non-kenotic incarnation, such as Morris, insist that there is no reason to give up necessary omnipotence, omniscience, perfect goodness, and other central divine attributes.

Incarnation in the Context of Evolution

Many contemporary theologians seek to understand Christology in the context of biology and physics as well as relating it to contemporary ethical issues. Several Catholic (e.g., Pierre Teilhard de Chardin, Karl Rahner) and Protestant (e.g., Thomas Torrance, F. LeRon Shults) theologians have argued that the classical doctrine of incarnation and its problems are driven by outdated metaphysical categories of “nature,” “soul,” and “person.” This has created a movement among theologians to reformulate the doctrine of incarnation in a way that is supposedly more compatible with contemporary evolutionary view of the world. A Darwinian understanding of these concepts would emphasize the fluidity of these categories: there are no fixed human (or divine) “natures” or “essences” anymore than there are essential differences between humans and animals. These differences are a matter of degree, not strict separation. Further, many theologians argue that metaphysical views of the incarnation are plagued by substance dualism and thus are based on unscientific psychology. Instead, we should adopt a more holistic and multileveled view of human nature and cognition, informed by contemporary cognitive and neurosciences. Persons, in their view, are fully embodied, complex wholes and metaphysical concepts, such as soul or nature, are not adequate to describe this. A radically different ontology is needed, an ontology of relationality and multiple levels, not of fixed essences. In this sense, the incarnation supports a positive and anti-dualistic

view of the created world: by assuming and perfecting material, embodied humanity, God signified that materiality and the material aspects of humanity are valuable and not to be rejected as a necessary evil. They conclude that the notion of incarnation has to be reformulated in order to jettison its metaphysical baggage (For such criticisms, see Shults 2008).

Contemporary evolutionary or dynamic accounts of incarnation tend toward either Kenotic views of the incarnation or jettison the idea of Christ’s essential divinity altogether seeing Him as perfect exemplar of humanity and openness to God. Most contemporary evolutionary Christologies (and theories of the incarnation) are inspired by both Teilhard de Chardin and process theology. These theories usually take Christ to be divine only to the extent that he is obedient to God’s will. By being completely obedient to God’s will and accepting His gift of grace, Christ becomes the perfect man. In this sense, incarnation means simply that Christ is both a new kind of perfected human being and a promise of a brighter future for humans through their God-controlled evolution (For overviews and criticisms, see Deane-Drummond 2009).

One problem with these proposals is that the classical motivation for the doctrine of incarnation is not realized. The early church held that the redemption and salvation of humans is only possible if humanity and divinity are unified in Christ. That is to say, if Christ is not fully human and fully divine, then there cannot be redemption for humanity. If, as many evolutionary or dynamic theories suggest, Christ is a human being who gradually becomes the greatest exemplar of a perfect relationship to the divine, indeed perhaps, a new step in humanity’s evolution, then Christ’s soteriological role vanishes. God the Son does not become incarnated “because of our salvation,” but rather because the emergence of a man with a perfect relationship to God in the course of human evolution is an inevitable step. That is to say, the incarnation (understood in this way) is built into evolution itself, thus being part of the doctrine of creation rather than redemption and salvation.

Further, evolutionary Christologies also seem to make incarnation a highly contingent

event: any human anywhere could have achieved the perfect relationship with God; there was nothing special about Jesus of Nazareth. This, in turn, detaches the doctrine of incarnation from the history of Jesus of Nazareth – from the very history which the doctrine was supposed to explain in the first place. Finally, evolutionary Christologies tend to smuggle strong metaphysical assumptions into their way of understanding evolution, namely, the idea that there is inevitable progress in biological evolution. Most famously, it was Teilhard de Chardin who thought that evolution by natural selection leads inevitably to more and more complex life-forms and toward the increase of charity and goodness. This tendency is also present in theories of incarnation that have their roots in process theology. The problem is that contemporary Neo-Darwinian synthesis is strongly opposed to the idea that there is a necessary and universal development toward complexity, altruism, or the realization of some value. The view is rather that natural selection might lead to increased complexity and altruism, but it is by no means necessary or universal.

Cross-References

- ▶ [Biblical Studies](#)
- ▶ [Christology](#)
- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Dualism](#)
- ▶ [Evolutionary Theology](#)
- ▶ [Metaphysics](#)
- ▶ [Philosophy of Religion](#)
- ▶ [Systematic Theology](#)
- ▶ [Theism, Classical](#)
- ▶ [Theological Anthropology](#)

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Indeterminism

- ▶ [Determinism and Indeterminism](#)

Indian Dialectics

- ▶ [Logic in Buddhism](#)

Indian Logic

- ▶ [Logic in Buddhism](#)

Indigenous Religions

- ▶ [Hopi Religion and Anthropology](#)

Indigenous Studies

- ▶ [Native American Studies](#)

Individualism

- ▶ [Externalism and Internalism](#)

Industrial Psychology

- ▶ [Organizational Behavior](#)

Infatuation

- [Love \(Affective, Sexual\)](#)

Infectious Disease

- [Biology of Religion](#)

Inference of Analogy

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The inference of analogy is the traditional manner of conceiving of the method according to which we gain knowledge of other minds. It has been explicitly suggested first by John Stuart Mill (1806–1876). It is based on the assumption that we do not have direct perceptual access to the mental states of other persons. We directly perceive only their bodily movements. Because we assume that similar effects have similar inner causes, we analogically infer another person’s mental states based on our knowledge of how we feel and think when we behave in that manner.

Inflation

- [Time](#)

Information Assurance

- [Information Security](#)

Information Ethics

- [Cyberethics](#)

Information Security

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Related Terms

[Application security](#); [Computer science](#); [Computer security](#); [Data protection](#); [Information assurance](#); [System assurance](#)

Description

Information security is a field focused on protection of data and the computer systems that work with the data. Security is a combination of privacy, assurance, availability, and integrity. In the last century, information security was focused on availability and assurance only and were the only entities that demonstrated any interest in privacy or integrity. Even so, these concepts were largely academic in nature and provided opportunity for researchers to examine previously undiscovered methods of maintaining privacy and integrity. Private businesses focused their attention on revenue-generating services. Consequently, security to business meant that the business had assurance that computer systems functioned as designed and that the systems were available at all times. Because governments were funding the majority of research in information security, the focus of academia aligned largely with government priorities.

In this century, people are using computer systems for increasing amounts of commerce. Governments have recognized that commerce through computer systems is highly lucrative for businesses and that continuity of business is critical to national and international interests. In this climate, citizens have come under direct attack by those wishing to use computer systems to steal, pressure, slander, and disrupt. Thus, governments have acknowledged information security as a global priority and have created weapons

to attack computer systems and defend against such attacks. For their part, businesses have largely stayed focused on what maintains revenue. Aware of this priority, governments have forced compliance with well-developed information security standards that have emerged from academia and private research groups. Further, special interest groups, such as payment processors and banks, have mandated compliance with their own standards. Academia continues to align with government funding but that funding has broadened in scope to include computer security in increasingly diverse areas.

Self-identification

Science

Computer Science is a field of study that focuses on data as well as the tools that process, store, retrieve, and transport that data. Because computers are so centric to protecting data, Information Security is frequently considered to be a subdiscipline of computer science. However, Information Security has strong ties to law, criminal justice, psychology, business, ethics, and governance. In many academic institutions, degrees in Information Security require specialized courses in topics that go well beyond the typical computer science course requirements. Thus, Information Security is a discipline that stands on its own in many respects but is largely inserted as a subdiscipline of computer science.

Religion

Although security professionals would not self-identify the field of security as a religion, computer security and religion have many parallels. The dominant parallel is the common foundation of “accountability.” Religion describes a God who judges sin, a concept defined as *noncompliance with the will of God*. Security provides oversight to a business or organization by defining, in particular, acceptable behaviors. Non-acceptable behaviors can be considered as sin or *noncompliance with the acceptable use (will of the computer system owners) of a computer system or intended use of the*

underlying data. This parallel of religion and computer security is such that users of computer systems often speak of being “watched” and express guilt when their behaviors fail to meet the standard. This idea of good versus evil is so pervasive that actors and activities in security are generally classified as good or evil and represented as such. For example, good hackers are called “white hats” and the evil hackers are generally called “black hats.”

Characteristics

The information security discipline bears three unique characteristics. The first characteristic is *how goals are expressed*. Most disciplines have the ability to state very concrete goals and measure progress toward those goals. Information security has but one goal: Be more secure today than we were yesterday. The challenge is that being secure against today’s attacks and threats is no guarantee of security against tomorrow’s attacks and threats. Therefore, measuring progress toward security looks more like a two-car race than a “percentage complete” chart. The second characteristic is *the impact to human lives*. A failure to maintain security may mean that people die, get imprisoned, lose wealth, lose jobs, or otherwise suffer. The third characteristic is *the breadth of impact*. Information is a common commodity that now stretches deep into every discipline and aspect of life. The protection of information must be uniquely examined in each space to fit information security into each topic, discipline, and business.

Relevance to Science and Religion

The vast majority of work pertaining to advancing information security is performed within the domain of science. The issues of study are *how to express the security rules* and *how to enforce the rules*. Expressing the rules correctly is critically important in order to properly articulate expectations to computer users, ecommerce buyers, software users, and others in ways that are both clear

and legally binding. These rules are often expressed in company policies, government laws and regulations, industry standards, and contracts. The enforcement of these rules requires many tools from many disciplines including: civil lawsuits, contractually binding consequences, incarceration, personal liability, and computer technologies. Computer technologies are the best and most effective because they prevent breaches in security by strictly enforcing the rules. It also frequently saves the expense and trouble of lawsuits, personal defense, and prison.

Sources of Authority

It is not possible to pick a single person, publication, organization, or institution as “the” authority for information Security. Current trends suggest that the authorities will continue to align around the themes and interests of academia, government, and business. Security does have common ground among the three groups, but the unique interests of each are likely to keep them separate with only limited interactions through journals, proceedings, conferences, and archival publications where experts meet to discuss and cross-validate new developments.

Ethical Principles

The guiding principles in information security are best defined as privacy, assurance, availability, and integrity of information. A violation of any one of these would be an egregious breach of ethics (e.g., a ► [firewall](#) that is not secure by allowing access of private personal information to unintended parties).

Key Values

The key value is “protection.” Security protects institutions and private citizens by blocking harmful and dangerous access or intervention in their computer systems. This protection

essentially limits activity to only activities that are intended and authorized. It further prescribes the specific methods for accessing or changing information. By protecting “what” a user can access with “how” the user access it, the data and the computer systems are often protected. This protection is there for the protection of customers, computer owners, and data owners from both the hacker who willfully is out to damage systems or access private data and also for the “untrained” user who may do “damage” by accident and not intention.

Conceptualization

Nature/World

The natural world for information security is defined as the digital representation of data and derived information in computer systems and devices.

Human Being

Human beings are simply the natural, human computer users, or data about them contained in computer systems.

Life and Death

Life and death are defined in terms of “allowing” or “denying” an activity or in terms of the creation or deletion of data. It is not uncommon for security professionals to describe stopping a user activity as “*killing* the activity” or deleting data as “destroying the data.”

Reality

Reality extends into a virtual, digital world where data is created, stored, transported, transformed, and output electronically.

Knowledge

Knowledge is the imperishable storage of data on the Internet.

Truth

Truth is what actually happened in the real world, as compared to what is recorded in the computer system.

Perception

Perception is a sampling of reality at any instance.

Time

Time is a concept with both a relative and absolute meaning. In relative terms, time is the number of computer cycles allotted to process or transport data. In absolute terms, it translates into the equivalent to the “wall-clock” or “real-world” time.

Consciousness

Consciousness is the awareness of computer-related activities, or perceived security threats.

Rationality/Reason

Reason is the expected behavior of computers as specified by programs running on them. Irrational events occur when computer activity provides unexpected results with respect to the intention of the programmer who created it, usually due to the intervention of “hackers” or unauthorized malicious users.

Mystery

Mystery in information security is simply *what is not discovered* or not *yet* discovered. Often in information security, mystery surrounds the so-called hackers (black hats) who search to damage and steal for personal, corporate, or political gain as well as the so-called good hackers (white hats) who are searching for unauthorized intrusion and unexpected action on computer systems.

Relevant Themes

Security is almost always embodied into rules, similar in nature to those found in religion. Security researchers and professionals assume that these rules must be followed and that everyone/everything else is actively searching out ways to break the rules (or sin). This dichotomy breeds an “us versus them” culture where “they” are assumed to be sinners of the worst sort.

Cross-References

- ▶ [Christianity](#)
- ▶ [Criminology](#)
- ▶ [Cyberethics](#)
- ▶ [Evil, Problem of](#)
- ▶ [Sin \(Vice, Human Limits, Negativity\)](#)

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Internet Storm Center: <http://isc.sans.org/>

Information-Processing Models (Philosophy of Mind)

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Deeply informing much of contemporary philosophy of mind is an information processing model of cognition. The initial basis for this model was the concept of a Turing machine developed by Alan Turing and refined by others including John von Neumann, and which underlies the basic architectural concept of modern digital computers. Modern digital computers employ a central processor and separate banks of memory, as well as clearly distinguishing between hardware, the physical components of the computer, and the software, instructions or set of algorithms that dictate the behavior of the computer. The operational structure of digital computers can be understood to parallel or mimic the operations of the human mind. Both operate serially; in the case of the computer, one instruction is processed after another, in conscious reflection, one thought follows another. Both employ memory, and both employ the rules of logic, notably the Boolean operators AND, OR, and NOT. Despite these apparent parallels, growing knowledge of the

details of the anatomy and the operation of the brain has made the comparison tenuous, for although the activity of neurons in the brain may be understood to act somewhat similarly to the logic gates in a computer chip, there is no parallel in the brain to the digital computer's central processor.

As a result, inspiration has been drawn from connectionist models of information processing. Connectionist models often emphasize parallel distributed processing (PDP). Whereas traditional digital computers employ a central processor which acts on each step of an instruction sequentially and through which all instructions must pass, a PDP system initially breaks down a task into a number of smaller tasks and then operates on them simultaneously. Neural network models are a form of PDP that are claimed to closely mimic the operations of neurons in the brain. A feature of some PDP models is that they display emergent behavior, showing higher levels of order that are not apparent at the lower level of processing.

Innate Releasing Mechanism, IRM

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The term “innate releasing mechanism” belongs to a classical concept of ethology. It refers to a neural sensorimotor interface that mediates between a *key stimulus* and the adequate action pattern. An IRM thus has stimulus recognition and localization properties at its input side and behavior-releasing properties at its output side. The IRM should allow an animal to recognize and respond a behaviorally relevant object that the animal had never encountered before.

The term “innate,” however, is controversial since it may have different meanings, such as present at birth, a behavioral difference caused

by a genetic difference, adapted over the course of evolution, unchanging throughout development, shared by all members of a species, present before the behavior serves any function, not learned.

For example, common toads *Bufo bufo* recognize prey objects by figurative visual features as tests of the prey-catching activity in response to changes in the configuration of dummies have shown: a stripe oriented parallel to its direction of movement (“worm” configuration) is preferred to the same stripe oriented perpendicular to its direction of movement (“anti-worm” configuration). This discrimination is *innate* in the meaning of an ability being present after metamorphosis (from the tadpole stage) and shared by all members of the species. The tadpoles of common toads do not hunt for prey animals; rather they feed on a vegetarian diet.

A neuroethological concept of (I)RM suggests a *command-release system* in which *sensorimotor codes* are involved that can be influenced by motivation and learning. A coded command involves different types of neurons (command elements), each type detecting a certain aspect of a behaviorally relevant stimulus (features, location, etc.). In a certain combination – sensorimotor code – these command elements cooperatively activate a corresponding motor pattern generating system. For example, it was shown that prey-feature-detecting neurons in common toads send their axonal fibers from the visual center (optic tectum) directly toward the motor system (medulla oblongata). Focal electrical stimulation in the layer of the optic tectum that harbors prey-feature-detecting neurons elicited prey-catching behavior. Recordings of such neurons in freely moving toads demonstrated that certain discharge patterns in response to a prey object preceded and – so to speak – predicted prey capture.

Insight

► [Buddhist Meditation Practices](#)

Inspection

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An inspection is a formal review process usually performed by several members of a software development team and at least one person from the software quality assurance (SQA) group. Note that small companies may not have dedicated SQA personnel.

An inspection can be conducted for any software artifact, such as requirements, design documents, or code. As originally defined, an inspection has five prescribed steps:

1. Overview. One of the individuals responsible for producing the artifact highlights the main points in the document and distributes it to the other participants.
2. Preparation. Each participant reviews the document and compiles two lists: (1) a list of likely faults and (2) a list of items that are unclear. Inspection members may also have at their disposal a list of fault types and their frequency compiled from previous inspections.
3. Inspection meeting. One member of the inspection team called a moderator goes through the document, making sure that every line is covered and discussed. The purpose of the meeting is to find faults. Faults are corrected, by the person who made the error or wrote the offending part of the document, at a later time. Within one day of the meeting, the moderator writes a detailed report about the meeting.
4. Rework. The individual responsible for the document makes sure that all faults have been corrected and any other modifications described in the report have been handled. Note that some items may have been incorrectly marked as faults during the preparation time or during the inspection meeting.
5. Follow-up. All changes to the document must be checked to make sure that no new faults have been introduced. If more than 5 % of the

document has been changed or marked as unclear, then a complete reinspection of the entire document must take place.

Note: See also ► [Walkthrough](#).

Installation Art

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Artwork consisting of objects arranged so as to create an environment into which the viewer can enter, or imagine entering, somewhat as an actor enters a stage set, or to alter the viewer's perception of space. An art installation may be as simple as a few rocks or sticks placed in a circle on the floor of a gallery, intending to evoke a campfire or a sacred grove, or as complex as Chris Burden's 1986 *Exposing the Foundations of the Museum*, in which the artist removed the concrete floor of the newly created Geffen Contemporary at MOCA in Los Angeles, inviting viewers to walk down rickety steps into what resembled an archeological dig. Installation art is often created or modified for a specific site, incorporating elements of the room or building in which it is housed. Installation artworks vary greatly, using natural and human-made materials for their symbolic and metaphoric, as well as visual and tactile, properties.

Instrumental Reason

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In general terms, instrumental reason is a specific form of rationality which focuses on effective means to an end and not, as other forms of

practical rationality do, on improving living conditions, promoting reasonable agreement, or human understanding. It is one of the most used and most relevant terms in Critical Theory, particularly M. Horkheimer and J. Habermas. It has traditionally meant domination, manipulation of nature and social relations. For Horkheimer, the sophisticated process of strategic choice of means to an end is regarded as the most representative corruption of practical reason.

Intellect

► [Intelligence](#)

Intellectual

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Intellectual Development

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Intellectual History

► [History of Ideas \(Intellectual History\)](#)

Intelligence

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Related Terms

[Aptitude](#); [Cleverness](#); [Cognitive processing](#);
[Human intelligence](#); [Intellect](#); [Intellectual](#);

[Intellectual development](#); [Intelligence quotient \(IQ\)](#); [Mental ability](#); [Multiple intelligence](#); [Standard intelligence](#); [Study of intelligence](#)

Description

Intelligence and the various methods by which it is assessed have progressively evolved during the past 150 years. A brief overview of the contributions of intelligence theorists and researchers speaks of the influence of these scientists on the current understanding of intelligence and its recent developments. An early intelligence researcher, Binet, believed that intelligence was comprised of comprehension, inventiveness, direction, and criticism. In 1927, Spearman suggested that intelligence could be divided into a general factor, pervading all types of intellectual practice, and specific factors, which involve specific tasks (Spearman 1927). The idea of one unifying factor representing intelligence across all domains remains a dominant, if controversial, force in the field.

In contrast to the generalist view, in 1936, Thurstone identified seven primary mental abilities – (1) number facility, (2) word fluency, (3) visualizing, (4) memory, (5) perceptual speed, (6) induction, and (7) verbal reasoning – which would later be utilized as the foundation for the Primary Mental Abilities Tests (Thurstone 1936). These mental abilities almost always correlate with one another, and when factor analyzed, a higher-order general factor emerged. Thus, Thurstone realized that he had to concede to the existence of a general intelligence factor. Spearman, on the other hand, was also forced to accept the group factors identified by Thurstone (Sternberg et al. 2008). Subsequent researchers extended Thurstone’s theory by adding more factors; Guilford, constructed a cube-like model yielding 120 different mental abilities.

Hierarchical models represent a blend of the generalist and multiple domain theories. In 1971, Vernon, for example, proposed a model of mental ability where general intelligence was at the top, verbal-educational and practical-mechanical abilities were at the second level, and the more

specific mental abilities were located at the lower levels (Vernon 1971). An even more detailed hierarchical model using numerous data sets and factor analysis studies was offered by Carroll.

Cattell and Horn proposed the theory of fluid and crystallized intelligence, which is arguably the theory of intelligence with the most impact on IQ testing (Kaufman 2009). They distinguish crystallized intelligence (what a person knows and has learned) and fluid intelligence (how a person deals with a new and different situation). Horn expanded the theory to include more dimensions, such as visualization, short-term memory, long-term retrieval, and processing speed. In recent years, Carroll's hierarchical theory and the Horn-Cattell Gf-Gc theory have been merged into the Cattell-Horn-Carroll or CHC theory (Flanagan et al. 2007). Until then, these and other factorial theories of intelligence had failed to address the processes involved in intelligence. Jean Piaget's theory was among the later theories that sought to examine these processes (Sternberg 2000).

Piaget conceptualized intelligence as a system of translating thinking into actions. He also believed that though intelligence manifests differently with age, we all follow a single path of intellectual development regardless of the rate of development. Wechsler viewed intelligence in light of its interaction with the environment. He conceived of intelligence as a global entity and defined it as the general capacity of an individual to cope with his/her surrounding environment.

Cognitive-processing conceptions of intelligence have also been proposed. These theories seek to understand (often with the use of computers) how humans mentally represent and process information during various tasks. Some researchers, such as Glaser, Pellegrino, Simon, and Sternberg, have recently focused on reasoning and problem solving in a quest to better understand the nature of intelligence (Sternberg 2000). Intelligence is also studied in relation to the external world and its link to culture. Researcher and scholar Robert Sternberg affirms a strong link between intelligence and culture and

states that intelligence is something that a culture creates (Sternberg 2000).

Another view on intelligence is that it is not just a single unitary construct. In 1999, Gardner proposed a theory of multiple intelligences which includes eight distinct intelligence functions that may interact in their production of intelligent behavior: linguistic, logical-mathematical, spatial, musical, bodily kinesthetic, interpersonal, intrapersonal, and naturalist (Gardner 1999). Sternberg's theory of successful intelligence includes creative abilities as one of three essential components, along with analytical and practical abilities (Sternberg 2000). Although not currently adapted into a major IQ test, this theory is the basis for exciting work in college admissions.

Currently, a consensus on the definition of intelligence has not yet been reached among contemporary theorists.

Characteristics

Intelligence influences our thoughts, actions, and interactions with the external environment. Therefore, every activity in which we engage is, in some way, affected by intelligence. Consider the first 20 things you do throughout your day; they all involve and require some degree of intelligence. Even certain instinctive behaviors such as eating require of us some intelligence. We must have the understanding to reach for an edible, nonpoisonous entity as a means for nourishment – a rock or a bottle labeled as snake poison would not be wise choices for sustenance. Intelligence is required in, almost, every activity that involves some level of thought and the use of our minds.

Relevance to Science and Religion

Intelligence researchers have mainly examined intelligence and related constructs through theory, analysis, and the scientific method and have generally not addressed the area of science and religion.

Sources of Authority

This field is driven by empirical research as well as empirical theory. Sources of authority for this discipline are scientific journals, journal articles, research-focused books, standardized IQ tests, authoritative researchers, theorists, and scientists within the field.

Ethical Principles

The ethical guiding principles of this field pertain to the method by which data are collected, the ways by which results are reported, and those affected by the results. Data should not be obtained by means not approved by an Institutional Review Board to make sure that participants are treated in an ethical manner. Reporting the results of the study must be observed with caution, especially in the case of reporting findings that may be undesirable to a particular population. Therefore, generalizations should be made sparingly (while bearing in mind all the specific qualities of the sample population) and with an understanding of the possible consequences of the information on the targeted population. Intelligence score reports can not only influence how one views oneself but also how a culture views itself, as well as how it effects the perception of other cultures of it. Scores may also be wrongfully interpreted or used as a means to discriminate against or pass policies disfavoring groups or classes of people believed to have lower levels of intelligence, heredity, or socioeconomic status. Before reporting the results of a study, we ought to ask whether reporting cultural disparities is indeed of any value other than hinting at differences.

It is important to remember that methods for assessing intelligence and intelligence measures are rapidly improving and therefore recognize that new measures may yield different outcomes. There is much that we know; however, there is much to be learned. In a field such as intelligence, hasty conclusions are not only unethical but bad science.

Key Values

The key values of this discipline include sound scientific knowledge, empirical research, theory, and upholding proper ethical principles.

Conceptualization

Nature/World

The element of nature versus nurture is under study in intelligence research. The findings tell us that intelligence is at least partly genetically determined. However, even though intelligence is thought of as strongly genetic (as demonstrated by twins studies), it can still be influenced by environmental factors and thus be improved (Pearson 2009). In a meta-analysis of 75 studies, children growing up in orphanages were shown to have substantially lower IQ levels than those reared in foster families, showing that the environment does in fact play a role on intelligence. Though we do know that both hereditary and environmental influences impact intelligence, exactly how much of the variance in intelligence is accounted for by either of these elements is yet to be determined.

Human Being

The study of intelligence has found its home primarily the field of psychology, a field dedicated to better understanding and appreciation of the human mind. Endeavors within this field, such as the investigation of intelligence, contribute to our knowledge of that which distinguishes us from other beings.

Reality

Broadly speaking, the study of intelligence assumes a person has knowledge of what is reality.

Knowledge

Crystallized intelligence (Gc), one type of intelligence, involves what a person knows and has learned. Fluid intelligence (Gf), another type of intelligence, addresses how a person handles a new and different situation. Both Gc and Gf contribute to the broader construct of intelligence.

Truth

The essence of science is to seek truths about the universe. In the field of psychology, intelligence is studied through scientific enquiry. Thus, it uses scientific methodology to seek factual knowledge about the construct of intelligence.

Perception

Some of the tasks on an intelligence test, such as reaction time, require better than average perceptual abilities.

Time

As time progresses, more empirical evidence is accumulated on the study of this construct. We know more about intelligence now than we did even ten years ago. Currently, we have more accurate measures for intelligence than we did a few years ago simply because we have gained more knowledge through scientific research.

Consciousness

Most research on intelligence is focused on conscious performance.

Rationality/Reason

Most intelligence tests and theories strive toward rationality and toward reason.

Mystery

There is still a great deal that we have yet to uncover about intelligence. Much remains a mystery; however, much is known and there is great potential for gaining more knowledge in this field.

Relevant Themes

Scientific inquiry and empirical research are of special relevance since it is with rigorous scientific enquiry that we can come close to accurate facts about how intelligence works, how it is used, how it is acquired, how it may be enhanced, and how it relates to other cognitive processes, among others.

Cross-References

- [Cognitive Psychology](#)
- [History of Ideas \(Intellectual History\)](#)
- [Imagination](#)
- [Intelligence, Swarm](#)
- [Intelligences, Multiple](#)
- [Memory](#)
- [Psycholinguistics](#)

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Intelligence Quotient (IQ)

- [Intelligence](#)

Intelligence, Swarm

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Related Terms

[Computer science](#)

Studies on Swarm Intelligence are developed from the discoveries and researches of collective behaviors emerged from the social animals or insect group. More than 50 years ago, biologists have reported that a new kind of intelligence form can emerge from some social insects, fish, birds, and mammals. For example, African termites (*Macrotermes bellicosus*) can build nest that may reach a diameter of 30 m and a height of 6 m with complex internal structure (Grasse 1984). These skyscrapers are built by millions of tiny (1–2-mm long) and completely blind individuals. Apparently, in terms of cognitive or communicational abilities, the complexity of an individual termite is not intelligent enough for designing and generating such complex system. Another example of collective behavior is the food recruitment in ant colony. At the beginning of the 1990s, Jean-Louis Deneubourg and his collaborators (1991) found there is a high probability for a colony of ants to find out the shortest path from multiple paths between the food source site and the nest. Many more examples of the impressive capabilities in other biological systems, such as colonies of bacteria or amoeba, fish schools, bird flocks, and sheep herds, share similar collective properties. However, it is hard to explain the complexity of all the behaviors at the colony scale level if only considering individuals of the colony. For a long time, these kinds of collective behaviors that emerge from social insects or animal society have remained mysterious and appear to happen as if an “invisible hand” or leader inside the colony coordinates the individuals’ activities. The power of the collective behavior of social insects has also inspired novelists. Michel Crichton, in his novel “Prey,” describes a swarm of nanorobots that can generate complex intelligence using their collective mind. Early attempts to explain this collective behavior focused on building the connection between the observed complex behavior in the colony level and the behavior of an individual. It was believed that the complex swarm behavior can only be generated by individuals with complex cognitive capabilities. In the research of the social insect behaviors, the queen of an insect colony used to

be considered as the leader of the colony having the capability of collecting the colony’s global information, supervising the worker, and coordinating the behaviors of the whole colony. However, researches indicate that neither queen nor workers have the neuron capability for collecting colony global information, processing the information, and making decision on controlling the behaviors of the whole colony.

The first serious theoretical explanation of the emerging of collective behaviors in social insects was provided by the French biologist Pierre-Paul Grasse. In 1950, Grasse introduced the concept of stigmergy in conjunction with his research on termites. His study has shown that a particular configuration of a termite colony’s environment could trigger a termite to modify its environment, for example, dropping mud in a particular place to build or maintain the nest. The modification in turn stimulates the original or other termites in the colony to further transform their environment. Grasse made a general definition of stigmergy as: “the stimulation of the workers by the very performances they have achieved.” The concept of stigmergy provides a theory for explaining how distributed, ad hoc contributions from individuals could lead to the emergence of large collaborative enterprises.

In recent years, some computer scientists adopt the stigmergy model to solve complex problems and categorized it as Swarm Intelligence. Swarm Intelligence is an artificial intelligence technique involving studies of collective behaviors in decentralized systems. Beni and Wang (1991) first introduced the term of Swarm Intelligence in the context of cellular robotic systems. Bonabeau et al. (1998, 1999) extended the concept of Swarm Intelligence to the work involved with algorithm design or distributed problem-solving devices. He defined the Swarm Intelligence as “any attempt to design algorithms or distributed problem-solving devices inspired by the collective behavior of social insect colonies and other animal societies.” The major concepts underlying Swarm Intelligence include decentralization, stigmergy, self-organization, emergence, and positive and negative feedbacks. Currently, most popular research

directions in Swarm Intelligence are grounded on the following three research areas: Flocking model (Reynolds 1987), Ant Colony Optimization (ACO) (Bonabeau et al. 1999), and Particle Swarm Optimization (PSO) (Eberhart and Kennedy 1995).

The flocking model, first proposed by Craig Reynolds (Reynolds 1987), is a bio-inspired computational model for simulating the animation of a flock of entities called “boids.” It represents group movement as seen in bird flocks and schools of fish in nature. In this model, each boid reacts to the neighboring mates in the flock and the environment it can sense and makes its own decisions on its movement according to a small number of simple steering rules. Three simple steering rules need to be executed at each instance over time. Three basic rules include: (1) Separation: Steering to avoid collision with other boids nearby; (2) Alignment: Steering toward the average heading and match the velocity of the neighbor flock mates; (3) Cohesion: Steering to the average position of the neighbor flock mates. By following these three simple rules, boids in the simulation can quickly form a stable swarm formation, in which every boid has the minimum distance from every other boid and will not move any further than the maximum distance.

The Ant Colony Optimization (ACO) is a heuristic algorithm that is inspired by the food foraging behavior of ants. Marco Dorigo introduced the first ACO system in his Ph.D. thesis (1992). The idea underlying the ACO algorithm is to mimic the ant’s foraging behavior with “simulated ants” moving around a graph searching for the optimal solution. As ants forage, they deposit a trail of slowly evaporating pheromones. All foraging ants use the pheromones as a guide regardless of whether the pheromone was deposited by itself or other ants. Pheromones accumulate when multiple ants travel through the same path. The pheromones on the trail evaporate as well. If an ant reaches the food first and returns to the nest before others, its return trail’s pheromone is stronger than other trails on which

ants have not found food or have longer distances from the food source because the return trail has been traveled twice. This high volume of pheromone volume attracts other ants to follow this trail. The more the trail is traveled, the stronger the pheromone content on this trail will be. The level of pheromone on other less traveled trails will decrease since fewer ants travel those trails and the pheromone evaporates. Eventually, the trail with highest level of pheromone and traveled by most of foraging ants will be the shortest trail between food sources and nest.

Particle Swarm Optimization (PSO) is a population-based stochastic optimization technique that can be used to find an optimal, or near-optimal, solution to a numerical and qualitative problem. Inspired by the social behavior of flocking birds or a school of fish, Eberhart and Kennedy originally developed the PSO in 1995 (Eberhart and Kennedy 1995). In PSO, birds in a flock are symbolically represented as particles. These particles can be considered as simple agents “flying” through a problem space. A problem space in PSO may have as many dimensions as needed to model the problem space. A particle’s location in the multidimensional problem space represents one solution for the problem. When a particle moves to another location, a new solution is generated. This solution is evaluated by a fitness function that provides a quantitative value of the solution’s utility. The velocity and direction of each particle moving along each dimension of the problem space are altered at each generation of movement. It is the particle’s personal experience combined with its neighbors’ experience that influences the movement of each particle through a problem space.

Swarm Intelligence is a growing research field for solving distributed problems. It offers an alternative way to design system that has traditionally required centralized control and extensive preprogramming. However, because the pathways to solutions are not predefined but emergent, there is no general guideline on how to design a swarm intelligent system. The system

designer has to rely on trial and error process to determine how the agents of a swarm-based solution should be programmed. Currently, most of the Swarm Intelligence studies and applications are mimicking the collective behaviors of social insect or animal society. These Swarm Intelligence applications seek to solve tasks strictly relying on simple individual capabilities, local interaction mechanisms, and indirect communication (stigmergy). Adaptation, computational intelligence, cognition, and other sophisticated capability are absent at the individual level in current Swarm Intelligence system.

Cross-References

- [Artificial Intelligence, General](#)
- [Collective Behavior](#)
- [Complex Systems](#)
- [Emergence, Theories of](#)
- [Model Theory](#)
- [Simulation Theory](#)

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Intelligences, Multiple

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Related Terms

[Education](#); [GoodWork project](#); [Multiple intelligences](#); [Spiritual intelligence](#)

Description

Since the early twentieth century, conceptions about intelligence in the West have been shaped by the work of Alfred Binet and the “IQ test” that he developed in Paris. In an attempt to devise a metric that could predict student success in school, Binet and those who followed him designed questions that measured verbal memory and reasoning, numerical processing, and the capacity to understand logical sequences. While these tests were useful in predicting outcomes in environments that relied heavily on such processing, such as schools, they sharply restricted what could count as intelligence. Such a one-dimensional definition of intelligence, supported by psychometricians who consistently cited data culled from paper-and-pencil tests, has remained dominant in many Western nations as well as other countries influenced by Western educational and/or testing practices.

Yet debate over this term, and this concept of intelligence, has continued over the ensuing decades. There have been challenges to the narrow limits of what counted as intelligence, debates about the heritability of intelligence, and allegations with respect to the possible biases of intelligence tests. Toward the latter part of the twentieth century, these discussions were heightened because of new discoveries about the

differentiation of the brain and the localized nature of many mental capacities.

It is within this environment that Howard Gardner approached the question of what counted as an intelligence. Working with brain-damaged adult patients and artistically talented children, he noted repeatedly that skills and capacities are not evenly distributed. That is, a person may be very good at learning a foreign language but unable to find her way around a new environment or learn a new song. The opposite profile of capacities can also be encountered. Such recurrent discoveries led him to think of the human mind less as a monolithic machine and more as a set of relatively discrete faculties. Conducting research and synthesizing findings in psychology, neurology, sociology, anthropology, the arts, and humanities, Gardner was led to proposing the existence of seven relatively autonomous intelligences, described in detail in his 1983 work, *Frames of Mind* (Gardner 1983).

In MI theory, an intelligence is defined as “a biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value to a culture” (Gardner 1999, pp. 33–34). Aside from broadening the definition of intelligence to extend well beyond skills needed to succeed in certain kinds of schools, Gardner also posited that intelligences are capacities and potentials that can be activated to varying degrees, depending on opportunity and motivation.

Gardner drew his criteria for an intelligence from a variety of sources. Two emerged from biological sciences: (1) potential isolation by brain damage and (2) an evolutionary history and evolutionary plausibility. The first drew on his experience as a neuropsychologist of seeing how brain damage can severely affect one set of capacities yet leave another untouched; the latter criterion indicated why an intelligence may have contributed to survival of the species. Two criteria came from developmental psychology: (3) a distinct development history, along with a definable set of expert “end-state” performances and (4) the existence of idiot savants, prodigies,

and other exceptional people. Two criteria were drawn from traditional psychology: (5) support from experimental psychological tasks and (6) support from psychometric findings. The final pair of criteria came from an analysis of the candidate capacity: (7) possessing an identifiable core operation or set of operations (such as command of syntax in the case of linguistic intelligence) and (8) susceptibility to encoding in a symbol system.

Gardner initially proposed the existence of seven intelligences, and information on them is available in many sources. We offer a brief list here:

1. Linguistic intelligence: involves the sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals. Exemplified among lawyers, writers, and speakers
2. Logical-mathematical intelligence: involves the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically. Most apparent among mathematicians and scientists
3. Musical intelligence: involves skill in the performance, composition, and/or appreciation of musical patterns
4. Bodily kinesthetic intelligence: the potential of using one’s whole body or parts of the body to solve problems or fashion products
5. Spatial intelligence: the potential to recognize and manipulate patterns of wide space as well as more circumscribed areas
6. Interpersonal intelligence: the capacity to understand the intentions, motivations, and desires of other people and to work effectively with others
7. Intrapersonal intelligence: the capacity to understand oneself and to use such information effectively in regulating one’s life

More recently, Gardner added an eighth, or “naturalist intelligence” – the capacity to make consequential distinctions in the world of nature, and he has speculated about a ninth or “existential” intelligence – see below for more on this intelligence.

Self-identification

Rather than a discipline, MI is a theory about the nature of intelligence. It has contributed to debates concerning the nature of intellect, as well as the identification of computational capacities that make various disciplines, professions, and crafts possible. Perhaps less predictably, it has considerable impact worldwide among classroom educators who have applied the theory in novel ways. As a social science synthesis, MI theory is subject to verification and revision. However, the theory is less likely to be revised as a result of experiments but more likely to be revised in light of new findings that revise the original synthesis.

Characteristics

MI is distinct from other theories of intelligence in a number of ways. First, most theories of intelligence are monolithic. That is, they measure and account for only one kind of intelligence, typically a combination of linguistic and logical capacities. The theory of multiple intelligences seeks to identify and examine a wide and potentially expanding range of intellectual capacities. While other theories consider the pluralistic nature of intelligence, these theories are typically limited by their exclusive reliance on paper-and-pencil tests. MI, on the other hand, draws its explanatory power from surveying different academic literatures and kinds of empirical data, in an attempt to tease out the range of human capacities and potentials.

Relevance to Science and Religion

In the years following the publication of *Frames of Mind*, Gardner was often asked if more than seven intelligences existed. In *Intelligence Reframed* (Gardner 1999), he considers the existence of a spiritual intelligence. In raising this possibility, he considers three possible meanings

of the spiritual intelligence: (1) a concern with cosmic or existential issues, (2) the achievement of a state of being, and (3) a specific set of beliefs and practices, as found in organized religions.

Inasmuch as engagement with spirituality or religion entails a concern with existential issues, it may qualify as an example of spiritual intelligence. Through myth, art, ritual, and philosophy, religious traditions have taught answers to, or at least ways of thinking about, the origin of life, the meaning of death, and the purpose of existence. Yet, Gardner cautions that identifying the exact content that is mastered in the spiritual realm is more difficult. Many traditions argue that there is specific knowledge to be acquired, but as the history of religions shows, fierce battles over doctrine are rarely resolved definitively.

By the same token, it would be inappropriate a priori to identify beliefs or morals that must be adopted by an individual. It is also worth noting that some analysts characterize the realm of spirituality as more affective and emotional, rather than purely cognitive. While it seems likely that one can identify the ability to train one's mind through meditation or prayer, it is far from evident exactly what content would be mastered within a spiritual intelligence.

Citing the impact that figures such as the Dalai Lama and Mother Theresa have had on others, Gardner also considers the possibility that the potential to influence others may constitute spiritual intelligence. And indeed, when it comes to identifying exemplars of spiritual intelligence, religious communities have long recognized those with advanced understanding or the ability to achieve trance states or be in touch with psychic realms. Yet, this phenomenon becomes problematic in the case of individuals who operate outside of a defined religious system, such as those who gain spiritual nourishment and insight on their own, through activities ranging from hiking to meditation to mathematical problem solving.

In light of this analysis, Gardner, in distinction to others who argue the contrary, has tentatively concluded that a spiritual intelligence does *not* exist, finding it more comfortable to speak of

a potential to engage in thinking about cosmic issues. He writes in *Intelligence Reframed*:

I think it best to put aside the term *spiritual*, with its manifest and problematic connotations, and to speak instead of an intelligence that explores the nature of existence in its multifarious guises. Thus, an explicit concern with spiritual or religious matters would be one variety – often the most important variety – of an existential intelligence. (Gardner 1999, p. 60)

Gardner argues that existential intelligence, which he identifies as the cognitive strand of the spiritual, is the best potential candidate for an intelligence. Its core capacities would include the abilities to reflect on what is not easy to perceive directly since it tends toward the infinite or infinitesimal, to locate oneself and others on a macro- and microcosmic level, and to process existential features (such as life and death) and experiences (such as love, sadness, emotional attachment, and immersion in a work of art) of the human condition.

Existential intelligence exhibits many of the criteria for an intelligence. It is valued in nearly every human culture, and its meanings are encoded in networks of symbols (e.g., the crucifix, the Torah, the Quran, the Ten Commandments, icons of saints and deities). There are clear stages of sophistication and mastery, with exemplars who have reflected at length on cosmic issues. Although biological evidence is less straightforward, Gardner suggests that the evolution of the human brain by the time of the Stone Age enabled human beings to reflect upon and integrate into artistic representation questions about the nature of life and death, conflict and reconciliation, and nature and culture. Indeed, concern with the ultimate seems to distinguish humans from other species.

Although information from the biological sciences is less forthcoming, evidence concerning brain damage and, in particular, temporal-lobe epilepsy is suggestive. Among the symptoms displayed by such individuals is hyperreligiosity, along with a tendency to transform minute experiences into a launchpad for extended introspection. Psychological evidence is less robust since no reliable psychometric test is correlated with

concern with cosmic issues. However, from a phenomenological perspective, reflection on cosmic matters in response to significant pain or peak/mystical states seems to suggest the stimulation of certain brain centers and the release of neural transmitters in such states. Given the still incomplete evidence with respect to existential capacities, Gardner accords this candidate the status of a “half-intelligence” status, pending the accumulation of further evidence, particularly from the biological sciences.

More generally, the theory of multiple intelligences can make useful contributions to discussions on science and religion. The theory can help frame the ways in which religious and spiritual concerns dovetail with the intelligences involved in solving problems or producing works of art and philosophy. In the classroom, educators of both religion and science can and have utilized the theory, using MI-informed entry points to facilitate students’ understanding of curricular material.

Sources of Authority

The theory of multiple intelligences is inherently interdisciplinary, as it draws on scholarly research in psychology, neuroscience, cultural studies, and other social and behavioral sciences.

Ethical Principles

The theory of multiple intelligences is amoral. Like any tool or any scientific finding, an intelligence can be used benignly or for ill. Although some have attempted to argue for the existence of a moral intelligence, Gardner does not believe that morality satisfies the aforementioned eight criteria for the status of an intelligence.

Struck by the paradox of intelligence as amoral, Gardner and colleagues subsequently developed the GoodWork Project, a multiyear, multisite study of how leading professionals engage in work that is excellent in quality, highly ethical, and personally meaningful (Gardner et al. 2001). A primary goal of the project has been to

determine how leading individuals make use of their intelligences: what role models do they choose? How does their personal history impact their choices? How do they conceive of their personal, professional, and global responsibilities? The project assumed that since human intelligence is amoral and subject to either good or ill use, it is important to understand how some individuals deploy their intelligence(s) to produce good for their communities. In the end, each individual must decide how to use his or her intelligence.

Key Values

As a scientific theory, MI is informed and bound by the values common to all scientific research, such as integrity, publication, susceptibility to critique, and revision. As an academic researcher, Gardner is keen on following the ways in which MI is used by educators, many of whom have integrated its insights into pedagogical techniques, such as the use of a variety of entry points in the communication of important theories, findings, concepts, and insights.

For the most part, Gardner has adopted a hands-off approach and allowed educators to adapt MI in whichever ways seem most useful. Nonetheless, he has on occasion spoken out when encountering egregious misapplications of the theory. In particular, he challenged the use of MI in one Australian state's school system. The architects of that curriculum had asserted that various racial and ethnic groups possessed certain intelligences, while lacking others. Such uses of MI clearly misunderstand the purpose and scope of the theory. The precepts of "good work" indicated that this misuse should be labeled as such.

Conceptualization

Nature/World

As a theory focused on explaining human cognition, MI theory does not have a stance on the status of nature or the world. Discussions of this

sort are beyond its purview, although reflection upon it would fall under the category of existential intelligence. Of course, the naturalistic intelligence focuses particularly on distinctions in nature, while other intelligences are focused more on human dimensions.

Human Being

Living, conscious creatures whose psychological makeup consists, in part, of multiple biopsychosocial potentials or capacities that enable them to solve problems or create products that are valuable in at least one society.

Life and Death

As a theory focused on explaining human cognition, MI theory does not have a stance on the origins of life and the nature of death. Discussions of this sort are beyond its purview, although reflection upon it falls under the category of existential intelligence.

Reality

As a scientific theory focused on explaining human cognition, MI theory assumes the existence and explicability of reality. That said, it does not have a further stance on the nature of reality. Discussions of this sort are beyond its purview, although reflection upon it falls under the category of existential intelligence.

Knowledge

Consists of data to be organized and utilized by individuals to solve problems and create products, through the lenses of various intelligences.

Truth

As a theory focused on explaining human cognition, MI theory does not have a stance on the nature of truth. Discussions of this sort are beyond its purview, although reflection upon it falls under the category of existential intelligence.

Perception

MI theory focuses on how individuals process and make sense of data, rather than on the mode

by which data are detected. That is, there are no visual or auditory intelligences per se. Rather, the intelligences operate on information, independent of how that information is transduced via one or more sensory organs.

Time

As a theory focused on explaining human cognition, MI theory does not have a stance on the nature of time. Discussions of this sort are beyond its purview, although reflection upon it falls under the category of existential intelligence.

Consciousness

MI theory focuses on the ways in which human beings process and make sense of information and has not developed a robust conception of consciousness.

Rationality/Reason

MI theory does not explicitly deal with the nature of rationality and reason, but insofar as they constitute the capacity to generate conclusions based on data, rationality/reason may be considered a faculty that enables one to solve problems. When classically defined, rationality/reason may be taken to refer to a capacity to make sense of data specifically through linguistic and/or logical-mathematical intelligence, but they may also be considered as facets of other intelligences.

Mystery

As a theory focused on explaining human cognition, MI theory does not have a stance on the nature of mystery. Discussions of this sort are beyond its purview, although reflection upon it falls under the category of existential intelligence.

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Intelligent Design

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Description

The idea of intelligent design in nature and the universe has a long tradition. The German philosopher Immanuel Kant (1724–1804) thought that this idea was as old as the reason of man. It can be found both in Western and non-Western religion and philosophy. You can find arguments for intelligent design in nature defended not only in ancient Greek philosophy but also in Hindu, Chinese, Islamic-Persian, and other non-Western traditions.

In Western tradition, Anaxagoras of Clazomenae (500–428 BC) is regarded by many as the first in ancient Greek philosophy to attribute the evident structural harmony and order in nature to some form of intelligent design plan rather than the chance concurrence of atoms. Anaxagoras believed a cosmic “Mind” ordered a primeval chaos of very small particles.

Socrates (470–399 BC) and Plato (427–347 BC) argued that cosmic and material order is the result of “Ideas” and “Mind” and that the order and design of the world can only be sustained by virtue of a Mind. Aristotle (384–322 BC) believed the organic analogy was the best to describe the natural world, which he thought functioned according to ends and design that was built into nature. Because his thoughts were adopted by Christian thinking in the Middle Ages, his ideas for centuries had an enormous influence on the thinking in western Europe.

The Stoics who dominated philosophy for almost 500 years in the ancient world adopted some of Aristotle’s teleological ideas. The Stoic cosmos was indeed an intelligently designed cosmos. The Stoics supported enthusiastically the design argument in all its forms.

In medieval Christian philosophy, arguments for intelligent design in nature are found in the widespread so-called teleological or physicotheological proofs of God's existence. Thomas Aquinas (1225–1274) completes the conversion of Aristotle's philosophy and teleological world view to Christianity. He had five arguments for the existence of God. In his famous *Fifth Way*, he used a teleological design argument to prove the existence of God. He argues that things in nature, which have no intelligence, move as if guided by deliberate ends, like an arrow shot by an archer.

In the Renaissance and in more modern time design, arguments are found in science and philosophy by people like Johannes Kepler (1571–1630), Galileo Galilei (1564–1642), Isaac Newton (1642–1727), Robert Boyle (1627–1691), Gottfried Leibniz (1646–1716), and William Paley (1743–1805), just to mention a few (Barrow and Tipler 1986).

Like design arguments had their critics in ancient Greek philosophy, they have their critics in modern time. David Hume (1711–1776) and Charles Darwin (1809–1882) represent the most effectual critics of the design argument in philosophy and science in modern times. When Kant said that the design argument was as old as the reason of man, you might add that the critique of the design argument is just as old and persistent.

Kant himself represents an interesting middle position in this never-ending discussion. On the one hand, he rejected the physicotheological proof of God's existence, though he said it deserved to be mentioned with honor; on the other hand, he claimed that it is inevitable to presuppose intelligent design in nature. The biological sciences must presuppose design and teleology, but these notions are not part of biology strictly taken as natural science.

The recent developments within the tradition have taken place in ► [astrophysics](#), origin-of-life studies, evolutionary biology, and ► [philosophy of science](#). Since the beginning of the 1990s, arguments for intelligent design in nature have had a renaissance especially among scientists in USA with some affinity to religious communities such as creationism and evangelism.

In the mid-1970s, physicist Brandon Carter drew the attention to the fact that the laws and constants of physics seem to be “fine-tuned” for the universe to be suitable for life. Since then, a number of physicists and astronomers have supported the fine-tuning hypothesis: John Barrow and Frank Tipler, Guillermo Gonzales and Jay Richards, Paul Davies, Stephen Hawking, and others. The fine-tuning hypothesis is a design argument. It is being opposed by the theory of the multiverse, which claims that there are many “universes” with different laws and physical constants, so “our” universe is just a chance occurrence.

In origin-of-life studies, the central question is how molecules that are able to self-reduplicate and contain coded chemistry can evolve. As early as 1968, Michael Polanyi pointed out that the information in code molecules transcends its chemical medium. In the mid-1980s, Walter Bradley, Charles Thaxton, and Roger Olsen suggested that the emergence of “coded chemistry” is best explained by intelligent design. Since then, some scientists have tried to underpin the design theory within origin-of-life studies: David Berlinski, Stephen Meyer, and others. In evolutionary biology, especially biochemist Michael Behe (Behe 1996), but also others, has argued for the relevance of intelligent design theory. In 1996, Behe claims that tiny molecular machines, such as the bacterial flagellum, are “irreducibly complex.” Structurally, they resemble a mousetrap. The system only works if all the parts are in place. Natural selection working on random mutations cannot build such a system, because it can only build systems one small step at a time, by traversing a path in which each step provides a present survival chance for the organism. It cannot select for a future function. Only an intelligent agent can do that. On the macroscopic level, it is a problem to Darwinian theory that in the fossil record the three-dimensional complexity of many diverse animal body plans show up at, geologically speaking, more or less the same time, the so-called Cambrian explosion. Darwinian theory of gradual evolution does not predict the sudden appearance of complexity. Sudden innovation

and increase of information are always due to intelligent agency, intelligent design theorists argue.

The recent attention to intelligent design arguments in science has, in philosophy of science, revived the idea of a correspondence between human rationality and rationality in the universe. The question is: how can it be that man using scientific investigation relatively effectively can discover important aspects of the truth of about nature? Or as Nobel Prize winner physicist Eugene Wigner points out, the enormous applicability of mathematics in natural science is a mystery, there is no rational explanation. Albert Einstein spoke of the laws of nature as “reason incarnate.” The universe is intelligible because it incarnates reason. Philosopher Anthony Flew, a former outspoken atheist, in 2004, puts forward a strong support for the design argument based on Einstein’s reflections and recent developments in astrophysics and microbiology. In continuation of Behe’s concept of “irreducible complexity,” mathematician and philosopher William Dembski elaborates a mathematical model for detecting intelligent design in nature (Dembski 1999).

Self-identification

Science

The intelligent design community in USA does self-identify intelligent design theory as science. Michael Behe argues that the design inference is inductive and therefore scientific. William Dembski argues that not only unintelligent causes like mechanical laws of nature and chance should be allowed in scientific explanations but also an intelligent cause. Others argue in continuation of Kant that the idea of intelligent design in nature is not a scientific but a prescientific concept. Intelligent design is a philosophical idea (Kant 1966).

Religion

It does not self-identify as a religion. It does not exclude religious implications, but it does not require religious premises. Many critics of the intelligent design movement in USA, however,

see it as creationism in disguise. It denies the religious character of the theory in order to have intelligent design theory taught in public schools. In fact, intelligent design proponents are trying to promote Christian ideas (Numbers 2006).

Characteristics

This tradition is distinct by being in its core a philosophical tradition. It is neither science nor religion, but it has the closest connection to science and some relation to religion. It is not science in a modern sense where science is defined by methodological naturalism which excludes intelligent causation. Rather, it can be categorized as what was formerly called natural philosophy. It is not religion because it is based on perceptions of nature and not belief in holy books or religious beliefs. The relationship between intelligent design in nature and religion is that the religious interpretation of intelligent design in nature as an expression of a transcendent creative power is a further interpretation of what or who the designer may be. The religious interpretation is a possible, but not a necessary, interpretation.

Relevance to Science and Religion

The tradition is highly relevant to the scholarly area called ► [science and religion](#). The idea of intelligent design in nature can be used to bridge science and religion. As being a presupposition for science and being open to a religious interpretation, the concept of intelligent design bridges science and religion without confusing science with religion.

Sources of Authority

The sources of authority for this tradition are classical and modern religious, philosophical, and scientific texts such as the writings of Plato, Aristotle, the Stoics, Thomas Aquinas, Kepler, Newton, Kant, Paley, etc. The classicistic

character of the texts and the quality of the science and the philosophical reflections make these sources authoritative.

Ethical Principles

The search and respect for truth.

Key Values

The love for truth and honoring nature. In this tradition, it is argued that nature has an intrinsic value, which provides nature with an ethical quality. It is critical to all theories of the universe and nature that reduce nature to mechanical processes and chance events, which remove all intrinsic value from nature

Conceptualization

The tradition of the idea of intelligent design in nature does not have any special definitions of the mentioned phenomena. It follows the traditional definitions from philosophy and science.

Relevant Themes

The concept of intelligent design in nature is especially relevant as a concept that bridges science and religion. It is critical to the way science and religion is bridged in the concept of theistic evolution. Here, God is seen as a primary cause behind the Darwinian mechanism. God creates the universe and then leaves it to evolve by itself. In this model, the concept of God is reduced to a deistic concept, and nature is reduced to be the result of meaningless mechanisms and chance events.

Cross-References

- [Biology, Theoretical](#)
- [Creationism](#)

- [Ethics](#)
- [Evolution](#)
- [God of the Gaps](#)
- [Natural Theology](#)
- [Phenomenology](#)
- [Philosophy of Science](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Intentional Action

- [Attribution/Attribution Theory](#)

Intentionality

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The quality of a behavior being intentional – that is, chosen, purposeful, done for a reason. Research shows that five components have to be present for people to consider a behavior intentional: the actor must have had a desire for an outcome, a belief that

the behavior will lead to the outcome, an intention to perform the behavior, awareness of fulfilling that intention while performing the behavior, and skill to perform the behavior.

Cross-References

- ▶ [Attribution/Attribution Theory](#)
- ▶ [Divine Action](#)
- ▶ [Externalism and Internalism](#)

Interbeing

- ▶ [Animal Theology and Ethics](#)

Interfaith

- ▶ [Science and Religion Dialogue and the Interreligious Dialogue](#)

Interiority

- ▶ [Externalism and Internalism](#)

Internet and Religion

- ▶ [Online Religion](#)

Internet Ethics

- ▶ [Cyberethics](#)

Interpersonal Relationships

- ▶ [Social Psychology](#)

Interpretation Theory

- ▶ [Hermeneutics, Theological](#)

Interreligious Dialogue

- ▶ [Pluralism \(Religious\)](#)

Interreligious Studies

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Description

The term “Interreligious Studies” is a relatively new one within academia, but one that is becoming frequently employed. Its basic meaning refers to studies involving two or more religious traditions or groups; however, it can bear a number of different connotations within this broad area. For instance, it is often seen linked to the term “Intercultural Theology,” a term that usually refers to recent development within ecumenics and mission studies where emphasis moves from mission as conversion toward developing an inculturated theology and dialogue with the religious other. In this context, although stressing the Religious Studies context rather than the theological, it may carry a theological tone where study between religions for mutual enrichment is key. However, this is not its only usage, and it may refer to the study of different religions in meeting, encounter, and activism. Here, a more “secular” than theological concern may be involved based in, for instance, a sociological exploration of the role of different religious traditions in social inclusion, or activism around issues like the environment. Another area that may be of concern in Interreligious Studies, and where, probably, the most common usage of

“interreligious” on its own is found, is as an alternative or synonym to “interfaith” in the phrase Interreligious/Interfaith Dialogue. This preview of three sample areas may suggest a variety of different usages, and this is indeed the case, however, this does not make the term too broad. Across its various usages, Interreligious Studies often tends to imply more than simply a study of two or more religions, but is about studying the dynamic encounter and interaction between them. This may involve hermeneutics, dialogue, historical encounters, or other areas; moreover there is normally an interest in the meaningful growth, enrichment, and benefit gained in this. Much of its focus will be on modern and contemporary issues; however, for particular scholars historical studies may be the focus.

Given its broad usage and general intentions, Interreligious Studies has a certain affinity with a number of other academic growth areas, particularly Intercultural Theology (referred to above), Comparative Theology, Comparative Religion, and studies in such areas as the Theology of Religions, Multiple or Dual Religious Belonging, and Interfaith Dialogue and Relations. It may, therefore, be seen, in some ways, as an interface between a more traditionally secular Religious Studies discipline, and a more traditionally confessional theological discipline. It is certainly a multidisciplinary enterprise employing historical, sociological, anthropological, psychological, philosophical, and other tools; in this regard, it stands clearly in the tradition of Religious Studies, perhaps as a more engaged aspect of Comparative Religion. However, it can be seen as something more, standing neither in Theology per se, nor simply Religious Studies, with some people involved in the research area sitting more comfortably in Sociology or Global Studies. Concerns with the social issues, political concerns, and other factors related to religious interaction make it a transdisciplinary or interdisciplinary subject area. While many involved may come from one particular background, Interreligious Studies involves the recognition that as a subject area it interacts with many disciplines and areas of life and study.

Self-identification

Science

In the broad sense of an area of study, or field of knowledge, Interreligious Studies can be seen as a science like the fields of Religious Studies and Theology. However, in the more restricted sense commonly used today, in reference to the natural and mathematical sciences, it is not a science. Nevertheless, in the mainland European context at least, many of those committed to Interreligious Studies may see their work as “scientific” in that it holds to strict qualitative and/or quantitative methodologies, criteria, and disciplinary guidelines that prescribe it as a genuine academic area of study.

Religion

It is not a religion, however, as outlined in section “[Description](#)”; there may be those who see its study as providing important details about the contemporary activity of their own religion.

Characteristics

As noted above, Interreligious Studies is a new term, and this has implications for its recognition. It could be argued that it is a development from the older, and well-established, field of Comparative Religion. However, whereas this sought to simply provide an objective historical or phenomenological account of similarities or points of meeting between religious traditions (notwithstanding criticisms of its quasi-theological function under such luminaries in the field as Mircea Eliade), Interreligious Studies is more expressly focused on the dynamic encounter and engagement between religious traditions and persons. Moreover, it can be seen as going beyond Theology and Religious Studies as a transdisciplinary area. Certainly the resurgence of religion in recent decades has seen it growing in importance in relation to areas such as politics, economics, and sociology; therefore, it may be suggested that there is room for a new research field that cuts across subject borders.

Relevance to Science and Religion

The issue of “Science and Religion” is one that would not necessarily be of interest within Interreligious Studies; however, at the same time, it could within certain contexts become a key focus for specific studies. For instance, in studying the historical encounter between Christianity and Islam the passing of Greek wisdom as interpreted and developed by Islamic scholars could be a fruitful area for exploration. It could certainly be usefully employed as an exercise in helping contemporary communities engage more closely in dialogue and understanding. In contemporary concerns, practical issues of interreligious activism may involve issues such as climate change, and as such would again involve directly scientific questions and issues.

Sources of Authority

There are no foundational texts for Interreligious Studies. While, as an interdisciplinary area it is, perhaps, best seen as an approach to looking at things and/or a methodological focus rather than something focused in a specific corpus of works. Nevertheless, it is possible to define scholars whose work fits readily into this research area, some of whom may see themselves as scholars of Interreligious Studies, some are even Professors of Interreligious Studies, whereas others would self-identify in different ways. These figures include Gary Bouma, Marcus Braybrooke, Diana L. Eck, Francis Clooney, Reuven Firestone, Paul Knitter, Oddbjørn Leirvik, Perry Schmidt-Leukel, Paul Weller, Hendrik Vroom, and Frans Wijsen.

Ethical Principles

As an academic discipline those involved in Interreligious Studies would follow any relevant ethical guidelines applicable to their own subject discipline, research methodology, etc. If Interreligious Studies has its own distinct ethical principles it would involve a sensitivity to the varied cultural and religious traditions of its

studies, while scholars involved would, normally, be methodologically self-conscious and would, as a principle, exercise a kind of hermeneutical suspicion about privileged starting points.

Key Values

Given the diversity of perspectives encompassed, key values would vary. However, by and large, some guiding principles could be noted: (1) respect for the other (religious, cultural, etc.); (2) valuing and appreciating diversity; (3) an awareness that truth is plural and diversely expressed; and (4) an interest in social change, particularly involving social cohesion and religious tolerance in society; for many this interest could be spoken of in terms of commitment or desire for these things as areas of scholarly study and personal activism may overlap.

Conceptualization

As a varied academic discipline Interreligious Studies would not have a set conceptualization of any of the following; however, some notes on each can be briefly observed.

Nature/World

These may be conceived from within the religious worldview of the traditions studied.

Human Being

Interreligious Studies will attach worth to the human being qua a human being, possibly based on humanistic ethics or on resources within the religious traditions.

Life and Death

Again, perspectives may depend on the religions studied.

Reality

Interreligious Studies may have a concern with Ultimate Reality if viewed from a more theological standpoint, from a more sociological one its concern may be with the perceived phenomenal

world, that is, how religions contribute, or deter, social inclusion rather than with how they relate metaphysically. However, these two perspectives are not incompatible.

Knowledge

As with much else, attitudes here will depend upon the researcher, their field, and methodology. Some researchers may be very much concerned with questions of how knowledge is obtained, that is, in terms of such things as intercultural hermeneutics, others may question the very concept as an objective category at all following, for instance, lines of thought inspired by the French critical theorist Michel Foucault where knowing is an act of power and what is known is shaped and determined by the means of knowing.

Truth

Questions of “truth” may not be of much concern to people involved with the pragmatics of interreligious social action, while the question of getting results may be valued. However, within religious contexts, truth may play a key role; indeed, it is likely to be held that lasting benefits must in some way be aligned with what is “true.”

Perception

Biological questions of what perception involves are unlikely to be of concern. However, in philosophical terms, what shapes what we perceive, the way we perceive it, etc. Then it will be related to some of the lines of thought discussed under “knowledge” and “truth.”

Time

Unless issues about the different perceptions and understandings of time between religious traditions are raised, that is, whether it is conceived in linear or cyclic terms and the effects of this on thought worlds, actions, etc. it would not often be of much concern in most circumstances.

Consciousness

Concepts of this vary vastly between different religious traditions, and social and cultural groupings and so may become a topic of discussion

among those concerned with the more abstract and metaphysical aspects of Interreligious Studies.

Relevant Themes

These would be strategically relevant issues rather than ones intrinsic to Interreligious Studies per se, and might include such things as follows: Areas of common concern in activism, for instance, where religious groups come together to discuss climate change, global warming, stewardship of the planet, etc.

The shared history of scientific endeavor that links Islam and Christianity (and also Judaism) could be a useful area to link these religions in a sense of a shared history, which would also bring it into intimate relation with certain secular realms of thought. For instance, the portrayal of religion as “irrational,” “anti-religion,” and “dangerous” by some of the New Atheists would be shown to be erroneous if the role Islamic scholars played in preserving and improving on the Greek scientific legacy and passing this to Europe, allowing that continent’s own Renaissance and moves to modernity, was more widely known.

Areas of scientific study could be applied in specific instances, for example, studies have been done on the brainwaves of people meditating or praying, showing that this activity alters the patterns. Comparative studies of religious experience or near-death experiences could also be undertaken which would have a possible application within Interreligious Studies.

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Cross-References

- [Bodhisattva Ideal](#)
- [Daoism](#)

- [Ecology in Islam](#)
- [Ecology in Judaism](#)
- [Feminist Philosophy of Religion](#)
- [Interbeing](#)
- [Liberation, Theology of](#)
- [Religion, Sociology of](#)
- [Religious Studies](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Interventional Neuroradiology

- [Neuroradiology](#)

Inverse Problem

- [Magnetoencephalography \(MEG\)](#)

Islam and Medicine

- [Medicine in Islam](#)

Islam and Science

- [Physics, Science in Islam](#)

Islam: An Overview

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Related Terms

[Koran](#); [Qur'an](#)

An Overview

The primary meaning of Islam is submission or commitment to the Will of God. At the second level, it refers to a religion, a system of beliefs and practices. At the third level, it refers to a culture and civilization created by Muslims. Islam, the second largest of world religions, has guided millions of people over the last 14 centuries to live full and productive lives and given consolation during misfortune and tragedy. Today Muslims number more than one billion and are scattered all over the world but are concentrated in the area stretching from Morocco to Indonesia and from Central Asia to sub-Saharan Africa. In recent years, Islam has grown significantly in Europe and North America as a result of Muslim immigration and local conversion. Many Westerners have been attracted to Islam and find that it satisfies their spiritual needs. This entry will primarily focus on Islam as a religion during its classical period (Shepard 2009; Esposito 2011).

The word *Islam* has different meanings due to different contexts in which it is used. Its first and most basic meaning is submission or commitment to the Will of Allah. The one who makes such a commitment is called a Muslim (an active participle derived from the Arabic verb *aslama*). Hence, the act of accepting Islam is essentially an inward mental action with personal obligations and outward consequences. At the second level, Islam refers to a religion, a system of beliefs and practices. At the third level, Islam refers to a culture and civilization created by Muslims over a period of time that integrated Arab-Islamic principles with ideas from other civilizations, especially Greece, Iran, and India (Shepard 2009; Hodgson 1974).

Allāh is viewed as the unique God – Creator, Sustainer, Ordainer, and Judge of the universe. The Will of God, to which a Muslim submits or commits oneself to, is known through the Qur'an – the Islamic scripture that was revealed to his messenger Muhammad who is believed to be the last in a series of prophets beginning with Adam. The revelation of the Qur'an is considered to be the literal Word of God and it consummates earlier revelations. The basic belief of Islam is expressed in the *shahada* (confession of faith), a declaration which entails that there is no god but Allāh and Muhammad is his Prophet. From this fundamental belief, there are derived beliefs in (1) angels, (2) the revealed Books (especially, the Torah and Gospels), (3) a series of prophets, and (4) the Last Day or the Day of Judgment when each and every soul will be accountable for her deeds and misdeeds. The righteous will be rewarded with paradise and the wicked will be punished in hell. A confession of faith involves further duties that are to be solemnly observed: (1) five daily prayers (*salat*) at dawn, midday, afternoon, sunset, and evening; (2) a welfare tax (*zakat*, about two and a half percent on the capital or income); (3) fasting (*sawm*) from dawn to dusk during the month of Ramadan; and (4) a pilgrimage to Mecca (*hajj*) at least once in one's lifetime if one is able to do it. These four obligations with the profession of faith are called the Five Pillars of Islam (Rahman 1979; Murata and Chittick 1994).

Unlike Christianity, religious dogma plays a minor role in Islam. In fact, the major division in Islam (between Sunnis and Shi'is) is initially attributed to a dispute over who was entitled to lead the Muslim community after the death of the Prophet. However, Sunnis and Shi'is generally agree on the basic principles outlined above. In contradistinction to other religious communities and their scriptures, the Qur'an and Muslim thinkers have accepted the concept of multiple revelations or religious pluralism in the concept of the People of the Book (*ahl al-kitab*). The Qur'an cites three major preceding scriptures: the Torah of Moses, the Psalms of David, and the Gospels of Jesus. It also indicates that there may have been many other prophets who brought revelations. Politically speaking, within a generation after the Prophet's death, the Arabs established an empire modeled on the imperial domains of the Persians and the Romans. Although Islamic law and symbolism played important roles within these empires, they were accompanied by a combination of local customs and administrative edicts derived from non-Islamic sources. Only in the last century, a new kind of Islamic ideology emerged wherein life in its totality could be lived according to Islam. Theories of a modern Islamic state arose mainly in response to Western colonialism and imperialism. Premodern societies ruled by Muslim rulers generally cannot be called Islamic states in the strictest sense of the word (Rippin 2005; Ruthven 2006).

Origins and Early Development

The life of the Prophet Muhammad (c. 570–632 C.E.) in Mecca, Arabia, was crucial to the unfolding of Islam and its ideal. His career revealed the inexplicability of God's activity in the world. His message was to create a just and decent society in which all members were treated equally and with respect. From the beginning of his mission, Muhammad had imparted a sense of brotherhood, a bond of faith among his followers, which helped develop a feeling of close relationship among them. The conspicuous socio-economic content of early Meccan revelations

along with Islamic religious practices further cemented this bond of faith. Following his emigration (*hijra*) from Mecca to Medina where his message was accepted, he was able to create a community-state of Islam in today's parlance. During the Medinan period, Islam acquired its ethos as a religion that united both the spiritual and temporal aspects of human life. Islam, therefore, seeks to regulate the vertical (an individual's relationship with God) and the horizontal human relationships in a social setting. Because of this objective and its emphasis on "community," which includes political, religious, social, and economic aspects, the history of Islam logically also relegates the "religious" to other aspects of culture. Thus, besides Islamic religious institutions and Islamic law, there evolved other institutions governing society that were heavily influenced with Islamic principles (Rahman 1979; Armstrong 1992).

Following the Prophet's death in 632 C.E., the Medinan state expanded with extraordinary speed and, in the course of less than a century Arab-Muslims, had brought a large part of the known world – from Spain across Central Asia to India – under the rule of the caliphs. These lands were now open to the preaching of Islam and, for various reasons, led most people of the conquered territories to accept it. Islam's attractiveness can be attributed to its pure monotheism, concern for human brotherhood, and social justice. The Rightly Guided Caliphs ruled from Medina from 632 to 661. They were followed by the Umayyad dynasty that ruled from Damascus until 750. They, in turn, were supplanted by the Abbasid dynasty that ruled from the newly established capital of Baghdad. In time, Islam spread further through peaceful activities of the Sufis and merchants. Consequently, it facilitated the development of the Arab-Islamic civilization that flourished during the ninth and tenth centuries with accomplishments in philosophy, science, art, and architecture as well as social organization, making it one of the great civilizations of all time. It displayed remarkable adaptive capacity, absorbing many disparate peoples into a single coherent cultural unit stretching

from Spain to Central Asia and northern India. Subsequent Western accomplishments in philosophy and science have been built on the foundations laid by Muslims (Hodgson 1974).

Doctrinal Sources

The central beliefs and practices of Islam are derived from two sources: the Qur'an and the *sunna* of the Prophet. For Muslims, the Qur'an (lit. recitation) is the exact Word of God, revealed word by word to the Prophet Muhammad through the angel Gabriel over a period of 23 years. Most of it was recorded on various materials and also committed to memory. According to Muslim tradition, it was first collected during the reign of the caliph Abu Bakr soon after the Prophet's death. However, the official collection and arrangement of its chapters in its present form was ordered by the third caliph 'Uthman. The Qur'an is considered the most beautiful literary composition in Arabic. Its beauty, in contrast to the Bible, is not the consequence of faith but the very product of divine origin. This aesthetic judgment was reached through literary analysis; hence, its beauty is held not only by the Muslims but also by the non-Muslims conversant with the literary aesthetics of the Arabic language. Thus, the Qur'an is unique among the religious scriptures of mankind in the sense that the veracity of its scripture rests on the fact of its sublime beauty. This is the real reason for its greatest veneration by the Muslims. Its recitation signifies divine participation in the divine drama. As a literary monument, the Qur'an stands by itself, a unique composition in Arabic literature, having neither forerunners nor successors with its idiom (Gibb 1963; Sells 2002).

Muslim orthodoxy's objection to translation stems mainly from doctrinal consideration that it is the Word of God. Doctrine also holds that it is the miracle of the Prophet. Those who permit translation, on the other hand, argue that the Qur'anic message is universal since it states: "*It is merely a reminder for the whole world.*" The reason it was revealed in Arabic is explained in the Qur'an: "*And we never sent a messenger save with the tongue of his folk.*" Hence, the very

verse used to justify the belief that the Qur'an was revealed in Arabic implies an obligation to translate and transmit its message to non-Arabs. The main reasons for the disapproval of translation were that it might be used in prayer, might be taken as the inspired version, and might even replace the original. Translation is permitted for the purpose of explaining the meaning of the text to non-Arabs. However, for liturgical and non-liturgical purposes, it has to be recited in its original form (Poonawala 1990).

The *sunna* consists of the words and the deeds of the Prophet that were subsequently recorded and collected. It is second to the Qur'an as a source. Six canonical collections, namely, the *Sahihs* of Bukhari and Muslim and *Sunans* of Abu Dawud, Ibn Maja, Tirmidhi, and Nasa'i, compiled during the latter half of the ninth century, became most authentic among the Sunnis. Although the Shi'is have their own authentic collections of the traditions transmitted through their *imams*, it should be stated that a majority of those traditions share a common heritage. Two additional sources, namely, consensus of the community (*ijma'*) and jurisprudential interpretation (*ijtihad*) of the textual sources, especially the Qur'an and the *sunna*, were added later (Hallaq 2005).

Worldview

God. The doctrine about God in the Qur'an is rigorously monotheistic. God is one and unique; he has no partner and no equal. The concept of the Trinity is repudiated. There are no intermediaries between God and his creation that he brought into being by his sheer command: "Be!" He is the sole Creator, Sustainer, and Ordainer of the universe, wherein every creature bears witness to his unity and lordship. He is just and merciful; his justice ensures order in his creation wherein nothing is believed to be out of place. His mercy is unbounded and encompasses everything. His creation and ordering of the universe is viewed as an act of mercy. The God of the Qur'an, described as majestic and sovereign, is also a personal God and is viewed as being nearer to

man than his jugular vein, and whenever a person in distress calls him, he responds. Above all, he is the God of guidance and shows man the right way.

The depiction of God, wherein the attributes of power, justice, and mercy interpenetrate, is related to the Judeo-Christian tradition with certain modifications. It also provided an effective answer to the concepts of pagan Arabs who believed in a blind and inexorable fate over which man had no control. Awareness of God in Islam is primarily an awareness of obligation and accountability (Rahman 1980).

The Universe: In order to prove the unity of godhead, the Qur'an stresses on the design and order in the universe. Order is explained by the fact that every created thing is endowed with a definite and defined nature whereby it falls into a pattern. This nature allows everything to function in whole but sets limits to its power. The universe is viewed as autonomous, in the sense that everything has its own inherent laws of behavior, but not as autocratic because the patterns of behavior have been endowed by God and are limited. God alone reigns supreme in the heavens and the earth (Rahman 1980).

Man. The Qur'an is primarily concerned with man; hence, the universe is viewed as man-centric. The Judeo-Christian story about the creation of man from clay and the Fall of Adam is accepted, however, with profound differences. In contradistinction to the Christian doctrine of the Fall of Adam, the Qur'an states that God forgave Adam for his act of disobedience and sent him to this world as a prophet to provide guidance to the future generations. There is no concept of original sin and heavenly drama wherein God had to incarnate in the form of a person (i.e., Christ) and suffer to save mankind. The rest of nature obeys God automatically, but man alone possesses the ability to obey or to disobey. With the belief in Satan's existence and man's nature as frail and faltering, man's fundamental role becomes one of moral struggle. Man is viewed as "rebellious" and "full of pride," regulating to himself the attributes of self-sufficiency. According to the Qur'an, the being that became Satan had previously occupied

a high station but fell from divine grace by his disobedience to honor Adam. Since then his work has been to beguile man into error and sin (Rahman 1980).

Prophecy. In order to communicate the truth of the divine unity, God sent messengers to every nation in their native language. The Qur'an states: "*We never sent any messenger except with the tongue of his people.*" According to one tradition, there were 1,24,000 prophets. Judging from the accounts of the Qur'an, the record of mankind's accepting the prophet's message has been dismal. The messengers of God have been calling man back to God, yet very few have accepted the truth. When man becomes obdurate, God seals his heart; nevertheless, it is always possible for a sinner to repent and redeem himself by genuine conversion to the truth. There is never a point of no return, God is always willing and ready to pardon. Prophets are men specifically elected by God to be his messengers. Prophethood is indivisible and the Qur'an requires recognition of all prophets without discrimination. Yet, it states that they are not all equal; some are outstanding in qualities of steadfastness and patience under trial. Noah, Abraham, Moses, and Jesus were great prophets. God often vests them with miracles. All prophets are human and never divine (Rahman 1980).

Eschatology. On the Last Day, the world will come to an end and the dead will be resurrected and judgment will be pronounced on every individual in accordance with one's deeds. The Qur'an in general speaks of a personal judgment, but there are some verses that indicate the resurrection of distinct communities that will be judged according to their own books. Strictly speaking, there is no intercession, although God may permit that privilege to whom He wills. The notion that the Prophet, the imams, and *Awliya'Allah* (saints) can intercede on behalf of their followers developed quite early (Rahman 1980).

Myths and Legends. Islam, being a strict monotheistic faith, did not develop a proper mythology. However, early exegetes and popular preachers embellished the revelation and traditions through various stories, folktales derived

from the ancient Near East, especially from Judeo-Christian traditions. Legends were woven around the Prophet and members of his family. Sufis also played a role in attributing Qur'anic words with deeper allegorical and spiritual meaning and pious legends (Rahman 1980).

Cross-References

- [Architecture in Islam](#)
- [Caliphate](#)
- [Humanism in Islam](#)
- [Muhammad, Prophet](#)
- [Mysticism in Islam](#)
- [Philosophy in Islam](#)
- [Science in Islam, Classification](#)
- [Theology in Islam](#)

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Islamic

- [Mathematics in Islam General](#)

Islamic Alchemy

- [Alchemy in Islam](#)

Islamic Bioethics

- [Bioethics in Islam](#)

Islamic Medicine

- [Medicine in Islam](#)

Islamic Religious Psychology

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Related Terms

[Arab indigenous psychology](#); [Muslim religious psychology](#)

Description

The definition of Islamic religious psychology can range from “the study of human *nafs* (soul) from an Islamic perspective” to a more complex description, like the “study of manifestations of God in nature as reflected in the behavioral patterns of all living and nonliving organisms in all walks of their lives using the Islamic paradigm” (Vahab 1999). In Islam, human beings are said to

possess a dual nature, as they are both body and soul. However, the body is not as important as the soul because it is the soul that consists of the inner structure of personality, and body/matter is considered secondary to the spirit. The seat of knowledge in human beings is said to come from the metaphysical elements of the person, i.e., heart (*al-qalb*), soul (*nafs*), spirit (*ruh*), and intellect (*aql*). Islamic psychology or *Ilm al-nafsiat* (knowledge of the self) was studied by early Islamic scholars under the umbrella of Islamic philosophy or *falsafa*. The field does not exist today as a formal or independent discipline, but there are efforts among Muslim psychologists to revive this discipline (Haque and Mohamed 2009).

Self-identification

Science

Scholars who study Islamic religious psychology under the umbrella of Islamic philosophy do not claim it to be a science. However, a growing number of Muslim psychologists are now using experimental methods to discover relations among variables, e.g., effects of *salah* (prayers) on anxiety, and there is a growth of new scientific journals covering this research. In North America alone, two such journals are *American Journal of Islamic Social Sciences*, which started in the 1970s, and *Journal of Muslim Mental Health* launched in 2006. There is a growing concern among Muslim psychologists who studied mainstream psychology to increase the use of reliable, valid, and culturally sensitive instruments for measuring Islamic religiosity in order to make the discipline scientific (Ahmad and Geilen 1998).

Religion

The discipline is not considered religion, but it does cover many religious concepts including Islamic metaphysics, Islamic ethics, dimensions of human nature, study of the nature of human soul, Islamic spirituality, etc. Islamic scholars who are not psychologists may, however, consider the study of the *nafs* or soul as a branch of Islamic religion or Islamic philosophy.

Characteristics

The discipline is as old as the Islamic religion and was studied extensively over 1,000 years ago. Many of its concepts are unknown in the western world but relevant and meaningful for Muslims the world over. Its distinctiveness lies in its unique ethical, spiritual, and legal character and in its potential for contribution to the mainstream psychology.

Relevance to Science and Religion

For Islamic psychology, science and religion are intertwined and all scientific inquiries and observations should lead to confirmation of the existence of God and the need to follow the Islamic religion. It may be proper to say that science is viewed from a metaphysical angle and Muslim psychologists attempt to do scientific research using the principles of critical thinking but without compromising their faith in their religion.

Sources of Authority

The driving force behind psychological inquiries is the Qur'an, which addresses many issues related to human existence including human nature and other topics of psychological interest and invites human beings to reflect on these notions. Muslims consider the Qur'an as words of God and do not question its authority. Another trustworthy source of knowledge for Muslims is the *Sahih Hadith* (or verifiable) sayings and traditions of Prophet Muhammad. Also, books written by certain Sufis, saints, and scholars over the centuries have been a source of knowledge for Muslim religious psychologists. Muslims believe that the knowledge generated by these scholars was divinely inspired and so would constitute authentic knowledge.

Ethical Principles

The field is guided by the principle that to understand oneself and others is a moral obligation and

all knowledge ultimately points to the reality of One God. Human beings are granted the faculty to discern God's will and have the moral responsibility to submit to God and follow Islam. All actions and endeavors of a Muslim including his/her educational pursuits and intellectual inquiries are ideally dictated by this basic ethical principle.

Key Values

The key values are those that are inherent in the Islamic religion. It is important to realize that life has meaning and it should serve the purpose laid out by God Himself. Muslims look at the transcendental values that govern the transitory life of this world. Seeking knowledge and purifying one's lower self are the basis for gaining knowledge of others, the environment, the nature, and the hereafter (Rahman 1980).

Conceptualization

Nature/World

Nature came into existence by the command from God, and it is God Himself who manages the affairs of the universe. There is an integral view of nature, which sees the flow of divine grace in the arteries of cosmic and natural order. The nature/world is finite, however, and will eventually come to an end.

Human Being

Human beings are distinguished from other creations in that God breathed His own spirit into "man" and sent him to the earth as His deputy in order to do good in this world and establish God's will. Humans possess *fitrah*, which is the primordial faith implanted into them by God Himself. *Fitrah* entails original goodness, and human beings were created pure and sinless (Mohamed 1998). Values such as justice, mercy, patience, forgiveness, etc., are intrinsic to the human potential. When humans deviate from their *fitrah*, suffering and psychopathology may emerge. Psychopathology also occurs when humans are unable to control the various levels of their self. Human beings are distinguished

from the *jinn* or genie who have impact on the psychological well-being of a person. The *jinn* are beings created with free will, live on earth, but are invisible to the human eyes in their normal state (Philips 2002). From the Islamic perspective, both men and women came from a single soul and neither is inherently or automatically better than the other. It is only their deeds that differentiate them in this way.

Life and Death

From the Islamic religious perspective, God is involved in the creation and functioning of a human life and has also decided the length of one's life in this world. God also created everything for the service of human beings. Life and death are part of a divinely mandated plan that all creations are subjected to. For Muslims, life for humans is a series of tests whether or not they appear related to us individually. Death is just an end to this worldly life and a beginning of the afterlife. After death, the body may decay, but the soul will not, and each soul will be judged on the basis of its action in this life. It will also be rewarded or punished in the next life accordingly.

Reality

The central theme is *al tawhid* or oneness of God, under which all concepts are viewed, including reality, which comprises of the Creator and creature. These two orders are absolutely disparate and must not be confused with one another. Islam emphasizes the faculty of understanding, asking human beings to know that the divine will is understandable through the observation of creation and that the workings of the cosmos are purposive. Everything in this universe and beyond is meant to fulfill a certain universal purpose, and in it the will of the Creator is always realized. Through mindfulness, one gets to the point of being able to see this reality. This is similar to empirical science, except that its focus is not confined to the physical world but reaches the domain of the ultimate reality.

Knowledge

Knowledge in Islamic religious psychology refers to a conceptual understanding of

metaphysical terms like the *nafs*, *qalb*, *ruh*, *aql*, etc., and their influences on human behavior and thought processes. Knowledge of the self and human *fitrah* and knowledge of human beings as a microcosm of the universe and as a part of Divine Plan is essential in understanding the role and purpose of human beings in this physical world. Scientific knowledge is highly encouraged because with sincere reflection would bring oneself closer to God.

Truth

Truth or "*Haqq*" is often termed *lubb* or kernel in Islamic terminology. Those who possess the kernels know the truth, thus the Sufi adage: "to get to the kernel you have to break the shell." In other words, what appears "scientific" may not be the truth, and one has to dig deeper into the metaphysical realm to get to the core of human personality. The term personality is used here interchangeably with terms like *nafs* and soul, which reflects itself in an individual's psychological characteristics.

Perception

The physical senses are meant for purposes of physical survival but are unable to convey spiritual truths. Islamic religious psychology encompasses all sources of perceptual influence including unobservable phenomena like spiritual truths. However, developing a capacity to see within and beyond requires reflection, patience, and endurance and a taming of the brain so it does not interfere in the perceptual process (Wilcox 1995).

Time

The concept of time is unique in that the history does not exist in any real sense. The past is not a tale of the ancient but living truths carrying real meaning for the present. History is important in that it helps to create a total picture of the events that would ultimately lead humans toward ultimate knowledge and truth.

Consciousness

Our consciousness is constantly affected by our bodily functioning, the people around us, and the environmental forces. Our personal

consciousness, however, is not capable of representing but only a small portion of all this because our senses cannot detect many energy forms affecting our body and mind. As consciousness depends on and reflects one's needs and desires, our ordinary consciousness may be an illusion based on our sensory input. True consciousness cannot be attained through sensory modalities. One has to develop the "senses of the soul" to experience reality, which does not exist in the brain's biocomputer but in the electromagnetic fields around us and in interacting with our receptive capacities. The electromagnetic elements are those traditionally perceived as "spiritual" within an Islamic worldview.

Rationality/Reason

Reason helps us understand and know ourselves and the things around us. It is only through reasoning that one can attain proper knowledge and guidance in order to establish an ideal society on earth that will reflect God's will for humanity.

Mystery

Islamic religious psychology is complex and much of it is not well understood, e.g., the concepts of Islamic metaphysics, spirituality, fatalism, etc. Such religious concepts that appear a mystery are explained in Islamic religious literature but largely untouched by Muslim psychologists because of their training in secular psychology and also because most scholarly texts exist in Arabic language, not commonly known by the majority of Muslims around the world.

Relevant Themes

According to Islamic religious psychology, the notion of "sacred science" (Nasr 2001) is especially relevant for this discipline because natural science is based merely on human sensory perceptions and cannot get to the esoteric knowledge needed to understand the ultimate reality. A keen interest in the "unseen" and in eschatology is needed because of the metaphysical nature of (the discipline), i.e., Islamic religious psychology. Delving deep into Islamic science developed

by Muslims from second Islamic century onward is crucial because it addresses the nature of phenomena, causality, and relationship between various forms of objects based on Islamic worldview and rooted in concept of Unity of God.

Cross-References

- [Allah](#)
- [Creationism](#)
- [Divine Action](#)
- [Incarnation](#)
- [Philosophy in Islam](#)
- [Soul](#)
- [Theology in Islam](#)

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Islamic Science

- [Astronomy in Islam](#)
- [Physics, Science in Islam](#)

Islamicate Mathematics

- [Mathematics in Islam General](#)

J

Jew

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Jewish

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Jewish Religion

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Jewish Renewal Movement

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Now known as Aleph, Jewish Renewal is a trans-denominational movement grounded in Judaism's prophetic, spiritual, and mystical traditions with the aim of political, ecological, and ultimately cosmic healing (in Hebrew, *tikkun olam*).

Conservative Judaism is a North American denomination dating from the early twentieth century that is more adaptive to modern living than Orthodoxy but less than the more liberal Reform movement. Halakah (Jewish law) is generally binding on Conservative Jews but is not considered to be of wholly supernatural origin.

The Haggadah is the text that sets out the order of the Passover Seder and is read communally at the Seder table.

Jewish Science and Creation

- ▶ [Creation in Judaism](#)

Jewish Science and Psychology

- ▶ [Psychology in Judaism](#)

Jewish Science and Revelation

- ▶ [Revelation in Judaism](#)

Jewish Science and Theology

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Jewish Theology

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Jewish Thought

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Jewish-Christian Relations

- ▶ [Messianic Judaism](#)

Jews and the Study of the Universe

- ▶ [Astronomy in Judaism](#)

Journey

- ▶ [Pilgrimage](#)

Judaic Studies

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Related Terms

[Jewish](#); [Rabbinic tradition](#)

The relationship between Judaic Studies and science is complex. In part, this is because these are both umbrella terms, which embrace several discrete fields of study. Not only must one take both the natural and the social sciences into account, but even the humanities have, at times, espoused scientific methods and ideals. Further complicating the situation are the interconnections between Judaic Studies and the Jewish religion. Although the two are conceptually separate, many academic practitioners, as well as the institutions in which they work, are deeply committed to and involved with Jewish practice and beliefs. As a result, Judaic Studies scholars are often concerned with Jewish life, and their research is sometimes invoked and even sponsored by the Jewish community for which it has direct bearings.

The “scientific” study of Jewry traces its roots back to the early part of the nineteenth century, when a group of young Jews organized the Verein für Kultur und Wissenschaft des Judentums in Berlin. Although this was largely a response to the pressures of modernity, it also drew on long-standing Jewish impulses. The rabbinic tradition, which has been the dominant form of Judaism for nearly two millennia, places a high value on learning, even though the founders of *Wissenschaft* rejected the ways in which that impulse had been carried out. In fact, they regarded Judaism as a moribund tradition, which could be modernized by making it more *wissenschaftlich* (scientific). As Heinrich Heine, who was a member of the Verein, explained, the *Wissenschaft des Judentums* movement sought to reconcile “historical Judaism with modern science (*Wissenschaft*)” (Meyer p. 173), which he saw as coming into dominance. Or, as Leopold Zunz, the Verein’s leading figure, put it, “Only through science (*Wissenschaft*) can we obtain for Judaism the status and appreciation which it deserves and gradually arouse and unite all the better forces in Israel” (Meyer p. 175). Hence, their choice of the designation *Wissenschaft des Judentums*, although that name was not adopted until 2 years after the group’s creation in 1819. (It endured until 1825.)

Neither Judaism nor its intellectual tradition has historically been hostile to science. To the contrary,

Jewish tradition has at times claimed credit for inventing various scientific endeavors while, at other times, encouraging practitioners to take advantage of gentile insights. The Bible describes ancient Israel’s King Solomon as a master of natural science (1 Kgs 5:12–13 = ET 4:32–33), and scientific knowledge plays an important role in Talmudic discussions. One reason for this is the nature of Judaism, which dictates much of daily practice. As a result, one must understand animal anatomy in order to enforce Jewish dietary laws and be familiar with female physiology in order to carry out the principles of ritual purity. Over time, astronomical techniques came to be a valuable tool for calculating the calendar, leading the Talmud to restrict calendric decisions to those who possess the requisite mathematical skills.

These interests broadened during the Middle Ages under the influence of philosophical rationalism and Islamic models, which themselves drew on the Greek scholarly tradition. Many of the great medieval Jewish philosophers were physicians or astronomers, who had been trained in Aristotelian science. Thus, scholars such as Moses Maimonides offered striking observations about human physiology (noting, e.g., the Fallopian tubes), while Saadia Gaon contributed important insights into Hebrew linguistics. The latter field became highly developed within the Sephardic tradition, especially as a result of Judah Hayyug’s recognition that Hebrew words are based on three letter roots, which opened the way to exploring the relationships between different words and grammatical forms while facilitating the use of evidence from other Semitic languages.

Jewish interest in the sciences, and particularly medicine, expanded during the Middle Ages. Historians have subjected Jewish involvement in these fields to particularly close scrutiny, noting the existence of relationships with non-Jews. For example, Joseph Solomon Delmedigo, a seventeenth-century rabbi, mathematician, philosopher, and doctor, studied with Galileo. Similar interests have continued to the present day, with Jews playing a prominent role in the development of modern science, as dramatized by the prominence of such figures as Albert Einstein and Jonas Salk. In fact, one

third of all American Nobel prize winners in science have been Jewish.

Scholars have speculated as to the reasons for this phenomenon. In the early years of the twentieth century, Thorstein Veblen pointed out that, alongside the rabbinic tradition's emphasis on mental acuity, Jews' liminal social status strengthened both their tendency toward skepticism and their drive to go beyond the conventional, important factors in scientific research. The exclusion of Jews from many European universities may also have stimulated their gravitation toward newly developing fields, such as the sciences. The fact that these disciplines were not professionalized until the nineteenth century made them an attractive vehicle for social acceptance, although many nineteenth-century Jewish scientists converted to Christianity in order to gain access to universities where they could achieve their professional goals.

Conversely, scientific competence has sometimes facilitated specifically Jewish endeavors. For example, Chaim Weizmann, the first president of modern Israel, was a chemist, whose work on acetone gained him access to and the respect of the British government; that, in turn, contributed to British support for the Balfour Declaration. For both political and cultural reasons, science continues to play an important role in Israeli culture to this day. Not only is it home to the prestigious Weizmann Institute in Rehovot and the Technion in Haifa, but also numerous high-tech companies, 63 of which are listed on the NASDAQ, more than those from all of Europe, Japan, South Korea, India, and China combined. Although that nation's military and economic needs play a major role in this, so does the high value Jewish culture has traditionally attached to the sciences.

Cultural and social historians have explored the response of traditional Jewish thinkers to modern scientific developments, particularly those posed by astronomy (heliocentrism), biology (evolution), and geology (the age of the world). Significantly, these responses have followed patterns that were already laid out in the Middle Ages. Following the lead of Judah HaLevi, who rejected the possibility that anything in the Bible could contradict reality, traditionalists, for whom the

implications of emerging scientific ideas could be threatening, especially to the biblical miracles, sought ways to harmonize those accounts with their understanding of nature (concordism). Others, such as Maimonides and Levi ben Gershon (Gersonides) who accepted the authority of empirical observation, interpreted the Bible figuratively. Finally, there were still others, such as Judah Loew (the Maharal of Prague), who insisted on the separation of religion and science. This latter point of view, which can be traced back to antiquity, has made it possible for even religiously conservative Jews to engage in scientific endeavors without having to worry about the theological implications of their findings. The Association of Orthodox Jewish Scientists was formed in 1947 to address apparent conflicts between scientific findings and traditional beliefs as well as provide a setting for Jewish scientists to discuss common concerns.

All of these approaches have persisted into modern times. Alongside religious conservatives who reject any challenge to tradition, there are Jewish scientists who defend traditional teachings, albeit in sometimes nontraditional ways. For example, Immanuel Velikovsky's theory of catastrophism was, at its base, an attempt to defend the Bible's historical claims, albeit at the expense of its theological message. Although his views did not attract significant support, Velikovsky, who knew both Sigmund Freud and Albert Einstein, was offered the presidency of the Hebrew University. *The Bible Codes*, which was developed by Eliyahu (Ilya) Rips, a Soviet-born Israeli mathematician, reflects a similar dynamic in its effort to affirm the Bible's validity by finding hidden meanings in its letters. At the same time, many of the scientific community's most ardent opponents of traditional religious ideas, such as Carl Sagan and Steven Weinberg, have come from Jewish backgrounds. Concurrently, Judaic Studies scholars such as Richard Elliott Friedman, a biblical scholar, and Daniel Matt, a leading figure in the study of Jewish mysticism, have tried to harmonize traditional teachings with modern scientific insights by linking their respective fields to the Big Bang theory. Nor should one ignore the role of Jewish mysticism (kabbalah), which emphasizes the effect that human behavior can have on the

universe, in the development of modern science, especially as mediated by figures such as Isaac Newton and Gottfried Leibniz.

One motivating factor in the development of Judaic Studies during the nineteenth century was the fact that university level study of Judaism had previously taken place in theological settings, where it was largely under the direction of Christian Hebraists and theologians who saw Judaism as either preparatory to or a foil for Christianity. Thus, the historian, Heinrich Graetz observed, “The great question today is, will Judaism survive or disappear? For I regard it as disappearing if it is christianized, or as Heine says, if it spins the fringes of its prayershaws from the wool of the Lamb of God” (Schorsch, p. 279). Some of the founders of the Wissenschaft movement hoped to create a Jewish theological faculty at a major university to counteract the exclusion of ancient Israel from the study of antiquity (*Altertumswissenschaft*). They intended to study Jewish civilization using the same tools that were applied to other ancient cultures. To do that, they invoked the then prevalent philological approach, compiling scientific editions of important texts from which they hoped to draw contextual and comparative conclusions. In 1862, the Mekize Nirdamim (literally, “Wakers of the Sleeping”) society was established in order to publish hard-to-find medieval works. That led some scholars, such as the prominent Kantian philosopher Hermann Cohen, to criticize Wissenschaft for its “antiquarian” cast (Schorsch, p. 334).

When they did not find positions in German universities, several of these early figures in the field joined the faculty of Breslau’s Jüdische Theologische Seminar, which was established by Zacharias Frankel in 1854, making it, in one scholar’s words, “a tiny haven for a handful of frustrated Jewish academics” (Schorsch, p. 62); others were attracted to Berlin’s Hochschule für die Wissenschaft des Judentums. They also created several scholarly journals, including the *Monatschrift für Geschichte und Wissenschaft des Judentums* (1851–1939) and the *Revue des Études Juives* (1880–), which is published to this day.

By the early part of the twentieth century, the center of Judaic Studies had begun to migrate to

the United States and Israel along with the Jews who were leaving Central and Eastern Europe at the time. This demographic shift was signaled by the publication of the 12-volume *Jewish Encyclopedia* (1901–1906). Barely two decades later, the Institute of Jewish Studies was established at what would become the Hebrew University in Jerusalem. In addition to laying the foundation for what are now the field’s dominant centers, these events heralded processes that would culminate in the professionalization of Judaic scholarship.

Accompanying these geographic and institutional changes was a methodological shift from text study to history, a focus which was rooted in medieval works such as Azariah de Rossi’s *Sefer Me’or Einayim*. That required a more descriptive approach to the subject matter in place of the earlier prescriptive attitudes. No longer could one kind of Jewish activity be privileged over others; instead, everything Jewish was to be taken into account. As the nineteenth-century Italian scholar Samuel David Luzzatto put it, paraphrasing the Latin dramatist Terence, “nothing Jewish is alien to me” (Luzzatto, Iggarot, vol. 6, p. 780). Still, the field retained its apologetic edge, as is evident in its early tendency to avoid subjects such as Jewish criminal activities.

During the latter half of the twentieth century, the field expanded dramatically, gaining recognition in American universities alongside the study of other previously ignored groups, such as women, ethnic minorities, and lesbian, gay, bisexual, and transgendered people, thereby effectively achieving the goal that the field’s founders had set a century earlier. American Jews furthered this process by providing financial support for both positions and programs as a way of ensuring Jewish integration into American society and an expression of their growing pride and confidence. One by-product of this process was the establishment of several scholarly societies, including the Jerusalem-based World Union for Jewish Studies (1947) and the American Association for Jewish Studies (1969), as well as several academic journals.

This new setting exposed Judaic Studies to a variety of academic approaches and attitudes

which it, in turn, absorbed. Like many other fields, it also became increasingly specialized. No longer was it confined to texts and history, nor did practitioners need a broad Judaic background; instead, they might be trained in any number of specialties, such as literature or linguistics, often at secular institutions. These processes fueled the field's expansion and fragmentation with regard to both the topics covered and the backgrounds of those involved. It now includes many scholars whose expertise is limited to specific segments of the Jewish experience rather than Judaic Studies as a whole, while others, whose academic interests lie in areas unrelated to Jewish culture, apply their skills to issues relating to Jews and Judaism. There are also several non-Jews.

The impact of these changes has been particularly noticeable in the social sciences, which came to be an early component of Judaic Studies under the influence of scholars such as the historian Simon Dubnow and the folklorist Joseph Jacobs. Anthropological, geographic, and demographic topics were subjected to academic scrutiny in the late nineteenth century. For example, it was during this period that Berlin's Bureau für Statistik der Juden was created. Since then, demographers have tracked the growth and changing composition of the Jewish population around the world. Their work is often supported by local and national Jewish organizations, which use its findings to develop political policies and social services. Scholars have also collected cultural and folk customs, while examining the underlying dynamics of various religious practices, including the Jewish dietary laws, and the ways in which Jewish identity is determined and expressed. The consequences of these studies can be problematic. For example, Jewish anthropologists participated in that field's efforts to identify Jewish racial characteristics, an endeavor which correlated with the emergence of Nazi Germany's racial policies, even as it was being challenged by Franz Boas, the founding figure of American anthropology. Ironically, such views also led Adolf Hitler to reject the utility of what he termed "Jewish physics," forcing many Jewish scientists, such as Fritz

Haber, a Nobel prize-winning chemist who had converted to Christianity and played a critical effort in the German effort during World War I, to leave for other countries.

The discovery of new sources has enhanced research into the diverse manifestations of Jewish culture. The most dramatic examples have resulted from archeological excavation. The Dead Sea Scrolls, which first came to light in 1947, illustrate the value of such material for providing insight into previously unknown groups, thereby demonstrating the diversity of Jewish culture in periods that were thought to be well understood. However, not all such discoveries came about through excavation. In 1896, thousands of texts were found in the storeroom (*genizah*) of a Cairo synagogue. These cast light on any number of medieval Jewish customs and practices, while providing entree into the lives of ordinary Jews whose experience might otherwise have escaped our attention. Copies of some of these documents were subsequently found by archeologists among the Dead Sea Scrolls at Qumran.

Such research has contributed to the expansion of interest to include less familiar groups and practices that lie outside the "mainstream" Ashkenazi (Central and Eastern European) Jewish communities. For example, anthropologists now study any number of communities that were previously ignored. These include numerically, geographically, and ideologically "marginal" groups like the Karaites, marranos (*conversos*), crypto-Jews, Jews for Jesus, and Jewish Buddhists (JuBu's). At the same time, researchers in the "hard sciences" have begun to apply their tools to the history of Judaism and the Jewish community, including Jewish population genetics. Thus, geneticists evaluate the claims of heretofore ignored communities, such as the African Lemba, to Jewish ancestry as well as the validity of religious traditions about the genetic lineage of priestly status (*kohanim*). One outcome of this effort has been the Jewish HapMap project, based at the Yeshiva University and New York University medical schools, which is working to map the Jewish genome.

Because of their long tradition of in-marriage, Ashkenazi Jews have been a particularly valuable

resource for genetic research by both scientists and the Jewish community, with particular attention directed toward finding markers of distinctly Jewish diseases. Concurrently, academically trained and employed Jewish religious authorities, such as J. David Bleich, Elliot Dorff, Immanuel Jakobovits, and Moshe Tendler, have addressed the many challenges posed by modern science, particularly in bioethics, while Jewish scientists seek solutions for modern religious problems.

Modern technology has provided valuable tools, which can facilitate religious observance; for example, timers make it possible to turn appliances on and off without violating religious proscriptions. Such practices can also stir debates, as happened when the Conservative movement determined that driving to synagogue was permissible on holy days and Orthodox authorities allowed the use of appropriately equipped elevators on the Sabbath. Some have even tried to breed the red heifer, which the Jewish tradition teaches is necessary for the restoration of certain rituals (see Numbers 19). Meanwhile, the Internet has become a valuable tool for both communication and the dissemination of information, with some seeing it as a metaphor for more ancient modes of Jewish discourse.

Collectively, these efforts demonstrate the continuing vitality of the Wissenschaft des Judentums' project of using scientific scholarship to modernize Judaism itself. In so doing, however, they also demonstrate the persistence of the religious dynamic that underlies much of Judaic Studies and the corollary observation that the distinction between Judaism and Judaic Studies is not as hard and fast as it has sometimes been thought to be or, probably, ever was.

Cross-References

- [Astronomy in Judaism](#)
- [Judaism](#)
- [Kabbalah in Judaism](#)
- [Philosophy in Judaism](#)
- [Physics in Judaism](#)
- [Science and Kabbalah](#)

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Judaism

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A religion grounded in the ethnic-cultural tradition, firstly of the nation of Israel (from approximately 1300 BC to 586 BC), then subsequently of the people identified as “Jews” (Judah/Judea, from 586 BC to the present). The content of Judaism is formulated in the canonical texts of the Hebrew Bible (coterminous with the Christian “Old Testament,” though ordered differently) and the Babylonian Talmud. Since the nineteenth century, Judaism has been defined variously by its denominations, principally Orthodox, Conservative,

Reform, and Reconstructionist. All these denominations agree in affirmation of monotheism (belief in one God) but there is considerable leeway as to the definition of “God.” They also agree in the calendar of major holidays. They differ considerably as to the degree of applicability of the traditional Jewish law (*halakah*) based in the Talmud, and as to the degree of belief and manner of interpretation to be accorded the traditional narratives recorded in the canonical texts (though all except the ultra-Orthodox agree on understanding the latter in the light of contemporary historical scholarship).

Cross-References

- ▶ [Judaism: An Overview](#)
- ▶ [Messianic Judaism](#)
- ▶ [Secularism in Judaism](#)

Judaism and Physics

- ▶ [Physics in Judaism](#)

Judaism and the Study of the Universe

- ▶ [Astronomy in Judaism](#)

Judaism: An Overview

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Related Terms

[Jewish culture](#); [Jewish religion](#); [Philosophy and way of life](#)

The term “Judaism” encompasses more than religion; it names the complete culture and civilization of the Jewish people. Through the course of time that civilization undergoes dramatic changes, including changes in dominant scientific models in the broader civilization in which Judaism is a subset. This encyclopedia entry traces changes in Jewish thought in correlation with changes in scientific thought. At the most general level, there are five periods of cultural change so radical that new types of Jewish literature and new forms of communal identity emerge. There are several different ways to classify these periods, but for our purposes, where the emphasis is on the mutual impact of science and Judaism, the periods are (1) Biblical Judaism, (2) Classic Rabbinic Judaism, (3) Early Medieval Judaism, (4) Late Medieval Judaism, and (5) Modern Judaism.

1. The dominant culture of the competing Mesopotamian and Egyptian civilizations deeply influenced the creation of what became known as the Hebrew Scriptures (between the twenty-first century BCE and the construction of the second Judean temple in 515 BCE). The opening chapters in the book of Genesis, in particular, lay out a universal world and life view that contextualizes the history and legal system of the Jewish people that occupies the central content of this sacred anthology. (See “▶ [Creation and Science in Judaism](#)” and “▶ [Redemption and Science in Judaism](#).”) The counterpart to scientists in the narrative are called “sages” or “wise men” (*chakhamim* in Hebrew). They are both Jewish and non-Jewish. The kind of science they reflect in general is practical rather than theoretical. So, for example, Pharoah can summon his “magicians” (*chartumim*) to reproduce at least some of the early plagues that God visits on Egypt by the hand and rod of Moses (Ex 8:14) and Bezalel is said to be filled with “the spirit of wisdom (*chakhmah*)” because of his skills in molding precious materials (gold, silver, and copper) into utensils for the sanctuary. These precursors of Jewish scientists are really, in modern terminology, craftsmen and technicians. In contrast, those who receive

knowledge of the universe – who believe they know how the world began at creation and how it will end in redemption – are a different sort of men, called “prophets,” who receive their wisdom by direct communication from God.

2. The Judaism of the Bible undergoes radical transformation as the civilizations of the Egyptians and the Mesopotamians are replaced by a new dominant culture of the imperial Greeks and then the Romans, whose conquest of the Near East stimulates the development of both early Christianity and classical rabbinic Judaism (from the beginning of the Greek conquest of Persia and the Middle East in 334 BCE through the end of the reign of the Saboraim over the exiled Jewish community in Babylonia in 540 CE). At this stage the term that will come to mean scientists (“chakhamim”) is associated with rabbis. The skill of these wise men is that they have inherited a tradition that enables them to infer the true and far-from-obvious meanings of the Hebrew Scriptures. But more than imparting knowledge, these men claim that they can impart wisdom (sofia). They are truly “lovers of wisdom” (philosophers) whose truths enlighten a path that leads directly to personal and collective happiness.

There are no rabbinic texts specifically dedicated to the study of nature as nature, which in general was looked upon as “external” or “foreign” wisdom, which is to say a form of wisdom removed from the Jewish wisdom of the rabbis. However, the separation was more theoretical than practical, since rabbinic texts such as the Jerusalem and Babylonian talmuds as well as the various collections of midrash (direct rabbinic conceptual commentaries on specific biblical texts) contain much that we would identify as “Greek” wisdom. Notable examples are readily at hand from mathematics, astronomy, natural history, and medicine.

An example from mathematics is the determination of how far an “eruv” extends, which is a virtual enclosure beyond which a person may not travel on the Sabbath. A second

equally important example is fixing the calendar. Similar examples include methods for calculating mixtures of grain and the holding capacity of a ritual bath. In a similar vein the rabbis calculate the ratio of the circumference of a circle to its diameter in order to discuss legal questions concerning the distance around a sukkah (ritual booth). Similarly, in the case of astronomy the determination of spherical cycles and planetary courses is most often connected with determining the liturgical calendar. One example from natural history is speculation about the relative life expectancy of diverse kinds of animals, including serpents, bears, dogs, and cattle. Finally, in terms of medicine, there are several thousand examples (N Efron, 55) because many rabbis (including Maimonides) were physicians. Passages include discussions of human anatomy and physiology, gynecology and obstetrics, hygiene, mental illness, and aging.

All of these examples of science in the classical rabbinic texts are *prima facie* “unsystematic” (*ibid.*) because they appear in the context of the discussion of either the meanings of the Hebrew Scriptures or discussions of Jewish law. But precisely because of this integration of scientific literature, the classical rabbinic literature exhibits an integration of science and Judaism that will subsequently decline, until it largely disappears completely in the modern period.

3. The new dominant culture of imperial Islam replaces the Hellenistic world in the lands surrounding the Mediterranean Sea (notably Egypt, North Africa, and Spain), extending from the establishment of the Ummayyad Caliphate, centered in Damascus Syria, in 661 CE, through the death of Moses Maimonides in Egypt in 1204, and classical rabbinic Judaism is transformed into early medieval Judaism. This transformation gives rise to a great deal of diverse rabbinic literature, including a standardized Jewish communal prayer books, major codes of Jewish law collected from a multitude of individual rabbinic legal decisions (referring back ultimately to

the Talmud and the Mishnah), as well as major philosophical commentaries on the conceptual meaning of the Hebrew Scriptures. Besides general works of theological philosophy by Platonists, Aristotelians, and Atomists, we begin to see some empirical studies of the physical world in a thematic form rather than as scriptural commentaries. Notable examples are the mathematician Abraham Bar Hiyya (d.c. 1145) of Barcelona, the natural philosopher Abraham ibn Ezra (1089–1167), and of course the physician Moses Maimonides. Bar Hiyya wrote a distinguished treatise on geometry (called *Hibbur ha-Meshichah ve-ha-Tishoret* in Hebrew and *Liber embadorum* in Latin) which introduced to Europeans algebra as well as a solution to the quadratic equation. Ibn Ezra's *Sefer Ha-Ehad* (Book on One) deals with number theory, *Sefer ha-Mispar* (Book on Number) introduces the Indian decimal system, his *Keli Nehoshet* (The Brass Instrument) is a handbook on the use of the astrolabe, and several books on astrology.

The connection between the knowledge of nature and the attainment of the good life, between what we call "science" and "ethics," is spelled out explicitly by the rabbis of this period, building on the world view of the Greek Platonists, Aristotelians, and Atomists to explain the believed inherent connection between the two disciplines. For the Platonists, the dimly and fuzzily perceived objects of the senses are only suggestions of what truly is the object of knowledge – the clear and precise forms, the highest of which are Truth, Goodness, Beauty, and God, which are themselves identical. Hence, what science leads to is what we would call religion, the ultimate good of gazing into the light of the one and only absolutely real deity who is identical with truth, goodness, and beauty.

The world view of the Aristotelians is not identical but similar, and it ends up affirming the same overall view, viz., that there is only one ultimate object of knowledge, which is the same ultimate objective of religion, viz., to achieve oneness with God. In the Aristotelian

case, however, the nonmaterial forms that point to the immaterial deity are contained within the perceived objects as what defines them. The differences are important and they will become increasingly important in the early modern period when the Renaissance humanists will carefully examine and distinguish the different conceptual strains of learning past on through the Middle Ages. It will be at this time that the material atomism of the Stoics will be revived and, by the seventeenth century at least, become the dominant world view for all of science.

4. The decline of Muslim hegemony in the world of the Mediterranean Sea opens the door for a new religious and political empire, The Roman Catholic Church, and a new kind of expression of Judaism, the Kabbalah. This late medieval period extends from the second crusade beginning in 1147 to the expulsion of the Jews from Portugal in 1497. Arguably, the most important Jewish natural philosopher of this period was Levi ben Gerson (Gersonides) (Provence, 1288–1344) who wrote many books on astronomy as well as inventing the "Jacob's staff," which, prior to the telescope, was the most advanced mechanical aid for astronomers measuring relative distances of stars. His *Milchamot Adonai* (Wars of the Lord) was the most sophisticated application of Aristotelian philosophy to interpret Jewish faith doctrines devised in the period. In many respects, especially in terms of the values of clarity and precision, Gersonides' philosophy is the highest achievement of the middle ages. But in many other respects, this period marks the decline of rational thinking in the pursuit of knowledge. What replaces it in the devotion of the lovers of wisdom of the period was Kabbalah.

Arguably, the single set of events that contributed most directly to the decline of natural philosophy in favor of mysticism was the so-called Maimonidean Controversy. The heart of the debate that raged through Western Europe in the thirteenth and fourteenth century focused on censuring the

philosophical writings, the so-called Greek wisdom, of Moses Maimonides.

The issue was not, as it is often characterized, rationalism as opposed to irrationalism. While there were some who discounted Greek wisdom because it was Greek rather than Hebrew, the question was not whether or not non-Jews can have knowledge. Rather, it should be remembered that Jewish law obliges the Jew to do what is good and think what is true, and the obligation to know truth, at least with respect to Jewish law, applied only to Jews. Hence, the issue was not a limitation on who can have knowledge, but on for whom knowledge counts as a religious duty.

The more serious issue was with the perceived dangers in the pursuit of knowledge. Reason, so it was argued, when properly used will lead to truth. But nature does not yield her secrets without a struggle. There are many opportunities to err, and in this case, since the object of study is the creator and his creation, err is heresy. Hence, the study of natural philosophy (or what is close to what we today would call science) was radically restricted because it was considered dangerous.

The issue itself was subtle but the results of the debate were not. A virtual ban with threat of actual excommunication was placed on the study of the philosophical traditions whose origins lay in the preserved writings of Plato and Aristotle. The result was that while learned rabbinical scholars entered the fourteenth century armed with a reasonable acquaintance with the best of fourteenth century natural wisdom, by the seventeenth, eighteenth, nineteenth, and even twentieth centuries all too many of these rabbis continued to think about the natural world with fourteenth century minds.

5. Late medieval Christian Europe gradually transformed into modern Europe. From the perspective of Jewish civilization, this is the age in which (at least culturally) traditional rabbinic expressions of Judaism are transcended by liberal as well as secular expressions of Judaism. This modern period

extends from the birth of Nicolaus Copernicus in 1473 through the establishment of the Kabbalistic school of Safed in Palestine in 1532 to the present. It is this period that gives rise to multiple forms of liberal religious Judaism (including Reform Judaism, with its first synagogue in Berlin in 1847), initiates the scientific study of Jewish history (arguably with Heinrich Graetz's *History of the Jews*, completed in 1878), and marks the ascent in Jewish communal life of secular forms of Judaism (including Zionism, formally with the publication by Theodor Herzl of *The Jewish State* in 1896).

With the notable exception of Baruch (Benedict) Spinoza (1632–1677) most rabbis turned either to the intricacies of Jewish law for mental challenge or the imaginative cosmological reflections of the Kabbalah hoped for insight into the deepest secrets of empirical reality to know the deeper truths they knew that lay beyond the screen of the senses. The above description however should be qualified. The picture of a strict rationalism of natural philosophy and soft fuzziness of mystical imagination is too stark. The lines in reality were less clear. The use of reason itself always involves the use of the imagination, and imagination itself is subject to rational clarification. Even more specifically, men of the major figures whose scientific work brought on the modern age of reason were themselves deeply involved, or at least intrigued, by the Kabbalah. The list includes Francis Bacon and Isaac Newton as well as other notable members of the seventeenth century British Royal Society. Counted among the Jewish scholars who also bridged the gap between Kabbalah and natural philosophy were Rabbi Judah Loew ben Bezalel (the Maharal) (1525–1609), Moses Isserles (Rema) (c.1530–1572), Solomon Luria (1510–1573) (the chief rabbi of the academy of Lublin), David Gans, Joseph Solomon Delmedigo (1591–1655), Tobias Cohen (1652–1729), and many others.

It should be noted that the path of admission of European Jews into the university, the

modern institution that trained individuals to become academic professionals, was not at first open to Jews. The story is part of a larger story of very ambiguous relations between Jews and Christians throughout European history. Christianity began as an outgrowth of Biblical Judaism more or less parallel to the rise of rabbinic Judaism, which makes the two religions competing cousins at the very least (if not warring brothers). Jews in general play a critical role in the development of Christian European civilization, but within that civilization the Jew remains the perpetual outsider. The Jews more than any other people have been the permanent “other” to the Christians “we.” This story is exemplified in the relationship between the Jewish people and the European university, and it is dramatically accented in the way this history played itself in Germany, the most significant land of Jewish settlement in Western and Central Europe.

From the eleventh century on the Germanic lands housed a well-developed Jewish health-care system that included hospitals as well as professionally trained family dynasties of physicians. At the same time, Jews were also viewed as members of a different race, and this racism colored the otherwise high respect in which Jewish physicians were regarded for their comparatively exceptional skill in healing patients. By the beginning of the nineteenth century, the Jewish otherness gave rise to mass anti-Semitism, significantly directed against Jewish doctors and Jewish medicine. While at the same time there were other European Christians who acknowledged the humanity of Jews, particularly if they could overcome their “Jewishness,” and these more liberal Christians fought for the admission of Jews to German medical schools in the eighteenth century, 200 years later than Jews were admitted into medical schools in Italy. It was in the middle of the nineteenth century that Jews gained citizenship in the newly formed German nation, Jews in general gained admission to university academic

programs, and medicine in particular became the crowning achievement of the Jews integration into German (and European) civilization. However, the achievement was far from permanent. By the end of the nineteenth century there spread through Germany as well as other western European nations, both at the level of intelligentsia and the ordinary people, beliefs that Jews had special mental, spiritual, and even physical innate defects that separated them from the rest of civilization. It is this racism that culminated in the Nazi policies against all Jewish people in the 1930s and 1940s.

From the 1870s on Jews had flocked to the European universities where many Jews achieved distinction in many fields, including the sciences. But by the 1920s these achievements were being diminished as something Jewish that was inferior to the achievements of non-Jewish academics and scientists. Jews were seen to be “clever” but not really “intelligent.” And new sciences in particular, notably the Jew Einstein’s relativity theory in physics and the Jew Freud’s psychoanalysis in psychology, were dismissed from many European universities as illegitimate science because they were “Jewish science.”

By the nineteenth and twentieth centuries and the integration of Jews into the politics and culture of modern Christian Europe, there developed an increasingly radical separation between those Jews who studied the sciences and those Jews who studied Jewish texts. What is critical is, in consequence of the Maimonidean controversy, scientific subjects ceased to be considered Jewish. Instead, they were part of something called “general studies,” while in the non-Jewish world of western Europe “science” itself was separated from what was called the “humanities,” as increasingly into the twentieth century there developed a major intellectual and cultural gap between the sciences and the humanities. Jews actively participated in both groups, but rarely were there any cross-overs, particularly among rabbis who spoke

for Judaism and whose academic training increasingly was humanistic.

By the twentieth century, especially in North America, Jews played a dominant role in scientific life. The who's who of science names includes Jews like Richard Feynman, Carl Sagan, Stephen Jay Gould, Albert Michelson, Isidor Rabi, J. Robert Oppenheimer, Edward Teller, John von Neumann, Albert Sabin, Jonas Salk, Norbert Weiner, and Murray Gell-Mann to mention only a few of the most famous Jewish scientists. In these cases, we know about their contribution to science, but we know nothing about most of them as Jews, and from what we know from the few who actually wrote about their attitudes toward religion, we see that the level of sophistication of their thought about Judaism is in no sense comparable to their knowledge of science. In this sense, the twentieth century has been relatively unsuccessful in exhibiting any new forms of integration of Judaism and science, and that is not surprising given two factors in particular. One is the radical increasing separation between the two cultures of the sciences and the humanities with the classification of Judaism as a religious humanity. Two is the fact that few trained scientists are also rabbis or, to be more accurate, have anything approaching a professional knowledge of Judaism. It is too early to judge whether or not this separation will continue in the twenty-first century.

6. There is a sixth period that we could add to our list. Let us call it, for want of a better term, "post-modern Judaism." We characterized the modern period both in terms of the sciences and Judaism. The modern forms of science were Newtonian physics, Freudian psychology, Darwinian evolution in the life sciences, and Socialism in economics and politics. Similarly, we identified modern Judaism with liberal Jewish religion and secular nationalist Zionism. Post-modern, as the term is used here, means any expressions of science and Judaism that move beyond the limits of what we have called "modern." In this sense, Quantum Mechanics and Relativity in

physics, and physicalist reductionism in psychology are post-modern, as are various new twenty-first century models of economics and politics and new emerging forms of Jewish identity that transcend now classical models of Reform, Conservative, Orthodox, and Reconstructionist Judaism, as well as forms of post-Zionist Jewish secular identity. However, it is as yet too soon to characterize them. Many of them will fade from existence and even those who survive and prosper will be transformed in unending processes of change, for Judaism, like science, is not a static concept but a living entity.

Cross-References

- ▶ [Astronomy in Judaism](#)
- ▶ [Creation in Judaism](#)
- ▶ [Mathematics in Judaism](#)
- ▶ [Natural Sciences in Judaism](#)
- ▶ [Philosophy in Judaism](#)
- ▶ [Physics in Judaism](#)
- ▶ [Psychology in Judaism](#)
- ▶ [Redemption in Judaism](#)
- ▶ [Revelation in Judaism](#)
- ▶ [Theology in Judaism](#)

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Judeo-Christian Tradition

► Prismatic Theology

Judgment

► Eschatology

Jungian Psychology

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An influential method of psychoanalysis developed by the twentieth-century Swiss clinician C.G. Jung that rejected Freud's pan-sexualism and emphasized the quest for universal archetypes of the unconscious manifested distinctively in dreams and myths. Jung was fascinated with Gnosticism, and developed both a psychological theory and a general philosophy that both he and his followers have regarded as "Gnostic."

Justice (Philosophically)

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Introduction

In general terms, justice is the morally appropriate allocation of benefits and harms. Justice may concern the activity of political and legal institutions, social patterns of advantage and disadvantage, the disbursement of criminal punishment or reparations, the fairness of particular

interactions among persons, or the character traits of individuals.

Philosophical discussions of justice extend back at least 2000 years to the time of Plato and Aristotle, and the idea of justice is already evident in discussions of law in the third millennium B.C.E. The idea of justice – both in its substantive requirements and in its general subject matter – has been understood in extraordinarily diverse terms by an enormous number of theorists. By necessity, therefore, the discussion that follows will be highly selective, focusing on the most significant approaches to justice in the Western philosophical tradition.

Early Theories of Justice

The Code of Hammurabi

The earliest recorded discussions of justice feature legal codes of punishment that presage notions of fairness and reciprocity central to the notion's later development. Prominent among these is The Code of Hammurabi (eighteenth century B.C.E.), which offers up a series of social rules and prescribed punishments for various infractions, aiming to ensure that "the strong should not harm the weak." Some of these punishments present quite literal interpretations of reciprocity, as in the famous "eye for an eye" requirement: "If a man put out the eye of another man, his eye shall be put out" (no. 196). From this perspective, others seem to be vastly out of proportion with the crime perpetuated: merchants who sell stolen property are to be executed (no. 9), for example. Many of the punishments are clearly intended to provide compensation to victims: those who accidentally flood a neighbor's field, for example, are to pay the neighbor in corn for their lost crops (no. 55). In general terms, the laws embody the core ideas that (a) those who perpetuate unjustified harm on others become the proper recipients of some appropriate harm in return and (b) those who are the victims of unjustified harm are entitled, where possible, to compensation. In some form, both of these notions remain durable fixtures of theories of justice throughout the idea's history.

Plato

Whereas the earliest treatments of justice are principally codifications of rules and punishments, the Ancient Greeks began to offer a systematic approach to the philosophical questions surrounding justice, that is, those concerning its nature, proper subject matter, and the status of its requirements within a broader moral framework. The first such treatment comes in Plato's masterpiece, the *Republic* (ca. 360 B.C.E.), which is devoted to an investigation of justice in both the individual and the polity overall. Plato argues that justice in the polity concerns its ability to perform its characteristic purpose or function well. On Plato's view, that function is to serve citizens' diverse needs as well as possible, or, in his terms, to foster the greatest amount of "happiness." That aim is achieved, Plato argues, when all citizens are assigned to perform the role for which they are best suited, a claim that implies a highly regimented and hierarchical society: there are some who are, by nature, best suited to rule (the philosopher kings or guardians of the state), and there are others who are, by nature, suited to be ruled, and all individuals are defined by membership within a particular social class. Analogously, Plato thinks that just individuals are characterized by a harmonious division of labor among discrete parts of the soul: our rational soul must rule over our appetites and emotional impulses. In achieving this, Plato argues, we will be both good and happy.

The understanding of justice that we get in the *Republic* is notably anomalous in its avoidance of any systematic treatment of punishment or fairness. Plato's project is to describe the ideal person and the ideal polity. Although that tells us what a good world would look like, it does not tell us in any clear way what we – as citizens, criminals, or victims – are entitled to receive in return for what.

Aristotle

In contrast, Aristotle's account of justice builds naturally on ideas implicit in the early codes of punishment and anticipates more recent preoccupations with the idea of economic and contractual

fairness. Aristotle's primary discussion of justice comes in the *Nicomachean Ethics* (ca. 350 B.C.E.), where he distinguishes between what he calls "general" and "special" notions of justice. General justice corresponds to a broad notion of moral virtue that applies both to individuals who are disposed to act and think well, and to states that rule in service of the common good. Special justice, however, is a more specific notion that concerns the appropriate distribution of harms and benefits relative to a fair equilibrium. It is this latter notion that fits most transparently into the historical development of the idea up to the present.

Prefiguring a distinction that has ultimately become commonplace in discussions of justice, Aristotle divides the idea of special justice into two forms: justice in "distribution" and justice in "rectification." Justice in distribution concerns the fair allocation of goods or benefits held among the community, such as respect, honor, or property. Aristotle holds that individuals ought to receive in proportion to merit, where merit is a function of the individual's contribution to communal assets. Thus, citizens who contribute more to the prosperity of their society through their virtue or leadership qualities, for example, are entitled to a greater share of power and respect in return. Aristotle's notion of justice in distribution is thus compatible with substantial social and political inequalities so long as they are connected with proportionate differences in relevant merit.

Justice in rectification for Aristotle concerns the response to unjust transactions among individuals. An unjust transaction, on his view, is one that introduces inequality between the parties involved relative to their previous levels of well-being. If A steals from B, for example, then A receives a net gain from the transaction while B receives a net loss, thereby introducing inequality. Restoring equality, for Aristotle, can involve some form of reparations for the losses incurred by A as well as some form of harm inflicted on B to cancel out B's gains. However, Aristotle never specifies exactly what the standard of equivalency is for losses and gains, making it difficult to derive precise implications

from the theory. In very general terms, nonetheless, his view of corrective justice provides a very early basis for thinking about fair compensation and punishment.

Distributive Justice

In keeping with the division espoused by Aristotle, theories of justice are now conventionally divided into theories of distributive or social justice and theories of punishment. This section will discuss the former, and the next section will consider the latter. Theories of distributive justice concern the fair allocation of goods that determine the scope of individuals' basic opportunities and quality of life. Because economic goods (money and property) figure so centrally in this respect, theories of distributive justice have typically focused most centrally on them. Such theories may also nonetheless concern political rights, social status and opportunities, education, and healthcare.

Justice as Fairness: Rawls

Without question, the most influential theory of distributive justice in the past century has been that of John Rawls, and most contemporary philosophical discussions of justice are in some way aligned in support or rejection of Rawls's views. In *A Theory of Justice*, Rawls argues that a just scheme of distribution is that which we, as free, equal, and rational individuals, would choose behind a "veil of ignorance," that is, under conditions in which we did not know our class or social status, the extent of our natural talents and abilities, or the nature of our substantive moral beliefs. Because it models principles of justice as the result of an ideal choice situation, it fits firmly into the so-called "contractarian" tradition of thinking about political and moral arrangements developed in the seventeenth and eighteenth centuries by Thomas Hobbes, Immanuel Kant, John Locke, Jean-Jacques Rousseau, and others.

The rationale for the veil of ignorance is that, on Rawls's view, it provides a hypothetical model of perfectly fair conditions of choice. Hence, Rawls dubs his view "justice as fairness."

The result of choice under such conditions, Rawls argues, would be three principles:

- (1) Each person should have "the most extensive scheme of equal basic liberties compatible with a similar scheme of liberties for others."
- (2a) *The Difference Principle*: Social and economic inequalities should be structured so as to maximize the prospects of the worst-off members of society.
- (2b) *Fair Equality of Opportunity*: "Those who are at the same level of talent and ability and have the same willingness to use them should have the same prospects of success regardless of their initial place in the social system" (63).

Principle 1 embodies a very basic conception of equality that is present in more or less all notions of justice that follow the introduction of moral and political egalitarianism in the Enlightenment. The principle of fair equality of opportunity embodies the intuitive idea that it is unfair when our success in social competition is influenced by morally arbitrary factors and in particular our initial social standing.

The most natural interpretation of the difference principle is a taxation scheme in which the rich are heavily taxed to pay for programs and subsidies that benefit the poor. The limit on taxation of the rich, following the logic of the difference principle, is just that point at which their incentives to be productive are reduced enough so that tax revenue available to aid the worst off begins to decline. The difference principle thus embodies the idea that substantial economic inequalities are permissible just so long as the poor benefit from them. Under the familiar conditions of capitalist society, those benefits come in the form of extra incentives (in the form of wealth) for the most productive members of society to contribute as much as possible to net social wealth through profitable ventures and technological innovations. The difference principle has proven particularly contentious in contemporary discussions of justice, and the main objections to it will be addressed in the next two sections.

Egalitarianism

Egalitarianism with respect to distributive justice is the view that all citizens are entitled to equal shares of some basic set of social goods, though it is a matter of contention what, exactly, constitutes the social good(s) that should serve as the basic measure of equality. Prominent understandings of that measure have included resources, well-being, opportunity, capabilities, and others. Given the broad interpretability of the idea of equality, therefore, more or less all contemporary theorists of distributive justice are egalitarians in some form.

Perhaps the most straightforward understanding of egalitarianism proposes that all citizens should receive the same amount of financial and material resources. But this idea is problematic on a variety of grounds. For one thing, citizens may have different levels of need, and, in that case, equal resources would lead to highly unequal degrees of welfare. Karl Marx thus proposed, in his “Critique of the Gotha Programme,” that all should contribute “according to ability” and receive “according to need.” Marx’s view is thus emblematic of a left egalitarianism that rejects inequalities in human welfare stemming from economic inequalities and which denies that inequalities can be justified by reference to merit or productivity.

In contrast, within a Rawlsian framework, substantial inequalities in material resources persist, contingent on the fact that some are more productive and therefore benefit the worst off by improving net social resources. Rawls’s view thus embraces the capitalist idea that inequalities in human welfare are a function of incentives that make individuals more productive and that therefore benefit all. From a leftist egalitarian point of view, such inequalities perpetuate a social order in which those worst off are dominated and reward the selfishness of those who will only contribute their skills in return for a greater share of economic reward.

Libertarianism

Left egalitarians have a very weak view of property rights: our entitlement freely to hold and exchange goods is subject to the tight constraints of maintaining equality relative to need. Libertarianism, in contrast, holds a strong view of

individual property rights: individuals are entitled to keep whatever they can fairly acquire through their own merits or through free exchanges with other individuals. Robert Nozick, the most influential proponent of libertarianism, thus holds that a social scheme of distribution is just strictly insofar as it is produced through a sequence of fair acquisitions and free exchanges among individuals. Gross inequalities are therefore justifiable so long as they arise through a historical sequence that satisfies these conditions. Nozick criticizes Rawlsian and left egalitarian alternatives to libertarianism on the grounds that the redistribution (through taxation schemes) of justly acquired property is an infringement of individual rights. One important problem with this view, however, is that, as Nozick himself concedes, it remains highly questionable whether the historical chains of events through which present property holdings came about were just. A second important issue concerns the moral status of the differences in skill and fortune that allow some to acquire greater holdings than others. Rawlsians and left egalitarians view such differences as morally arbitrary and therefore incapable of justifying inequality.

Punishment

Punishment involves the infliction of some pain or cost on an offender for moral and/or legal transgressions. The Code of Hammurabi, considered earlier in this entry, provides an early example of social rules and the punishments that correspond to their violation, but does not offer a substantive account of the justification for punishment, or a conception of fair punishment. Justifications of punishment have been dominated by a dichotomy between consequentialist and retributive theories, and these are both considered below.

Consequentialist Theories of Punishment

Consequentialist theories of punishment hold that the justification of punishment is its tendency to advance morally good consequences, which we can generically characterize in terms of “the public good.” Though the notion of “public good” is

a matter of substantial dispute, all consequentialist theories are defined by their concern for the effects of punishment practices on future states of affairs.

The future effects of punishment are complex, but the most significant concerns of consequentialists are (a) the tendency of punishment to reduce the commission of moral harms by inspiring fear and fostering, through the public display of communal morals, the social embrace of a valid moral code, and (b) the tendency of punishment to reform offenders by facilitating the abandonment of morally bad beliefs and tendencies. Consequentialist theories take a different shape depending on how these different kinds of effects are weighted. A consequentialist who views deterrence as the most important effect is likely to recommend substantially harsher penalties, for example, than one who puts reformation at the center of the theory.

Consequentialist views confront a variety of significant objections. Among the most significant are those that focus on the idea of proportionality. Consequentialists are committed to endorsing extremely harsh penalties for mild transgressions, for example, just so long as doing so benefits the public through strong deterrent effects. Conversely, consequentialists are committed to mild penalties for extreme transgressions, just so long as the gains in deterrence or reformation achieved by stronger transgressions are small or negligible. In general terms, consequentialists have no intrinsic sense of fittingness in the assignment of punishments; rather, fittingness or proportionality is simply a function of anticipated consequences.

Retributive Theories of Punishment

In contrast to consequentialist theories, retributive theories hold that it is the fact that someone is the perpetrator of a particular type of offense, and only this fact, that is relevant to determining the pain or cost that is due to them. Any further consequences that arise from punishment – its deterrent effects, for example – are irrelevant to its justification. Retributivists have attempted to justify the view in various terms. On Hegel's influential view, for example, punishment

functions to “negate” the original transgression. Other proposals focus on the way in which justice restores to equilibrium the relative well-being of victim and perpetrator, or on the way in which punishment expresses a warranted emotional response to injustice.

Retributive theories avoid the particular difficulties with proportionality that consequentialists face insofar as the harshness of a punishment, on the retributive view, is strictly determined by the severity of the crime. But retributive theories, unlike consequentialist alternatives, have a more difficult time explaining why a particular punishment is warranted by a particular crime. Whereas the consequentialist can refer simply to the anticipated benefits of matching particular punishments with particular crimes, retributivists are burdened with the difficult task of explaining and interpreting their particular conception of proportionality. Aside from these difficulties, retributivism cannot account for many ordinary and seemingly essential features of our institutions of punishment, which provide a vital system of incentives for the regulation of social conduct. In abandoning consequentialist arguments, the retributivist cannot explain how our punishment practices should be adjusted in order to serve effectively as vehicles of deterrence, education, and rehabilitation.

Religious Convictions and Public Principles of Justice

As the preceding discussion reveals, ideals of justice are not only philosophical theories; they are also substantial proposals for the organization of social and political institutions. They also provide a basis from which to justify specific legal policy prescriptions on a broad range of social issues. At the same time, in contemporary pluralistic societies, citizens approach questions of justice from diverse religious and moral worldviews, many of which are incompatible in important respects. It is therefore essential for political communities to be able to address important questions of justice, as a community, in spite of such underlying disagreements.

In recent years, political philosophers have sought to develop a theory of “public reason”: an account of what kinds of considerations citizens are morally permitted to appeal to in deliberating about public (legally codified) matters of justice. On the dominant interpretation of public reason, developed by John Rawls, citizens should restrict themselves in deliberations about justice to considerations that are acceptable from all “reasonable” points of view. “Reasonable” citizens, on this view, are motivated by an ideal of fair cooperation with their peers and acknowledge their fallibility in debate. The motivation for this proposal is a classical liberal social ideal: in a free and egalitarian society, no citizens should be required to live under social arrangements that they cannot endorse from their own point of view.

As critics of this view point out, in ruling out reasonably contested views, we must effectively bar from public debate many principles that are essential to citizens’ understanding of themselves and the world. In this regard, religious citizens seem to be at a particularly grave disadvantage, because such a principle is likely to rule out much of what is essential to and distinctive of religious worldviews. Appeals to Scripture, to insights gained through revelatory experiences, or to the teachings of religious authority figures, for example, will all plausibly be ruled out of public deliberation. In place of these appeals will remain insights that can be justified through publicly verifiable experience and rational inference. The consequence is likely that our public understanding of justice will be shaped exclusively by secular considerations. Religious critics contend that this restriction ultimately amounts, itself, to a violation of religious and personal liberty. They have also argued that, in restricting ourselves strictly to uncontroversial premises, our discussions of justice will be narrowly limited to individualistic and materialistic considerations.

The challenge for religious critics of public reason remains the concern that if we fail to rule out controversial moral and religious ideals from our deliberations about justice, we will open the door to unacceptable forms of government coercion. The atheist who lives in a society in which biblical principles provide the public rationale for

justice, for example, plausibly has reason to feel alienated and disrespected by the prevailing social order. Notably, the same is true for other religious individuals who hold differing interpretations of the Bible or who view a different religious text as authoritative. From this point of view, religious citizens themselves have reason to endorse the standard interpretation of public reason as a principle that prevents others from imposing upon them a moral framework that they cannot accept.

Cross-References

- [Deontology](#)
- [Ethics](#)
- [Political Theory](#)
- [Utilitarianism](#)

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Justice Theory

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K

Kabbalah

► [Science and Kabbalah](#)

Kabbalah in Judaism

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Related Terms

[Kabbalah and science](#)

Description

Kabbalah is a distinctive intellectual strand within Judaism that functioned as a self-conscious program for the interpretation of rabbinic Judaism. Rooted in esoteric speculations of the rabbinic period, kabbalah emerged in the Middle Ages as the theory and praxis of Jewish life that fathomed the depth of divine mysteries; charted the paths for interaction with God – including a mystical union with God; and harnessed divine energy for the redemption of the world. Although kabbalah viewed its

doctrines as timeless truths, first revealed by God in the creation of the universe, kabbalah was a cultural product whose doctrines and practices evolved over time in response to changes within Judaism and through interaction with non-Jewish cultures.

The word “kabbalah” means “reception” and in the context of rabbinic Judaism the term refers to the reception of divine instruction, namely, revealed knowledge. According to rabbinic Judaism, God revealed to the People of Israel a dual Torah: a written Torah and an Oral Torah. Medieval kabbalists saw themselves as recipients of Oral Torah par excellence, since kabbalah for them constituted the inner, esoteric meaning of the revealed Written Torah. As such, kabbalah pertained to the mysteries of God, the universe, and the Torah that exceed the ken of ordinary human apprehension and cognition. These secrets had to be disclosed only to the initiate few who were spiritually prepared to receive the privileged information and deserved the benefit from it. Ordinary Jews, let alone non-Jews, were not to have access to this restricted information lest they be led to insanity, reach mistaken conclusion about God (i.e., idolatry), or even risk death. To ensure that esoteric content would be transmitted only to those who deserve it, kabbalah was originally transmitted orally from authorized teachers to worthy disciples within the confines of rabbinic academies and specific kinship groups.

The intellectual roots of kabbalah can be traced to rabbinic esoterica of late antiquity, one strand of which depicted heavenly ascents in which the mystic envisions the beauty of God seated on a throne. These ecstatic experiences were believed to be dangerous and could be endured only because the mystic was protected by magical formulas that contained the power of the Divine Name. The depiction of God's luminous, noncorporeal form in a literary tradition known as *Shiur Qomah* (Measurement of the [Divine] Stature) became most problematic in the eighth century when rabbinic esoterica was edited in the Islamic East. Islamic rationalism, interreligious debates, and Karaite sectarianism brought about a critique of rabbinic esoterica, especially the blatant anthropomorphism of some rabbinic midrashim and the speculations about God's luminous body. To survive the critique, rabbinic Judaism had to be given a rationalist, systematic interpretation with the help of contemporary science and philosophy.

Kabbalah in the Middle Ages

The articulation of Jewish philosophy functioned as a catalyst for the emergence of kabbalah. The process began with speculation about a short and enigmatic book, *Sefer Yetzirah* (Book of Creation), whose earliest variants were probably composed in the Hellenistic period. The text was edited in the Islamic East during the ninth century when Islamic intellectuals, the *Ikhwan al Safa*, articulated a philosophy of nature based on number symbolism and linguistic ontology. Attributed to the patriarch Abraham, *Sefer Yetzirah* speaks about the creation of the world by God by means of 32 paths of wisdom: 10 *Sefirot* and 22 letters of the Hebrew alphabet. The *Sefirot* are understood either as ideal numbers or as powers that govern the creation of the physical cosmos, clearly reminiscent of the Neo-Pythagorean conception of numbers. The Jewish intellectuals who generated *Sefer Yetzirah* regarded creation as a linguistic process and the cosmos was a linguistic construct made out of infinite permutations of the letters of the Hebrew alphabet, each

of which has a numerical value. From the tenth to the twelfth centuries Jewish thinkers in the Islamic East, North Africa, Italy, and Spain composed commentaries on *Sefer Yetzirah* in which they debated the meaning of the *Sefirot*, a theoretical debate that pertained to the ontological status of divine attributes.

These commentaries were known to a group of Pietists in Germany (*Hasidei Ashkenaz*) who preserved rabbinic esoterica and developed a distinctive spiritual culture. The group generated *Sefer Hasidism* (The Book of the Pietists), under the leadership of Judah ha-Hasid (d. 1217). This anthology of ethical instructions, folktales, anecdotes, demonology, and magic constituted the exoteric teachings of the group shared with the Jewish community at large. For their own consumption, the German Pietists speculated on the Hebrew language as the grammar of reality, and especially about the divine Glory (*kavod*), the incorporeal addressee of prayers. They visualized the Glory and developed a sexualized, symbolic language to refer to the realm of the divine chariot (*merkabah*) upon which the divine Glory was seated. The feminine quality of the Glory was identified with the Shekhinah and was imaged in multiple ways (e.g., crown, prayer, the divine voice, the king's daughter, or bride). The destruction of the Rhine Valley communities in the First Crusade (1096) stimulated the writing down of these esoteric traditions, which would influence the emergence of medieval kabbalah.

A different, philosophical spirituality was cultivated among the Jewish courtier class in Muslim Spain during the eleventh and twelfth centuries, which developed a blend of Neoplatonic and Hermetic views, culled from Muslim texts and adapted to Judaism. In the second half of the twelfth century, however, this blend was supplanted by Aristotelianism as the dominant philosophical schema for Jewish intellectuals in Spain, although it too was suffused with Neoplatonic themes. The leading figure in this development was Moses Maimonides (d. 1204) and his interpretation of rabbinic Judaism would eventually become normative. Maimonides' intellectualist reinterpretation of rabbinic Judaism was yet another impetus for the emergence of medieval

kabbalah. In critique of Maimonides' view, a group of scholars in Provence who called themselves "masters of kabbalah" articulated an alternative interpretation of Judaism. In the beginning of the thirteenth century, the first kabbalistic commentary on *Sefer Yetzirah* was composed by Rabbi Isaac Sagi Nahor ("The Blind") (d. 1235) who began to articulate kabbalistic symbolism. It emphasized the immanence of God contrary to the remote and uninvolved God of the rationalist philosophers. The process by which the concealed God has revealed Himself was now systematized in writing and could be studied by others.

It is very likely that the early kabbalists in Provence were also responsible for the editing and circulation of yet another foundational text in the history of kabbalah – *Sefer ha-Bahir* (Book of Brightness). This text too is pseudo-epigraphic, attributing its views to the second-century rabbi, Nehunya ben ha-Qanah, the hero of ancient rabbinic esoterica. Written in Hebrew with occasional Aramaic phrases, the *Bahir* uses the literary form of parable (*mashal*) to teach deep truths about an earthly king, his royal family, his loyal and disloyal subjects, and his majestic palace. The language is often symbolic; some of the symbols are taken for granted without further exposition, while others lead to an extended narrative. In the *Bahir*, speculations about the ten divine potencies, the *Sefirot*, express a mythical conception of God because the *Sefirot* are viewed as character traits of the divine personality. Unlike the philosophers who viewed God as an intellect that thinks itself, the people who studied the *Bahir* delved into the inner life of God's personality, perhaps reflecting the so-called "rise of the individual" that medievalists associate with the Renaissance of the twelfth century. The symbolism of *Sefer ha-Bahir* would later be elaborated by the kabbalists during the thirteenth century, active mainly in Spain.

In the first decades of the thirteenth century, kabbalistic speculations, now available in writing (despite the commitment to esotericism), began to disseminate in the Jewish communities in Catalonia. In the town of Girona a small coterie of Jewish intellectuals who were at home with

Neoplatonic philosophy – R. Ezra ben Shlomo, R. Azriel, R. Jacob Ben Sheshet, and R. Moses ben Nahman (Nahmanides) – developed the teachings of Provencal masters further through commentaries on Talmudic homilies, the Song of Songs, *Sefer Yetzirah*, the Hebrew alphabet, and Genesis. From this perspective, their kabbalistic discourse was decidedly traditional. The fact that Nahmanides (d. 1272), the leader of Catalanian Jewry, was associated with the group gave authority to kabbalah as an alternative to Maimonidean rationalism. Nahmanides, however, was deeply committed to esotericism and restricted the dissemination of kabbalah to the initiated few, forbidding the employment of creative imagination in Scriptural interpretation.

During the early 1230s, Jewish communities of Spain and Provence debated the validity of Maimonides' legacy, focusing on the proper approach to the biblical text, especially the creation narrative of Genesis. Those advocating Maimonides' approach understood the biblical text in accord with Aristotle's physics and cosmology, whereas the kabbalists claimed that the creation narrative pertains to processes within God. At stake were not only the exegesis of Scripture but also the nature and observance of the commandments. Maimonides' historicized interpretation of the commandments rendered them as a means to an end, whereas the theosophic kabbalists offered a sacramental view of Jewish rituals: each commandment is linked to an aspect of God so that performing a given commandment with the proper intention empowers God. Despite these differences, philosophers and kabbalists had much in common: both groups were elitist and believed that their privileged knowledge should be known by the few; both claimed to possess knowledge of ultimate truth which they regarded as salvific; both assumed the biblical text to be esoteric and offered their way to decode the text; both were open to non-Jewish strands of thought although the rationalist philosophers were Aristotelian, whereas the kabbalists perpetuated Neoplatonic, Ismaili, and Sufi paradigms.

In the second half of the thirteenth century, rationalist philosophers relaxed their elitism that

had characterized the teachings of Maimonides and began to popularize philosophy through translations of Averroes' commentaries on Aristotle into Hebrew, commentaries on Maimonides' *Guide of the Perplexed*, philosophical encyclopedias, and philosophical novels. The philosophically informed interpretation of Judaism could thus become official Jewish theology for Spanish Jewry. That prospect compelled kabbalists to take a public stand and to present their alternative to rationalist philosophy. Between 1270 and 1290 kabbalists left behind the restrictions articulated by Nahmanides and committed their creative insights to writing. Kabbalah now received its "classical" formulation in *Sefer ha-Zohar*, the most creative composition of Sephardic Jewry.

The *Zohar* presents itself as a commentary on the Torah articulated by the second-century Rabbi Shimon bar Yohai in his conversations with his companions while they were strolling through the Holy Land. The *Zohar* was composed in the last quarter of the thirteenth century in Castile, probably by a mystical fraternity, at the center of which was Moses de Leon (d. 1305). The *Zohar* was written in Aramaic in order to give it the appearance of an ancient Midrash, but it is full of neologisms and words that betray its medieval context. The homilies of the *Zohar* focus on the unique personality of its protagonist, Rabbi Shimon bar Yohai, who is portrayed as a righteous person endowed with supernatural powers, a perfect mystic, master teacher, and a shaman who is able to impact the supernal world of the *Sefirot* as well as transform the physical world through miracles. The primary activity of the Zoharic group is Torah study, a redemptive activity that is depicted in highly sexual overtones. The mystics of the *Zohar* love God and love Torah and the erotic nature of their constant study of Torah is expressed through the love poetry of the Song of Song, the text most associated with the ancient text of *Shiur Qomah*. The major focus of the Zoharic group is the feminine aspect of God, the Shekhinah, whose precarious existence is threatened by the powers of evil, ruled by the archdemon, Samael. The mystical goal of the Zoharic group is to identify

with the Shekhinah, surrender themselves to her, and ultimately unite with her.

The *Zohar*'s artistry, rich symbolism, and eroticism made it an irresistible literary text, worthy of imitation, translation, and commentary. In the fourteenth century, kabbalists imitated the style of the *Zohar*, composed dictionaries to its Aramaic language, generated lists of kabbalistic symbols to decode the *Zohar*, and began to write commentaries on the *Zohar*. In the late Middle Ages, Jews took the *Zohar* to be an authentic ancient Midrash, and that assumption contributed to the positive reception of the *Zohar* in the premodern period. Yet, as much as the dissemination of kabbalah in the early modern period was tied to the reception of the *Zohar*, the historical critique of kabbalah in the modern period involved a challenge to the *Zohar*'s claim for antiquity.

With the consolidation of theosophic kabbalah in the *Zohar*, the difference between rationalist philosophy and kabbalah became evident also in regard to attitudes toward the natural world. Whereas the rationalist philosophers sought to understand the laws of nature by virtue of the physical sciences as defined by the Aristotelian traditions, the kabbalists regarded nature as a text that mirrored God. Nature was believed to be constructed of the Hebrew letters (an idea traced back to *Sefer Yetzirah*), the basic units of information whose endless combinations mysteriously give rise to physical reality and all forms of life. The textualization of nature made kabbalistic discourse rich in organic symbolism, but it did not make the kabbalists interested in the study of the natural, corporeal world for its own sake. It was precisely the physical reality of natural things that the kabbalists claimed to transcend and decode by means of their hermeneutical procedures. The sacred life of the kabbalists did not revolve around the study of nature but around the endless interpretations of the sacred text and the infinite permutations of the Divine Name. This hermeneutical activity was enhanced by the *Zohar*, which presented itself as the revelation of the cipher required to decode the Torah. Based on the linguistic mysticism prevalent in thirteenth century kabbalah in Castile, the *Zohar*

provided the grammar of reality, so to speak. When the *Zohar* itself became the focus of study, commentaries on the *Zohar* further enhanced the primacy of textuality in kabbalah, rendering kabbalah even less interested in observation of nature. Kabbalah thus retarded Jewish interest in the study of nature, the goal of scientific inquiry.

In the mid-sixteenth century the *Zohar* became a canonic text, second in importance only to the Talmud. This development was aided by the expulsion of the Jews from Spain in 1492, the growing interest in kabbalah among Christian humanists, the attacks of the Papacy on the Talmud and the burning of the Talmud in 1553, and the printing of the *Zohar* in 1558–1559 in Italy, an event accompanied with heated controversy.

In Italy, the *Zohar* replaced the intellectualist kabbalah of Abraham Abulafia (d. ca. 1292), a close reader of Maimonides' *Guide of the Perplexed* who believed to have achieved the cognitive ideals of Maimonidean philosophy – the mystical union of the human intellect with the Active Intellect. Abulafia's the so-called "prophetic kabbalah" or "ecstatic kabbalah" creatively blended ancient Jewish esotericism, German Pietism, theosophic kabbalah, and Maimonides' rationalist philosophy. Abulafia identified the *Sefirot* with the Separate Intellects, but gave this idea an anthropological or psychological interpretation: the *Sefirot* are internal states of human experience; they are part of the human psyche, since the human is a microcosm of the macrocosm. Knowledge of the *Sefirot* is a form of self-knowledge, a process that requires the acquisition of moral and intellectual virtues and that culminates in the conjunction between the human intellect and the Active Intellect. This cognitive union is prophecy, a reception of divine efflux from God through the Active Intellect, precisely as Maimonides explained. The kabbalah of the *Sefirot*, anthropologically or psychologically interpreted, is thus the highest example of the philosophic maxim "Know Thyself."

The main obstacle to self-knowledge is the corporeal body itself, especially the power of imagination. However, the Jewish tradition itself,

according to Abulafia, also reveals the way to break through human embodiment and to free oneself from the errors of human imagination. This is the highest form of kabbalah, "the path of the [divine] names" (*derekh ha-shemot*), which is religiously superior to the knowledge of the *Sefirot*. Building on the linguistic theory of *Sefer Yetzirah* and the mystical practices of the German Pietists, Abulafia articulated exegetical, meditative, and contemplative techniques that supposedly resulted in a mystical union with God. However, like the theosophic kabbalists, Abulafia rooted the mystical path in the Hebrew language itself, which he regarded as the "mother of all languages" because it is "in accord with nature." God chose Hebrew to be the language for the creation of the universe because of the unique perfect properties of Hebrew.

Abulafia's kabbalah was a full-fledged, experiential program to achieve paranormal psychic states that culminate in a mystical union with the Active Intellect. As a result, the human intellect attains immortality, precisely as Maimonides taught. In addition to the performance of the commandments and rigorous learning of philosophy and its sciences, Abulafia's program included seclusion, breathing techniques, physical postures, recitation of divine names, visualization of letters and letter combination. Most of these techniques were developed on the basis of existing Jewish practices, but some have analogs in other mystical systems, mainly Sufism, and were influenced by the contact Abulafia had with Sufis during his travels in Palestine and the Balkans and through the writings of ibn Arabi which he encountered in Spain.

Kabbalah in the Early Modern Period

Abulafia's works and other kabbalistic texts were translated into Latin by Flavius Mithridates (d. 1483). Mithridates elaborated these translations with his own forgeries. Kabbalah then became of great interest to Christian humanists such as Pico della Mirandola (d. 1494), Pico's nephew, Alberto Pio (d. 1530), and Yohannes Reuchlin (d. 1522) who regarded kabbalah as part

of *prisca theologia*, which culminated in the truths of Christianity. In 1558–59, 5 years after the Talmud was publically burned as a blasphemous text, Christian humanists sponsored the printing of the *Zohar* in two printing presses, one in Mantua and the other in Cremona, and kabbalah was presented as the inner truth of Christianity. It was believed that the dissemination of kabbalah among Christians would encourage Jews to convert to Christianity.

Christian kabbalah developed as a distinctive interpretation of Christianity, inseparable from the contemporary fascination with the occult properties of language. For Yohannes Reuchlin and his followers, for example, Hebrew was a pure, natural language, the foundational structure of the created universe. Knowledge of Hebrew along with the unique vocalization, punctuation, and accents was therefore conducive to knowledge of nature as much as it was conducive to the salvation of the individual soul. If the *Zohar* indeed contained spiritual truths whose revelation could bring about the redemption of the Jewish people, publishing the *Zohar* was a religious obligation of the highest order. Jews who supported the printing of the *Zohar* collaborated with the Christian publishers and helped in the translations of the *Zohar* into Latin.

In 1555, Jews residing in the Papal States were forced to live in ghettos by decree of Pope Paul IV. In the Italian ghettos, kabbalah would be studied by voluntary associations, or confraternities, who found solace in the spiritual message of the *Zohar* and its symbolic understanding of reality. However, whereas in sixteenth-century Italy the *Zohar* was perceived as part of ancient philosophic lore, in North Africa the *Zohar* was regarded as a holy book that had to be treated as a sacred object because it contains occult powers that bring concrete benefits to those who study it. In the Draa Valley of Southern Morocco, kabbalah was cultivated under the influence of local Sufi practices, such as ritualized recitation of divine names and communication with the souls of deceased saints.

In Safed, a small town in the Upper Galilee of the Land of Israel, a mystical fellowship made up mainly of refugees from the Iberian expulsions

brought about the next main development of kabbalah. Under the leadership of Moses Cordovero (d. 1570) and then Isaac Luria (d. 1572), this kabbalistic fraternity lived an intense religious life in expectation of the imminent coming of the messiah. Obsessed with personal guilt and the catastrophic nature of Israel's exile, the kabbalists of Safed devised an elaborate spiritual program that included ascetic practices and penances for sins in order to cultivate spiritual virtues such as modesty and humility. The intense introspection and self-examination was designed to purify the soul and facilitate communion with God. Additionally, this goal required specific mystical practices such as social isolation and seclusion, reduction of verbal communication to the minimum, meditation and recitation of divine names, and withdrawal from contact with material objects so as to minimize bodily sensations. Other practices included prostration on the grave sites of ancient rabbis to commune with their departed saintly souls (*yihuddim*) and outdoor peregrinations to encounter the Shekhinah (*gerushim*). The kabbalists of Safed, like the literary figures of the *Zohar*, identified themselves with the suffering of the Shekhinah and acted to rescue the feminine aspect of God from its suffering. All of these mystical techniques and practices yielded visual and auditory revelatory experiences which were given normative power not only because they were associated with the figure of Elijah, but because some of the mystics, especially Joseph Karo (d. 1575), were regarded as authoritative interpreters of Jewish law.

Underlying the mystical practices of the Safed community was an elaborate cosmogonic myth about events that took place within the Deity: the "withdrawal" of God into Himself (*tzimtzum*), the expansion (*hitpashtut*) of Divine Light into the structure of Divine Anthropos (*Adam Qadmon*), the catastrophic breakdown of the divine "vessels" (*shevirat ha-kelim*), and the redemptive repair of the broken deity (*tiqqun*). These processes, which Isaac Luria and his disciples described in great detail and specificity, were to account for the disharmonious condition of the universe, the human, and the People of Israel. The elaborate theogonic and cosmogonic

myth was the theoretical rationale for the mystical practices of these religious virtuosi. It was held that the kabbalist, whose own soul is healed by living the mystical way, was able to repair the broken universe and the broken deity. In the mending or healing of the world and of God lies the messianic import of Lurianic kabbalah. Isaac Luria understood himself in messianic terms but did not declare himself publicly as a messiah. His students – Hayyim Vital (d.1632), Joseph ibn Tabbul (d. ca. 1590), and Israel Sarug (d. 1610) – would offer divergent interpretations of the Lurianic narrative which they took to be the science of divinity.

Lurianic kabbalah spread in the seventeenth century to Italy, Central Europe, and Amsterdam, especially among former conversos. For Abraham Cohen Herrera (d. 1635), for example, the elaborate myths of Lurianic kabbalah were totally compatible with renaissance Platonism, even though kabbalah was not reducible to Platonism. Exposed to Lurianic kabbalah through the teachings of Israel Sarug, Herrera diminished the messianic orientation of Luria as he interpreted the stark anthropomorphism of Lurianic kabbalah philosophically. Herrera's interpretation of kabbalah was known to Benedict Spinoza (d. 1677), and probably had some influence on the latter's philosophic monism, in which there is only one substance: God/Nature. Other ex-converso scholars in seventeenth century Amsterdam who promoted kabbalah included Menasseh ben Israel (d. 1657), the advocate of Jewish resettlement in England who had personal contact with leading Christian scholars of the time, members of the "Republic of Letters." Menasseh ben Israel showed the affinity between kabbalah and Platonism, and went on to discuss the letters of the Hebrew alphabet as the "lights of the Sefirot." For ben Israel, the letters function like the Platonic Ideas, a notion already stated in the late fifteenth century by several Jewish philosophers.

In the mid-seventeenth century, Jews and non-Jews in Amsterdam and England were influenced by the Jewish messianic movement associated with Sabbatai Zevi (d. 1675). Born in Smyrna, Zevi declared himself to be the messiah in 1648

after devoting himself to the study of the *Zohar* and kabbalistic texts composed in the Byzantine Empire. He was expelled from Smyrna by the unsympathetic rabbinic leadership, but found his way to Salonika, Istanbul, Jerusalem, and Cairo, places where he engaged in non-normative acts, in which he either defied rabbinic authority or negated accepted Jewish practice. In May 1665, Zevi declared himself once again a messiah, but this time in Jerusalem, the place from where the messiah was indeed to appear according to the Jewish tradition. Now, his messianic claims were taken seriously by Nathan of Gaza (d. 1680), a Lurianic kabbalist and spiritual healer, who became Zevi's propagandist. Nathan of Gaza would cast the idiosyncratic behavior of Zevi, including his later conversion to Islam (1666), in the garb of Lurianic theology, although it was quite different from the initial teachings of Luria. In contrast to the Lurianic orientation of Nathan of Gaza, Zevi's personal faith was shaped by his own mystical experiences and his peculiar psychological makeup.

The Sabbatean movement lasted throughout the seventeenth century and well into the eighteenth century. It was condemned by rabbinic authorities as a heresy and was driven into clandestine existence. Sabbatean cells in Turkey, Italy, Germany, and Poland persisted despite the persecution and eventually gave rise to the heretical sect of Jacob Frank (d. 1791) in Poland. He considered himself an incarnation of Zevi's soul, and in imitation of Zevi, he also converted, in his case, to Christianity. Frank's theology was a blend of kabbalah, Christianity, and some modernist views all practiced with the intent of liberating his followers (who likewise converted to Catholicism) from the shackles of Judaism.

While the Frankists expressed their heretic views, a spiritual revival movement would reshape the life of Jews in Eastern Europe in the second half of the eighteenth century – Hasidism. The movement is associated with Israel Baal Shem Tov (d. 1760), a folk healer, magician, and exorcist, regarded as the founder of Hasidism. His interpretation of kabbalah focused on prayer as an exuberant experience filled with joy in which negative thoughts are transformed into

positive awareness of God. The charismatic leadership of the founder was eventually replaced by a more structured organization and Hasidism developed its own theology on the basis of Lurianic kabbalah. Hasidic masters, however, communicated their teaching in stories, parables, and oral exposition of the weekly Torah portions that wove kabbalistic doctrines (especially of Lurianic kabbalah) into a highly creative interpretation of the received rabbinic tradition. Hasidic stories and sermons (delivered in Yiddish but often written down in Hebrew) expanded the appeal of Hasidism and made exuberant experiences accessible to the many. The literary style and the psychological interpretation of kabbalah account for much of the mass appeal of Hasidism. Hasidic teachings minimized the mechanistic and catastrophic aspects of Lurianic theology, and instead interpreted the major events of God's evolution as states of consciousness. The psychological emphasis shifts the messianic drama from the public arena to the private sphere, and to the redemption of the individual Self.

As successful as the Hasidic movement was, it also generated fierce opposition. The traditional opponents (*mitnagedim*) of Hasidism claimed that it paid too little attention to Torah study, and diminished the importance of intellect in the pursuit of religious perfection; that it introduced a highly emotional and undignified style of worship; and that it was rife with non-Jewish folk traditions. While these opponents considered Hasidism an affront to traditional Jewish learning and leadership, the proponents of the Jewish Enlightenment (the *maskilim*) scorned Hasidism for its superstitious, and unenlightened views.

Kabbalah in the Modern Period

While the proponents of Hasidism and their opponents in Eastern Europe battled over the correct interpretation of Judaism, Jews in Central and Western Europe struggled to be granted civil rights as citizens of a modern state. The Jewish demand for emancipation was rooted in the awareness that Judaism is culturally backward and that if Jews are to be integrated into European

society, Jewish religious practices must be thoroughly transformed. Those who agitated for the reform and modernization of Judaism adopted the logic of historical inquiry about the Jewish past and promoted the Science of Judaism (*Wissenschaft des Judentums*). Looking at Judaism in a disinterested fashion, the scientific study of Judaism was to discover the truths about the Jewish past and separate that which is essential to Judaism (e.g., monotheism) from that which is a product of historical circumstances (e.g., the rituals of Judaism). In the pursuit of objective truth about the past, all claims were to be examined critically with the help of philology and the commitment to the recovery of the past as it truly was. The historical analysis of the past was to be applied first and foremost to the immediate medieval past including philosophical and kabbalistic strains of medieval Judaism.

The Jewish historians of the nineteenth century were largely unsympathetic to kabbalah. The symbolic worldview of kabbalah, its valorization of the imagination, and its association with magic and astrology were all taken to be manifestations of a superstitious worldview that was not only antithetical to modern rationalism, but also the cause for the continued backwardness of the Jews. The integration of Jews into Western society and culture demanded relinquishing the commitment to kabbalah, speculative or practical. The historical approach to the Jewish mystical tradition, however, also contributed to the spread of kabbalah because it brought kabbalistic sources to a wider audience. Such sources included critical editions of seminal texts, monographs on outstanding authors, and initial interpretations of the historical development of the Jewish mystical tradition.

Gershom Scholem (d. 1982) dominated the modern study of kabbalah in the twentieth century. Contrary to his predecessors in Germany, Scholem saw in the academic study of the Jewish mystical tradition a lever to promote the Zionist critique of Jewish integration into Western culture. Soon after he migrated to Palestine in 1923, Scholem was among the founders of the Hebrew University in 1925, where the study of kabbalah was to be conducted with utmost commitment to

scientific method. Under Scholem, the academic study of kabbalah was professionalized and kabbalah was incorporated into the study of religion in academic settings. The focus was textual and philological, and Scholem deliberately ignored the actual practice of kabbalah in Palestine, North-America, or Europe and dismissed attempts to integrate kabbalah and modernism.

The most influential of modernist kabbalists in the twentieth century was Yehudah Leib Ashlag (d. 1954), who was exposed to kabbalah through Hasidism. Ashlag settled in Palestine in 1921 and devoted his life to the dissemination of egalitarian and highly psychological interpretations of Lurianic kabbalah. He translated the *Zohar* into Hebrew with an extensive commentary, wrote commentaries on Lurianic kabbalah, and composed political tracts for the general public. The ideal society, so Ashlag believed, is a Communist community in which one works according to one's ability but receives according to one's needs. In the second half of the twentieth century, students of Rav Ashlag (e.g., Rabbi Philip Berg, and his sons, Michael Berg and Judah Berg, as well as another popularizer of kabbalah, Michael Laitman) are engaged in the dissemination of Ashlagian kabbalah in Israel and all over the world through special learning centers (e.g., The Kabbalah Center) and through the Internet. The attraction of several Hollywood celebrities (most notable being Madonna) to kabbalah has further increased its popularity in the USA. Marketed as "a technology of self-transformation," kabbalah appeals to baby-boomers who seek meaning and personal happiness.

In the USA and in Israel, kabbalah has become exceedingly popular in print, public happenings, performances of spiritual poetry and music, adult education courses, radio broadcasts, columns in daily newspapers, and Internet blogs. Kabbalistic language, symbolism, and outlook are ubiquitous and kabbalah is studied on all levels whether or not one lives a traditional Jewish life and whether or not one is intellectually and spiritually competent to study kabbalah.

In North America, kabbalah is disseminated primarily through the mediation of Hasidism. Interest in kabbalah began to take root during

the counterculture revolution of the 1960s when young American Jews found the style of American suburban synagogues unappealing and sought new spiritual self-expression. Under the influence of Abraham Joshua Heschel (d. 1972), a scion of a famous Hasidic family, these spiritual seekers found their way to Hasidic and kabbalistic texts; some studied them academically and others began to search for a Neo-Hasidic interpretation of kabbalah fit for the sensibilities of a New Age. At the helm of the Jewish Renewal Movement was Rabbi Zalman Schachter-Shalomi (b. 1924), an original, creative mystic who encouraged the incorporation of kabbalistic symbolic terminology and the psychological interpretation of kabbalah. The movement continues to influence the spiritual life of American Jews, although it remains small in number.

Today, kabbalah has become a popular phenomenon in the USA, accessible to Jews and non-Jews alike, in part because of the outreach programs of one particular branch of Hasidism known as Chabad-Lubavitch. Founded by Shneur Zalman of Liadi (d. 1812), the grandson of the Baal Shem Tov, this brand of Hasidism was transported to the USA in the 1920s and was strengthened when Rabbi Joseph Isaac Schneerson (d. 1950) settled in New York in 1940 and began an aggressive outreach program to Jews. After the Holocaust, his son-in-law, Menachem Mendel Schneerson (d. 1994) intensified the outreach program through schools, youth camps, community centers, and "Chabad Houses" whose goal was to encourage Jews to lead an Orthodox Jewish life with the express intent of bringing about the messianic age. In these settings, Chabad emissaries introduce Jews to kabbalah as interpreted by the official teachings of the Chabad-Lubavitch movement, but with no interest in the history of kabbalah, let alone the relationship between kabbalah and non-Jewish culture.

Conclusion

Kabbalah is an important and creative body of teachings directed at fathoming the mysteries of God, the universe, and the Torah, which emerged

within rabbinic Judaism, evolved over time, and continues to shape Jewish life. Kabbalah also exerted a deep influence on Christianity through what became known as the Christian kabbalah. The esotericism that characterized the early kabbalistic teachings was breached by the mid-sixteenth century when its major canonic text was printed. Kabbalah enhanced and deepened Jewish religious life over the centuries, but it also gave rise to heresies such as Sabbateanism and Frankism. The relationship of kabbalah and science is complex and even contradictory. On the one hand, the excessive focus on textuality in kabbalah made its adherents uninterested in the study of the physical world, but on the other hand, the notion that the world was essentially a linguistic construct encouraged some kabbalists, especially during the Renaissance, to engage in alchemy, astrology, astral medicine, and talismanic magic because they claimed to know the basic grammar of reality. Today, kabbalah is attractive to many scientists, especially those interested in mathematics or information science, and psychology. In the beginning of the twenty-first century, kabbalah informs many aspects of contemporary Judaism in the Diaspora and in Israel and has infiltrated all aspects of popular culture.

Cross-References

- [Gnosticism](#)
- [Judaism: An Overview](#)
- [Kabbalah and Science](#)
- [Mysticism](#)
- [Myth](#)
- [Philosophy in Judaism](#)
- [Revelation in Judaism](#)

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Kabbalah and Science

- [Kabbalah in Judaism](#)

Kamma (Pāli)

- [Karma \(Buddhist\)](#)

Kamma/Karma

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Kamma (Sanskrit: *Karma*), which literally means “action,” is used by the Buddha only as “intentional action,” it might be a physical, verbal, or mental action. “It is motivation (*cetanā*), o monks, what I call kamma.” (“*Cetanā’ham, bhikkhave, kammaṃ vadāmi*”, Collection of Gradual Discourses, Aṅguttara-Nikāya, A VI. 63)

The mental factor (*cetasika*) *cetanā* is motivation, stimulation, intention, or volition. Only *cetanā* associated with unwholesome or wholesome types of consciousness is *kamma*.

While one performs intentional actions, a kammic energy is produced laying latent as a potential which can bring about its kammic result or fruit, called “*vipāka*,” later.

There are various types of kamma concerning its function, the priority of its ripening, the time of maturity, and the plane where it can produce its result. According to function, one of them is producing *kamma*, which produces a new life. Others can support, obstruct, or destruct this *kamma*. *Kamma* is often compared with a seed which has the potential to produce only a species of the same kind but only with present suitable conditions like water, Earth, Sun, etc. *Kamma* alone also cannot bear its effect, but it is the main cause of the kammic result. Results of kamma can be mental and physical.

Abhidhamma shows clearly that not all is *kamma*, and not all is *vipāka*, one’s fate. One performs new *kamma* during the impulsion stages (*javana*) of a mental process (*vīthi*) only (The mental process and its various stages as well as *kamma* are explained in Abhidhammattha Sangaha and its commentaries. See, e.g., Process of Consciousness and Matter, by Dr. Rewata Dhamma, Burmingham Buddhist Vihara, 2007 (<http://www.bbv.org>).

uk/), Triple Gem Publications. Free download: http://www.abhidhamma.com/Process_of_consciousness_and_matter.pdf). Other stages, like eye consciousness, are its resultant (*vipāka*). Not everything is determined – there is no fatalism, although our “free will” is limited.

Karma (Buddhist)

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Related Terms

Kamma (Pāli)

Description

The word karma means simply “action,” although in modern parlance it is generally used as a shorthand for *karma-vipāka*, the result of intentional action. In the ancient Indian setting, the Buddhist position on karma appears to have taken a middle path position between two standpoints. One of these two is karmic determinism, according to which the results of each and every action would have to be fully experienced. Hence, the path to liberation in traditions adopting this standpoint requires expiating the results of former deeds. The other standpoint appears to have denied the existence of karmic results and advocated that deeds have no consequences at all. Both are considered by the Buddhist tradition as mistaken views on the nature of karma.

From a Buddhist perspective, the key factor in the performance of a deed is one’s own mental volition (Morris and Hardy 1885–1900, III 415), since volition is what leads one to speak or physically act in a particular way. This invests the ethical quality of one’s own volition with crucial importance; hence, the dominant concern in early Buddhist thought is with mental culture and ways of training the mind.

The Buddhist conception of karma holds that one's deeds will inevitably have results. A stanza poetically proclaims that neither up in the sky nor deep down in the ocean will it be possible to escape the retribution for one's evil deeds (Hinüber and Norman 1994, Stanza 127). However, the form that such retribution takes is said to depend on the overall situation of the person in question. The same unwholesome deed will thus have a considerably stronger effect when it is performed by someone who habitually does evil, in contrast to someone who generally lives a wholesome life. This difference finds illustration in a simile of a lump of salt that is thrown into a cup of water or else into a river (Morris and Hardy 1885–1900, I 250). While in the first case, the water becomes undrinkable, in the case of being thrown into a river, the lump of salt hardly has any effect on the drinkability of the water.

Karma is, however, not the sole determinant of one's experiences, which besides being the results of former deeds are also the outcome of a variety of other factors (Feer 1884–1898, IV 230).

Another aspect of karmic retribution is that its effect may manifest in the present life as well as in future lives. This provides the background for appreciating the case of a serial killer by the name of Aṅgulimāla, who converted to Buddhism, became a monk and eventually reached full awakening (Trenckner and Chalmers 1888–1896, II 103). The fact that, in spite of his former criminal activities, he was able to reach complete awakening and become an arahant illustrates that, from an early Buddhist perspective, the gaining of awakening does not depend on expiating all the results of one's former deeds. Had a full experiencing of the fruits of his murderous activities been required, he would hardly have been able to progress to full awakening within a single lifetime. By becoming an arahant, Aṅgulimāla had gone beyond future rebirth and thus was able to avoid the retribution for his killing that would have awaited him in a future life, presumably to be spent in hell, had he not embarked on the path to awakening. All that he still had to experience was the retribution bound to ripen in his present life.

In order to fully appreciate the Buddhist teaching of karma, it needs to be considered in relation

to the not-self doctrine, which denies the existence of an eternal self (► [Anattā](#)). Instead of assuming an eternal and unchanging self at the core of subjective experience, Buddhism holds that the individual is made up of what are merely changing and conditioned processes. These processes continue during a particular lifetime and through subsequent rebirths. Thus, Buddhism does not reject the existence of an individual as a conditioned process – one of the central conditions operative in this process being precisely the results of karma – but only opposes the notion of an eternal substance or substratum.

From an early Buddhist position, the notion that the individual qua process is bound to change does not imply that it ceases and reappears every moment, as proposed during subsequent developments of Buddhist thought (► [Impermanence \(Buddhist\)](#)). Instead, the individual is simply seen as a changing process, perhaps best illustrated with the example of the steady flow of a river (Morris and Hardy 1885–1900, IV 137). Thus, future instances of the particular process that make up an individual will be the recipients of the karmic fruits of the actions done by the present and past instance of this particular individual process.

Unlike the basic principle underlying karmic fruition, the precise working out of karmic causes and effects are held by Buddhist tradition to be beyond the range of what can be ascertained by reflection, in the sense that it would not be possible to determine them with complete precision (Morris and Hardy 1885–1900, II 80). Presumably, too many causes and conditions are involved, making their interaction in a moment-by-moment changing situation something that cannot be predicted with exactitude. General patterns, however, can certainly be discerned. Thus, one discourse indicates that those who kill are in the future prone to be short lived themselves (Trenckner and Chalmers 1888–1896, III 203), just as harming others leads to being sickish oneself, anger results in ugliness, theft leads to becoming poor, etc. It is in this sense that, from a Buddhist perspective, living beings can be said to be the owners and heirs of their karma.

Cross-References

- [Creation](#)
- [Determinism and Indeterminism](#)
- [Free Will](#)
- [Reality in Buddhism](#)
- [Virtue](#)

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Key Stimulus

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The notion “key stimulus” belongs to a classical ethological concept. It refers to a stimulus (sign stimulus, releaser) that is adequate to activate an (innate) *releasing mechanism*. A key stimulus

represents a behaviorally meaningful object by a few characteristic features. The term “key” stimulus is based on the idea that the releasing features are analogous to a key which opens a lock. However, “key” may misleadingly suggest that the corresponding behavior were addressed just to *one* highly specific stimulus, so that the behavior failed to occur, if that unique stimulus were not available. Actually, no such case has been described. In fact, key stimulus comprises a category of objects. From this category, an object characterized by a certain feature configuration/combination has a maximal releasing value.

Kierkegaardianism

- [Christian Existentialism](#)

Kin Altruism

- [Altruism](#)

Kinetic Energy

- [Energy in Physics](#)

Knowledge, Sociology of

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Description

Studies in the sociology of knowledge share a common theme, *the social foundations of thought*: ideas, concepts, and belief systems share an intrinsic sociality explained by the

contexts in which they emerge. From its origins in German sociology in the 1920s, the sociology of knowledge examines how ideas (knowledges) emerge out of and are determined by the social contexts and positions (structural locations) of their proponents. More recently, its subject matter has included not only a society's authoritative ideas and formal knowledges, but also those knowledges that operate in the realm of everyday life, informal knowledges.

According to its framers, Max Scheler and Karl Mannheim, *Wissenssoziologie* was an empirical and historical method for resolving the conflicts of ideologies in Weimar Germany that followed the political and social revolutions of the late nineteenth and early twentieth centuries, conflicts grounded in competing worldviews and directed by intellectual and political elites. The new discipline reflected the intellectual needs of this era, to bring both rationality and objectivity to bear on the problems of intellectual and ideological confusion. In this sense, classical sociology of knowledge has been described as a field of study that reflected a new way of understanding "knowledge" within a modern and ideologically pluralistic setting: The approach defines a new situation, summarily described as "modernity," a world where knowledge and truth have many faces (modern relativism). What we believe that we know varies with the cognitive operations of human minds and these vary by community, class, culture, nation, generation, and so forth.

For Max Scheler ([1924] 1980) who offered the first systematic outline of the discipline, the *forms* of mental acts, through which knowledge is gained, are always conditioned by the structure of society. While Scheler's original essays provoked commentary and debate, it was Karl Mannheim's formulation of the discipline in *Ideology and Utopia* ([1929] 1936) that defined the subject matter of the field for years to come; critics and contributors to the field defined their positions relative to Mannheim's arguments concerning ideology, utopia, and relationism.

Mannheim's treatise begins with a review and critique of Marxism and proceeds toward a theory

of the total conception of ideology: the mental structure in its totality as it appears in different currents of thought and across different social groups. Like ideologies, "utopias" arise out of particular social and political conditions but are distinguished by their opposition to the prevailing order. Utopias are the embodiment of "wish images" in collective actions that shatter and transform social worlds. Both concepts form part of Mannheim's broad design for a critical but nonevaluative treatment of ideology, one that supersedes the sociohistorical determinism and relativism of Marxism while moving toward a "relationist" notion of truth. From an analysis of the various and competing social positions of ideologists and utopians, a kind of "truth" emerges that is grounded in the conditions of intellectual objectivity and detachment from the social conditions that more directly determine ideas. *Ideology and Utopia* established the criteria for a valid knowledge, a *relational* knowledge, of sociohistorical processes. It raised the problems surrounding the historicity of thought and did this within the newly emerging academic discourse of sociology, thereby giving legitimacy to a new set of methodological issues involving the problems of objectivity and truth for the sciences and the humanities. Despite the many criticisms of *Ideology and Utopia*, the work received wide attention and appreciation inside and outside the social sciences where the problems posed by relativism continued to attract the attention of those working in the sciences and the humanities.

Werner Stark's *The Sociology of Knowledge* ([1958] 1991) prompted an advancement and redirection of the field, arguing for the embedding of sociology of knowledge within the larger field of cultural sociology. The sociology of knowledge is concerned with the "social determination of knowledge," not with the problem of ideology. Stark's book clarified the principal themes of writers who addressed the problem of the social element in thinking. He also intended it to serve as an introduction to the field that would prepare the way for a comprehensive history of the sociology of knowledge: theories of ideology of Marx and Mannheim; philosophical

speculations of the neo-Kantians Heinrich Rickert and Max Weber; views of the German phenomenological school of the 1920s, especially Scheler. Stark's strongest affinity was with Scheler's struggle to reconcile the antithetical claims of idealism and materialism, and his view of the sociology of knowledge as the foundation for a knowledge of "eternal values."

Contemporary sociology of knowledge addresses a related but different set of concerns than those posed by its founders, and its subject matter extends beyond the problems of relativism and the social location of ideas and ideologies. Among its themes are the "local" features of knowledges and the study of their functions in everyday life. This redirection of the field represents a shift from concerns with the truth-status of ideas and ideologies to the concerns of a cultural sociology of meaning, a movement away from a study of the ideological functions of elites and intellectuals to conceptions of knowledges as discursive (cultural) forms and as part of the entire range of symbolic and signifying systems operating in a society.

The most prominent contemporary argument in the sociology of knowledge was Berger and Luckmann's *The Social Construction of Reality* (1966). It advanced the position that sociology of knowledge is compatible with a view of sociology as a humanistic discipline and, the related argument, that "human reality" is a "socially constructed reality." The work moved the field further away from the study of theoretical knowledge or ideas and toward the (pre-theoretical) knowledge that social actors draw from in everyday life. Their treatise also redirected the traditional theory of social determination of ideas by social realities: social reality itself is a *construct*. The authors proposed that knowledge and social reality exist in a reciprocal or dialectical relationship of mutual constitution. This work placed the sociology of knowledge on a new footing whose focus was the broad range of signifying systems that form and communicate the realm of social realities. Since its introduction, the idea of a "constructed reality" has summarized a number of concerns of writers in the sciences and humanities that may

be described as the *problem of meaning* and the use of philosophical, literary, and historical approaches to study its social construction. Berger and Luckmann's treatise subsumed knowledges within a framework of interpretation, a ► [hermeneutics](#) that was decidedly cultural and semiotic, concerned with the symbolic and signifying operations of knowledges.

More recently, the "new sociology of knowledge" (Swidler and Arditi 1994; McCarthy 1996) can be seen as part of this larger movement in the social sciences, distinguished by a turn away from materialism and social structure toward semiotic and post-structural (Derrida, Foucault, Deleuze) theories that focus on the ways in which a society's meanings are communicated and reproduced. Swidler and Arditi (1994) also ask how social organizations (e.g., the media) order knowledges, rather than examining social locations and group interests. In light of new theories of social power and practice (Michel Foucault and Pierre Bourdieu), they also examine how knowledges maintain social hierarchies and how techniques of power are simultaneously and historically linked to knowledges. They join others in pointing out that newer theories of power, gender, and knowledge depart from the economic, class, and institutional focus of the classical sociology of knowledge.

Proponents of the new sociology of knowledge do not claim that the subfield has been entirely superseded by newer work in sociology and cultural studies. However, they note that the new sociology of knowledge is not a unified field, an argument also advanced by earlier writers who treated the sociology of knowledge as a "frame of reference" rather than a body of theory in its own right. In fact, this broad approach to knowledges as socially constituted – delineated in the early statements of Scheler, Mannheim, and other early writers in this field – today serves as a set of working propositions for a range of social scientists as well as for specialists in other disciplines, including the subfields of the history of ideas, social psychology, social studies of science, feminist theories, and cultural studies. In fact, a sociology-of-knowledge perspective – concerning group life and mind – has been

incorporated into the many subfields of sociology as well as sister disciplines from anthropology to history. Furthermore, as long as knowledges are understood as preeminently cultural phenomena, the more likely it is that the sociology of knowledge will be seen as a broadly inclusive set of theories and studies rather than a subfield with a distinct subject matter. Knowledges operate across the full extent of society, from the realm of everyday affairs to the institutions of law, politics, art, and religion, to the various sites and fields where knowledges are produced. The new sociology of knowledge examines the observable properties of knowledges in texts, modes of communication, and forms of speech within specific institutional settings.

The sociology of knowledge – much like the field of historical studies – reflects and advances further a distinctly modern set of presuppositions about human knowledge: *Knowledges develop out of particular sociohistorical circumstances and these circumstances inform what human beings know and their various ways of knowing.* Whatever one thinks about this relativistic set of presuppositions, a sociology-of-knowledge perspective has come to dominate the modern disciplines, certainly the social sciences but also the humanities, as well as other specialized fields like law and medicine. Put differently, modern ways of knowing – those of academics as well as all of us in the domain of everyday life – are characterized by the understanding that what people know and what they think are, in important ways, circumscribed by language and culture and that these develop and flourish in human communities of one kind or another.

These arguments have special relevance for both science and religion in the modern world. Among the many implications of a sociology-of-knowledge perspective for understanding these two knowledge domains, the most general and important one is that *all knowledges are situated*. Regardless of the truth claims of religion, for example, religious ideas, images, and symbols develop out of particular social worlds. Eternal religious verities take on a life within particular religious communities. Similarly, science itself – whatever final claims it makes

concerning a domain of reality (the human brain, sleep, or sex) – understands the relevance of history and sociology to its own enterprise. Increasingly today, practitioners of both science and religion draw from a sociology-of-knowledge perspective whenever they examine the changing and situated paradigms that make up their own disciplines. However else they understand their field of study today, they have come to recognize the legitimacy of grasping religion or science as a particular *discourse* or as a *social construction*, ideas first formulated by Scheler and Mannheim in the classic statements of Wissenssoziologie, almost a century ago. All knowledges, they argued, are cultural phenomena and this means that they are burdened with the presuppositions of their time and place, their *situation* (Wolff 1974).

Cross-References

- [Coherentism](#)
- [Consciousness, the Problem of](#)
- [Epistemology](#)
- [Gnosticism](#)
- [Philosophy of Mind](#)
- [Science and Scientific Knowledge, Sociology of](#)
- [Secularization, Secularity, Secularism](#)
- [Theory of Mind](#)
- [Worldview](#)

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Koch's Postulates

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Robert Koch derived these postulates for determining microbial pathogenesis. These are as follows:

- The microorganism must be found in abundance in all organisms suffering from the disease.
- The microorganism must be isolated from a diseased organism and grown in pure culture.
- The cultured microorganism should cause disease when introduced into a healthy organism.
- The microorganism must be re-isolated from the inoculated, disease experimental host and identified as being identical to the original specific causative agent.

Koran

- [Islam: An Overview](#)
- [Qur'an](#)

Kurzweil

- [Robotics and Religion](#)

Labeling

► [Deviance and Social Control, Sociology of](#)

Landscape

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Related Terms

[Cosmology; Ritual; Temples](#)

Religions have persistent impact on the landscape they are situated in. The mutual integration of the cosmology and mythology of a religion with the geographical landscape alters believers' attitude towards both religion and landscape. The invisible, transempirical side of religion is supplemented by manifestations that make religion perceptually available for the believers. The visible, physical landscape manifests invisible aspects of religion, and thereby landscape supports religion as a shared and accepted part of human life. This mutual integration can take different forms (Hirsch and O'Hanlon 1995).

The landscape is organized by imposing meaning onto it through situating cosmology or mythological events in it, thereby establishing religious landmarks in the landscape that give

a cosmological order to it. Such places are often the location for rich ritual activity, sites of pilgrimage, or believed to be the location of a religious source of transformative power (Park 1994; Stump 2008).

Religious practices connected to these landmarks and other religious activities modify the landscape, either abruptly as when dolmens, temples, or other buildings are constructed or destroyed in order to build other ones or gradually as when pilgrimage routes slowly turn into proper roads, when religious institutions bring new crops or agricultural styles to a new area or the slow modification of rocks through the repeated touch by believers.

Landscape is demarcated according to religious maps, thereby enforcing certain restrictions and options for movements in the landscape. Temples, smaller areas, or sacred places may be off-limits to other than adherents of a certain religious tradition or only accessible for initiated religious specialists. Many of the conflicts between religious traditions in the world concern, among other issues, the conceptual and political control over territory (Bender 1993; Low and Lawrence-Zúñiga 2003).

The organization, modification, and demarcation of landscape are all parts of a process of the continuity of religions. Newborns inherit a world already constructed through religious practices, and as such the religious system presents itself as more natural than other religions. A foreign landscape may therefore be considered dangerous not only because the topological features like

mountains and rivers are different but also because they are imposed by other kinds of religious and cultural meaning. This landscape is unpredictable, since the religious and cultural system is unknown, and it is difficult to identify the demarcations and the landmarks. The religiously organized landscape also brings shared objectivity to the conceptual system of the given religion, since the landscape can be approached, perceived, and interpreted by groups of believers. The perception of the landscape is thereby informed by religious content.

Some religious traditions seek a very close connection between their cosmology, mythology, and rituals on the one side and the landscape on the other side, as when the gods are believed to live further up the mountain, below in the sea nearby, etc., or when rituals are performed in accordance with a calendar based on the sun's ascent or descent at a certain location in the horizon seen from a specific location. Such religious systems are necessarily local and small scale, and the religious conceptual system is likewise connected to the everyday life of the indigenous group. The religious conceptual system may provide locally relevant information, such as myths about the ancestors' ways of cultivating the land, rituals that seek to control the uncontrollable weather, or ideas that console in harsh conditions. Other religious systems de-emphasize the connection to landscape, striving instead for universal relevance of their belief system. The gods reside nowhere in particular and are best approached through construct places. These religions have better options for spread and distribution of ideas but may, as they spread, take on local forms in order to connect to new geographical landscapes.

Cross-References

- [Cosmology](#)
- [Ecology in Judaism](#)
- [Environmental Theology](#)
- [Geography in Islam](#)
- [Myth](#)

- [Pilgrimage](#)
- [Religion](#)
- [Ritual](#)
- [Space](#)
- [Space and Time](#)
- [Worldview](#)

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Language

- [Psycholinguistics](#)

Language and Literature, French

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Related Terms

[Linguistics](#); [Literary theory](#); [Philology](#)

Description

This discipline is devoted to the study of the French language and its literature from their origins to the present. Traditionally defined as a Romance language derived from Vulgar Latin

during the Middle Ages, French is spoken today by approximately 200 million people in over 50 countries around the world (Organisation internationale de la Francophonie 2007). Recent developments in this discipline reflect a shift in emphasis from the early periods and from France to the modern period and to French-speaking regions outside of France. For much of the twentieth century, the study of language was largely integrated with the study of literature. In recent decades, language study and linguistics have evolved away from literature, and literary studies have expanded to include Francophone studies, i.e., studies of texts written in French by authors from various French-speaking countries across the globe. Important subdisciplines within this field, as within other similar fields, include feminist and gender studies, film studies, cultural studies, critical theory, and foreign language pedagogy.

Self-Identification

Science

Within the field of French and Francophone studies, linguistics typically self-identifies as a science whereas literary studies are usually thought of as being opposed to science. According to French linguist André Martinet, “a study is said to be scientific when it is founded on the observation of facts and refrains from picking and choosing among the facts in the light of certain aesthetic or moral principles” (Martinet 1964). That literary studies are typically based on fictions rather than facts, and that the conclusions of literary scholars are often guided by aesthetic or moral principles are only two of the many reasons evoked in opposing literature to science, another of which being that, whereas science is said to destroy its past, literature conserves its history. Whereas new scientific discoveries make previous science obsolete, resulting in the removal of outdated books and journals from library shelves, literary works of the past are reprinted and studied as well as quoted by current authors.

Literary history nonetheless offers some notable exceptions to the commonly held notion of literature being incompatible with science. Literature of the French Renaissance includes several examples of “scientific poetry” which is said to stem from “a lyrical impulse both to praise and to caution against the awesome potentialities of human desire (*curiosité*) and thirst for knowledge (*science*),” and is referred to as displaying “an extraordinary variety of themes and styles, bringing together apparently unrelated ways of envisaging the universe: the scientific, the religious, and the magical, seen later as being at odds” (Wilson 1989). The effort to unite science and poetry is associated in the nineteenth century with the head of the Parnassian school, Charles Marie René Leconte de Lisle, who saw the poet as playing a “historical and scientific role in his attempt to rediscover for modern man the original sources from which all beauty and meaning proceed” (Denomé 1973). Renewed interest by scholars in the relation between science and literature during the final decades of the twentieth century is due, in part, to the influence of French philosopher Michel Serres whose work is characterized as running counter “to the prevalent notion of the two cultures – scientific and humanistic – between which no communication is possible. In Serres’s view ‘criticism is a generalized physics,’ and whether knowledge is written in philosophical, literary, or scientific language it nevertheless articulates a common set of problems that transcends academic disciplines and artificial boundaries” (Serres 1982).

Religion

Though not typically self-identified as a religion, French and Francophone studies can in many ways be thought of as bordering on religion. Leaving aside the broader question of language, the interpenetration of literature and religion can be ascertained from a variety of sources. The mixture of the sacred and the profane, which eighteenth-century critic Nicolas Lenglet-Dufresnoy associated with the earliest French literary compositions, is equally prevalent in works from later periods, as exemplified by

Gustave Flaubert's novel, *Madame Bovary*. French Romanticism is characterized by what Paul Bénichou has called the "consecration of the writer," citing Alphonse de Lamartine, Alfred de Vigny and Victor Hugo, who, beyond making religion a subject of their poetry, contributed to sanctifying the image of "the poet," whom they saw as accomplishing a sacred mission, and alternately referred to as a prophet, a teacher of peoples, and an interpreter of the divine word. The "consecration of the writer" in Romanticism from 1810 to 1830 is a manifestation of what Bénichou sees more broadly in the eighteenth and nineteenth centuries as the eclipsing of "the old religious system" by "a faith in which human beings, and not God, tended to occupy the primary position" (Bénichou 1999). From the 1830s forward, the rise of aesthetics in the face of what appears as a retreat of religion in modern democratic society can be traced in the writings of numerous authors, including Théophile Gautier and Charles Baudelaire, and is seen as culminating in Stéphane Mallarmé's conception of poetry as a substitute for religion, replete with its own mysteries and rituals.

While anxiety and religious faith remain a central concern for several prominent writers in the twentieth century, including Charles Péguy, Paul Claudel, and François Mauriac, the transfer of religion to the aesthetic domain is illustrated by Marcel Proust, who writes in a letter to one of his correspondents: "If I do not have the Faith, as you say, on the other hand the preoccupation with religious things is never absent even a day from my life." The "preoccupation with religious things" referred to by Proust is reflected also in recent works of nonbelievers, including writer and philosopher Michel Deguy, whose theory of "relics" is intended to give new meaning to what has become unbelievable: "The poet is someone who seeks a re-use for the great theologemes that made and were our great beliefs" (Deguy 2001). Outside of the specifically French tradition, religion appears as an essential question for twentieth-century Francophone writers, including Mongo Beti, Assia Djebar, and Ahmadou Kourouma. The ambiguities pertaining to modern

disenchantment are exemplified notably by Kourouma, as the demystification of African history associated with his novels is coupled with a sanctification of writing which he compares to priesthood (Ouédraogo 2000).

Characteristics

The distinctiveness of this discipline pertains to specificities that are at once linguistic, cultural, historical, and geographic. Today's linguists and Francophone scholars study the different forms of French and diverse literary texts from various countries that share a common history. As stated by Jean-Benoît Nadeau and Julie Barlow, "if French became not only a European but also an African, Asian and American language, it is because French became an important colonial power" (Nadeau and Barlow 2006).

In the eighteenth century, French was recognized as "the universal language." Responding to a question chosen by the Berlin Academy for its essay contest in 1783, Antoine de Rivarol attributed the status of French as the world's *lingua franca* to its clarity: "*If it's not clear, it's not French; if it's not clear, it's still English, Italian, Greek or Latin.*" The reputation of French as a language of exceptional clarity has been perpetuated by authors such as Paul Valéry, stressing its resistance to "composite word formations, facile agreements [and] arbitrary placement of words in sentences." And while having relinquished its former status as the universal language, which is presently that of English, French remains one of the official working languages of world organizations such as the United Nations and the International Olympic Committee.

As related to the area of "Science and Religion," the ideal of purity associated with the French language since the seventeenth century may be viewed in an anthropological or a religious light. Nadeau and Barlow compare purism to "a religion" uniting speakers of French, and refer to the French Academy, whose history is synonymous with that of purism, and whose chief function is to produce a dictionary, as being all about

“consecration”: “If a word enters the Academy’s dictionary, its use is indeed ‘consecrated’” (Nadeau and Barlow 2006).

Relevance to Science and Religion

Scholars of French and Francophone literature and culture often see their discipline as related to religion. A smaller but growing number focus on the relation of literature with science. Seen in a broad perspective, this discipline appears intimately connected with the scholarly area called “Science and Religion.”

The publication of Denis Diderot and Jean le Rond d’Alembert’s *Encyclopedia* during the 1750s became the subject of a controversy in which the philosophical (or scientific) “search for origins” was at odds with the mysteries of religion. Authors such as Voltaire and Paul-Henri Thiry d’Holbach similarly pursued a rationalist critique of religion that was widely echoed in the literature of the late eighteenth century and in the oratory of the French Revolution. The Enlightenment debate opposing philosophy and religion resurfaces during the nineteenth century, for instance, as parody in Flaubert’s *Madame Bovary*, where the priest Bournisien and the pharmacist Homais reflect the waning of belief and the rise of science, or as part of avant-garde aesthetics in Baudelaire, whose critique of faith in scientific progress is coupled with a reflection on religion that should be understood as scientific. The assertion that “nothing upon earth is interesting except religions” is made by an author whose religious views are unorthodox, if not heretical, and for whom the “fanaticism of humility” consisted in “not even [aspiring] to understand religion.”

The pairing of scientific inquiry and religious uncertainty in twentieth-century French novels such as Samuel Beckett’s *Molloy* and Michel Houellebecq’s *The Elementary Particles* is indicative of a spiritual impoverishment that is felt not only in France, but also in other parts of the French-speaking world. Complementing Kourouma’s famous assertion that the suns of Independence “not only unmanned, but also

unmagicked Africa,” late twentieth-century women writers Véronique Tadjo and Werewere Liking respond to the seeming disappearance of traditional belief systems in urban Africa by advocating a return to ritual.

Sources of Authority

The sources of authority for the study of French language and literature are, firstly, literary texts from the Middle Ages to the twenty-first century. In recent decades, attention in this discipline has shifted from strictly literary texts to focus on other media, including newspapers, comic strips, radio, film, and television.

To ask what makes these sources authoritative is to pose the question of canonicity which has been a subject of considerable debate, particularly within American universities, since the 1960s. While critics of the traditional French literary canon typically point to the exclusion of women and minorities, its defenders appeal to the notion of aesthetic value. In light of the preceding section, “[Relevance to Science and Religion](#),” the late twentieth-century literary debate can be seen, as an extension of Enlightenment philosophy’s critique of religion. Just as philosophers questioned the authority of the Holy Scriptures, for instance, in opposing the four canonical Gospels to the apocryphal Gospels, modern literary scholars have questioned the authority of texts they consider to have been arbitrarily imposed to the exclusion of others. In our post-Enlightenment societies, the process of desacralization is more obvious than the opposing but often complementary process of resacralization. That the critique of the established canon is articulated in rational terms may keep us from seeing that the establishment of new canons, or anti-canons, is part of an ongoing “religious” process.

Ethical Principles

The ethical principles that guide this discipline can be placed under the heading of beneficence.

While particularly identified with subdisciplines devoted to advancing the causes of social justice and cultural diversity, such as Francophone studies, feminist studies and gender studies, the discourse of “doing good” is frequently adopted as well by professors of literature and pedagogy. That the rise of moralism (or of utilitarianism) within this discipline has coincided in recent decades with a shift away from literature may be thought of, not as an arbitrary development, but as relating to traditional discussions of literature and morality. The notion that literature would serve the cause of good is antithetical to a tradition exemplified by Baudelaire, who admired Pierre Choderlos de Laclos and the marquis de Sade for their portrayal of evil, or André Gide who said that good sentiments make bad literature. More recently, philosopher Jean-Pierre Dupuy has wondered whether our scientific culture based on rationalist principles has forgotten evil, and Michel Deguy has argued that teaching the knowledge of evil is specifically the role of literature.

Key Values

For most of the twentieth century, the key values of this discipline were the notions of social progress, scientific reason and cultural refinement comprised in what was referred to as “French Civilization.” As explained by Tyler Stovall and Georges Van Den Abbeele, the word *civilization*, “first coined in the eighteenth century by the philosopher Mirabeau to indicate both the reality of organized society and the ideal of human progress, took on what Jean Starobinski has termed a ‘sacred authority’ during the period of the French Revolution and afterwards” (Stovall and Van den Abbeele 2003). Whereas the exportation of French cultural values and intellectual traditions was “institutionalized by the colonial school systems seeking to advance France’s ‘civilizing mission’ throughout its empire,” with the rise of postcolonial and Francophone studies in recent decades, the authority and the objectives of “French Civilization” have been called into question. While continuing to embrace

Universalist Republican principles of social progress, proponents of *la Francophonie* emphasize the consciousness of belonging to an international community and respect for cultural differences.

Conceptualization

Nature/World

This discipline defines nature as, for instance, the phenomena of the physical world as opposed to human beings and human creations or the whole natural world including human beings. Considered in classical aesthetics as a model to be imitated by art, nature takes on new significance in Romanticism where its diversity and immensity are seen as a reflection of the human soul. The scientific “study of nature” characteristic of nineteenth-century realism and naturalism stands in contrast to the predominance of mystery in symbolism. Opposing scientific and religious views of nature are equally prevalent in twentieth-century literature.

Human Being

The term *human being* (*être humain*) was traditionally synonymous with *man* (*l’homme*), defined as a rational being, and referring either to particular individuals irrespective of sex, or to the human race or species personified as an individual. In keeping with modern values inherited from the French Revolution, this discipline typically conceives of human beings in terms of individual rights and social justice. After the French National Assembly’s *Declaration of the Rights of Man* in 1789, Olympe de Gouges published a *Declaration of the Rights of Woman*. The influence of feminism during recent decades has resulted in the gendering, or ungendering, of language pertaining to individuals in accordance with modern egalitarian ideals.

Life (and Origins of)/Death

The conception of life as depicted in literary works varies widely according to the period, the culture, and the beliefs of a given author.

Historian Philippe Ariès relies extensively on references to French literature in outlining a shift in Western attitudes from the Middle Ages when death was communal and public in character to the twentieth century when death had become more private and discrete. Eulogizing Hugo upon his induction into the French Academy in 1887, Leconte de Lisle attributes what he refers to as Hugo's disdain for scientific attempts "to explain the origins of life" to his faith in the "arbitrary dogmas" of religion.

Reality

An illustrious line of modern French writers have sought to question and reinvent our understanding of reality. Proust's observation on the style of Flaubert, who, "by his entirely new and personal usage of the past definite, the past indefinite, the present participle, and of certain pronouns and prepositions," is said to have "renewed our vision of things almost to the same extent as Kant, with his Categories, renewed our perception of the reality of the external world" is echoed in the writings and theories of later experimental authors, including those associated with the *Nouveau Roman* in the 1950s.

Knowledge

This discipline usually conceives of knowledge as corresponding to areas of specialization that are defined either historically (i.e., as relating to a period or century) or geographically (i.e., in terms of a country or region). The knowledge of literature associated with fields of expertise is, nonetheless, distinct from the question of knowledge in literature. With respect to knowledge, literature is often contrasted with science in ways that recall the opposition of science and religion. If, for instance, literary knowledge appears questionable from a scientific perspective, the foundations of scientific knowledge have also been questioned by literary, and particularly postmodern, critics. The association of knowledge with initiation rituals pervades a wide array of French and Francophone literary texts from the eighteenth century to the present.

Truth

The first definition of the word *vérité* in the original edition of the *Dictionary of the French Academy* (1694) is: "First truth, the essential truth. God is the principle of all truth." The second definition is: "Conformity of what one says or thinks with what actually is." In the fifth edition of this dictionary in 1798, the order is reversed. The first definition of *vérité* is: "Conformity of the idea with its object." The theological meaning is mentioned only later, along with several other meanings, including an aesthetic meaning used in referring to painting or poetry. The erosion of essential or divine truth during the eighteenth century is followed in the nineteenth century by its recuperation in literature, notably with Hugo and Baudelaire. Late twentieth-century critical theories, from structuralism to postmodernism, emphasize the arbitrariness of sign systems in rejecting the notion of absolute truth.

Perception

Examining and redefining modes of perception has been a main preoccupation in French and Francophone literature, particularly since the beginning of the twentieth century. In *Remembrance of Things Past*, Proust adopts a narrative technique which he attributes to Madame de Sévigné and Dostoevsky. "Instead of presenting things in their logical sequence, that is to say beginning with the cause," these authors show us "first of all the illusion that strikes us." Nathalie Sarraute would later borrow the term "tropisms" from biology to describe "certain interior actions," "the indefinable movements that slip by very rapidly at the limits of our consciousness," and which are "at the origin of our gestures, of our words."

Time

A variety of literary texts, from Romanticism through the twentieth century, reflect an opposition between traditional notions of cyclical time and the modern Western idea of linear time. Kourouma's *The Suns of Independence* is punctuated by references to cyclical time, which is the time of myth and ritual associated with the

main character Fama's place of origin, Togobala, in contrast with the anonymous westernized "capital city." The contrast of linear and cyclical time is, moreover, contained in Kourouma's title, as the Malinke expression, "the suns of Independence," evoking the cycles of nature, corresponds to the historical "era of Independence" in French. A similar juxtaposition of cyclical and linear time linking myth and ritual to a rural place of origin is found in Gérard de Nerval's novella *Sylvie*.

Consciousness

The French word *conscience* is translated into English either as *conscience* or as *consciousness*. The philosophical sense (that is, *consciousness*) referring to the awareness of one's existence, as distinct from the preceding moral sense, dates from the Enlightenment, and is particularly associated with the writings of Rousseau. A variety of nineteenth- and twentieth-century aesthetic theories explain literary creation as a process of bringing the unconscious to consciousness. The word *consciousness* is used by critics in Francophone studies and cultural studies in reference to race, gender, and alterity.

Rationality/Reason

Rationality and reason are particularly associated with Enlightenment philosophy where reason, understood as a mental faculty or as a guiding principle, is routinely opposed to faith and religion. As stated in the article "Philosopher" from Diderot and d'Alembert's *Encyclopedia*, "Reason is to a philosopher what grace is to a Christian. Grace impels the Christian to act, reason impels the philosopher." The reliance on reason in the Enlightenment critique of religion results not only in the de-Christianization of French society but also, paradoxically, in the sacralization of "Reason," notably as the object of an official cult during the French Revolution. The questioning or rejection of Enlightenment rationality pervades modern literary movements from Romanticism to Surrealism and has more recently been associated with postmodern philosophy.

Mystery

The attitude of eighteenth-century French philosophy, which viewed mystery not as something incomprehensible, but rather as something which has not yet been understood, is epitomized by the opening sentence of Diderot's *The History and the Secret of Painting in Wax*: "Nothing is more contrary to the progress of knowledge than mystery." The later appropriation of mystery in aesthetics, for instance, by Mallarmé – who wrote that "whatever is sacred, whatever is to remain sacred, must be clothed in mystery," and that "art has its own mysteries" – is considered not as a reaction against, but rather as a consequence of, scientific progress, with art appearing as a substitute for religion in a disenchanted world.

Relevant Themes

The evolution of French language and literature from the Middle Ages to the present reflects a variety of different phases in the thinking of French speakers with respect to science and religion. Additional relevant issues, themes, or concepts within this discipline are virtually limitless. From the historical perspective outlined in this article, magic appears as a particularly important issue. Depending on the period, magic is opposed to science and associated with religion, or associated with science and opposed by religion. The waning belief in magic during the Enlightenment parallels the rise of its metaphorical usage in art criticism and literature.

Cross-References

- [Aesthetics \(Philosophy\)](#)
- [Critical Theory](#)
- [Cultural Studies](#)
- [Magic](#)
- [Myth](#)
- [Poetry](#)
- [Rationality \(Philosophical\)](#)
- [Ritual](#)

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Language and Literature, German

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Related Terms

[German philology](#); [German studies](#); [Germanistik](#)

Description

The discipline has a double focus of interest: It deals with both the material of human utterance and its results. The linguistic approach bears close resemblances to sciences like anatomy, neurology, statistics, or geography, while the

study of literature is related to art history, cultural studies, and literary criticism. The hermeneutic challenge of literature unites the scope of the field of study with the problems discussed in the classical philologies, philosophy, and theology. The discipline as a whole draws on specific subdisciplines (rhetorics, poetics, emblematics, codicology, etc.). Moreover, it is linked to neighboring fields, such as cultural, historical, artistic, theological, or linguistic studies.

Founded in the early nineteenth century (initiated by Jacob and Wilhelm Grimm in the framework of German Romanticism and Nationalism), the field of study was historically oriented and aimed in a distinctly antiquarian manner at reconstructing “das deutsche Altertum” (*German antiquity*). Since then and especially in the postwar twentieth century, scholars have taken up new issues and widened their perspectives. The linguistic part of the discipline analyzes the systematics of the German language in respect to articulation and writing (phonology, orthography) and of its components, words (morphology) and sentences (syntax). The production and communication of meaning are investigated in terms of semantics and pragmatics; the components of the German language are examined by lexicography, phraseology, and dialectology. All these aspects are treated in synchronic view as appearing in certain historical periods or regional and social variants, as well as in diachronic development from Indo-Germanic roots to present German within certain language families (Weimar 1989/2003; Gardt 1999).

Reflecting the historical evolution of their subject, larger university departments of German language and literature are mostly divided into at least two subdepartments, mediaeval (and sometimes Renaissance) studies and Neue deutsche Literatur (“new” referring to the evolution of Neuhochdeutsch, the present German, which basically emerged at the beginning of the Renaissance).

As migration movements have increased, the didactics of German language and literature have widened their focus and explored teaching techniques for younger and older learners whose first

language is not German. This has led to a still growing number of departments for German as a foreign or second language.

After the entanglement of the discipline in fascist ideology during Hitler's reign (welcomed by many Germanisten as a proof of usefulness of their studies (König 2003)), postwar scholars developed new approaches to the study of German language and literature, including Europeanness, structuralism, social history, intertextuality, psychology, and psychoanalysis. These developments coincided with a similar paradigm change in the humanities in general. Recent research intensively draws on theories elaborated in cultural studies. Media studies investigate the history of text circulation ranging historically from orality to electronic virtuality. Indeed, there is a strong interest in all forms of culturality, especially gender constructions, relation of identity and otherness, and consequences of the performative turn (Bachmann-Medick 2009) for our understanding of language and its artifacts. The themes discussed at the last international congress for German language and literature (Paris 2005) ranged from Jiddish via German as a foreign language, empirical basis of grammar research, cultural studies as opposed to classical philology, migration, media, national vs. global cultures, cultural topographies, gender as cultural conflict, and classicisms to the Europeanness in and of German literature (2007/2008).

Self-identification

Science

For the study of German language and literature, there is no clear distinction between science and religion but an interwoven relationship. Basically and normatively, modern philology in general is the product of academic diversification during the Enlightenment, when theology lost its potential as the leading discipline. Focusing on German antiquity, first German philologists had to find, understand, edit, and comment on religious texts for lack of others. However, they were not applying religious but historical and philological

tools. Nevertheless, all vernacular-based new philologies drew heavily and exclusively from the apparatus of biblical scholarship in using the techniques of securing, editing, and commenting on texts. Moreover, it was the transfer of religious thinking to secular objects that brought about the modern hermeneutics of art.

Characteristics

By definition, the discipline concentrates on German language and literature or, in a broader sense, on German culture, as opposed to other language-oriented studies within the humanities. Historical and systematical research on German cannot be achieved without a comparative look at other languages and cultures. Therefore, German studies have to investigate not only the linguistic and literary influence of neighboring modern European cultures but also the Greek and Roman classics that shaped European knowledge and art. At present, language interference and German immigrant writing, especially from Islamic background, are matters of growing interest. The close relation to other modern philologies and the almost identical scholarly activities have led to a constant interdisciplinary discussion of problems and methods and to a still growing international, if not yet intercultural, exchange of trends.

Relevance to Science and Religion

Except for linguistics with its tradition of experimental and empirical research, scholars in the German-speaking countries seem to shy away from dealing too closely with hard sciences like neurobiology or brain research. Here, the distinction between the traditional concept of "Geisteswissenschaften" (humanities) and, as opposed to, "Naturwissenschaften" (sciences), expounded by Wilhelm Dilthey in the nineteenth century, still influences the view of these as two different academic cultures, Geisteswissenschaften being postulated as a corrective of the (moral, ethical, philosophical) shortcomings

of hard sciences: “Je moderner die moderne Welt wird, desto unvermeidlicher werden die Geisteswissenschaften” (*the more modern the world, the more necessary the humanities*) (Marquard 1985/1986).

On the other hand, scholars were for long periods equally reluctant to deal with religious matters. The Weimar classics propagated and created literature on the basis of “idealistic” art and aesthetical autonomy, which meant a strict refusal of all attachments outside of art itself. After the deep contamination of the discipline with Nazi ideology, “ideological” texts of all sorts were a no-go area for at least the postwar generation of scholars (Conrady and Polenz 1967). Meanwhile, the cultural turn has drawn new attention to how art is intermingled with religion and ideology and facilitated a more flexible and pragmatic approach to all texts, producing what we call meaning and cultural orientation.

Sources of Authority

Like elsewhere in the scientific community, high quotation scores generate authority. It is assumed that the impact of publications correlates with the importance of the journal or the publishing house. At the same time, there are distinctive networks propagating certain fields or approaches and competing in their aim to establish their ideas as a new state of the art. Research funding is usually granted to those projects drawing on emerging theories in the humanities. This means that theoretical debates stimulate research quite directly, at least in the German-speaking countries with their system of almost exclusively public research funding.

Ethical Principles

German studies respect individual authorship of text and thought to the point that coauthorship in research is rather the exception than the rule. Presumably, this owes also to a certain individualism scholars still tend to cherish. A strong

awareness of the fact that the academic field was playing a major part in spreading Nazi ideology in the field of education has led to changes in German studies that brought the discipline closer to the other modern languages and their achievements.

Key Values

The discipline is guided by philological accuracy in relation to the text and historical precision with regard to its origin and its communicative circumstances. Scholars have to keep in mind the relation between text and speaker (or, in literature, author) and between text and media and the encoding of the text. Their research is bound to exactness in applying the methods and terms of the discipline. Great attention lies on the fact that languages shape and transport social constructions like gender or history.

Conceptualization

The linguistic branch of the discipline regards nature as the organic, neurological, and environmental condition of human speaking. Literature, by contrast, depicts *world and nature* as products of human apperception and its cultural representation. In explaining the relation between comprehension and utterance, the discipline applies the means of philosophical and anthropological models (I. Kant, S. Freud). Language and literature form a central part of the social construction of meaning and of cultural identities. The study of German language and literature has helped to shape and foster the concept of *Deutschtum* (“*Germanness*”) from Romantic nationalism via Nazi misuse of language and art to German reunification and the search for a cultural identity within the European union.

As language and literature deal with the basic facts of *human existence*, this includes deliberations on *life and death*. Death plays a central role in German literature from the mediaeval Dances of Death to authors of our days (e.g., Thomas Bernhard, Hermann Burger, etc.), which can be

traced back to the fact that Christian religions shaped the culture of central Europe.

The questions whether and, if so, how art can depict *reality* have been central to art theories since Greek and Roman antiquity. Discussing these issues under the heading *mimesis*, the German debate has led to a specific development. G. E. Lessing stressed the difference between the visual arts and drama and promoted the idea of educating the theater public by training their ability to perceive compassion in others. Friedrich Schiller, on the other hand, argued that reality was to be esthetically transformed. His concept, which became known as “*Idealisierungskunst*” (*idealizing art*), opened the way for the Classical period of German literature around 1800.

In the twentieth century, the so-called linguistic turn (Bachmann-Medick 2009) has linked *knowledge* to the conditions of language structures that provide the pattern of utterance. This nominalist concept can be traced back to at least the nineteenth century in the German philosophical tradition, when Friedrich Nietzsche spoke of *truth* as “*ein bewegliches Feld von Metaphern*” (*a moveable field of metaphors*) (Nietzsche 1967). At present, it seems to be rather uncontroversial to conceive of truth as a discursive effect engendered by certain historical and generative rules open to scientific reconstruction (Brandt 2004).

The discipline concentrates on visual and acoustical *perceptions* generated by the respective media. Hence, German studies deal with the history of listening and reading, of speaking and orating not only in printed media but also in folk songs and libretti. Tactile perception is considered less important, although human heartbeat and breathing are elements of the phenomenon of metrically organized poetical expression.

In relating their findings to the concepts of *time*, *human being*, and *human consciousness*, scholars have adapted the models of historical and scientific research.

While both language and literature draw not only on reason but also on sources that elude rational control, science is considered to rely solely on *reason and rationality*. Putting aside

in presentations, papers or books is looked upon as unscientific sentimentalism, dilettantism, or partiality. *Mystery* plays no role in German academic discourse but as an effect is used in popular and trivial literature since the late eighteenth century. Unsolved problems of understanding in language and literature are regarded either as still to be elucidated in future research or as part of the uncertainties language produces on principle, and even more so in works of art. The former is the position of classical modernity relying on the progress of knowledge, the latter the understanding of postmodernism and post-structuralism.

Cross-References

- [Aesthetics \(Philosophy\)](#)
- [Classics](#)
- [Cultural Studies](#)
- [Education, Sociology of](#)
- [European Studies](#)
- [History of Ideas \(Intellectual History\)](#)
- [Humanities](#)
- [Judaic Studies](#)
- [Philosophy of Language](#)

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Language and Literature, Hebrew

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Related Terms

[Ben Yehudah, Eliezer](#); [Biblical Hebrew](#); [Hebrew Bible \(Old Testament\)](#); [Hebrew literature](#); [Jewish identity](#); [Medieval Hebrew](#); [Modern Hebrew](#); [Rabbinic Hebrew](#); [Sacred language](#); [Semitic languages](#)

Description

Hebrew is a Semitic language which developed in the Near East during the latter half of the second millennium B.C.E. in an area between the River Jordan and the Mediterranean known as Canaan. The language is named after Ever (Eber, Genesis 11:14), a biblical ancestor of Abraham, the patriarch who would become the father of the Hebrew/Israelite/Jewish nation.

Hebrew was defined and accepted as a sacred language by its earliest practitioners and scribes as it was viewed as the language spoken by the Biblical God when creating the world and when communicating with the people of Israel, their leaders, their prophets, and the occasional lay people who were chosen to carry forth a divine plan. As a sacred language, it was used in liturgy

and for the expression of doctrine, thus becoming the holy language of Judaism and its practice.

However, evidence suggests that Hebrew served from its inception as a vernacular, spoken language, as well as the written language of the Hebrew Bible (Biblical Hebrew). In both functions, the language played an important role in shaping the identity and the culture of the Jewish people. This phenomenon continued as Hebrew served not only as the daily language in the Land of Israel until the destruction of the Second Temple (70 C.E.) and the final exile by the Romans in 135 C.E. (Rabbinic Hebrew) but also as a language that followed Jews into their places of exile. Throughout Jewish existence in the diaspora, which would last until the creation of the modern State of Israel (135–1948 C.E.), Hebrew maintained its functions as a sacred language expressing the being and the essence of a monotheistic God, a language of prayer and ritual, a legal language, and a language of commerce connecting the Jewish communities throughout the world. Medieval times witnessed the use of Hebrew as a language of philosophy, poetry, and literature (Medieval Hebrew), while modernity and Jewish nationalism inspired a return to Hebrew as the renewed marker of a political and cultural entity bound by a shared language (Modern Hebrew).

This history that spans more than 3,000 years also contains constant exposure to the languages of the peoples wherein the Jews dwelled. Linguistic evidence, however, indicates that Hebrew remained substantially the same language in its morphology, phonology, and syntax throughout the years. The Hebrew which is used today in Israel derives its structure and vocabulary from all the periods preceding the creation of the modern State of Israel and its expansion and development through a revival movement driven by the man considered the father of Modern Hebrew language, Eliezer Ben-Yehudah (1858–1922).

Hebrew Literature

The range of literary genres found in the Hebrew Bible enabled the creation of both secular and

religious literature throughout Jewish history, despite the interruption of the function of Hebrew as a vernacular. Included in the 24 books of the Hebrew Bible were not only mythical stories such as The Creation of the World and the Flood but also the story of the Tower of Babel that explained the existence of languages other than God's original one (*Genesis* 11). Erotic poetry found its place in the *Song of Songs* (The Song of Solomon); wisdom literature in *Job* and *Ecclesiastics*; historical tales in *Chronicles*, *Ezra*, and *Nehemiah*; prayers and hymns in *Psalms*; law and theology in *Exodus* and *Leviticus*; and pathos, revelation, and redemption literature in *The Prophets* and in the Apocryphal *Dead Sea Scrolls*.

Rabbinic literature added commentaries and extrapolations of Biblical texts to the canon of Jewish literature, as did Medieval writers who also wrote scientific, mystical, and philosophical treatises in Hebrew. Enlightenment and modernity led to the revival of secular literature which included poetry, prose, and even drama, leading to the revival of the vernacular. The relationship between Jews and their language now included the seeds of aesthetic as well as religious experiences.

Hebrew was and still is a subject of linguistic, theological, historical, and literary inquiries because of its unique position as the original holy language of monotheism. The study of Hebrew grammar, syntax, and morphology is pursued by scholars and believers alike striving to glean meaning from sacred texts that shaped Judaism as well as early Christianity and Islam. The Hebrew alphabet became a signifier of contents believed to be hidden and theologically significant to pursuers of mysticism. Modern researchers engage in contextual (Aaron 1990, 2000), comparative (Saenz-Badillos 1993), and historical inquiries (Rabin 1969–1970; Weinberg 1981; Kutscher 1982). *The Academy of the Hebrew Language in Israel*, which was founded in 1953 to provide a continuing supply of (renewed) vocabulary as well as control over pronunciation and grammar, still publishes word

lists approved by its members (<http://hebrew-academy.huji.ac.il/english.html>). Contemporary Israeli artists engage in creating visual, plastic, and theatrical representations of their relationship with the constantly evolving language and its roots in the sacred (Aviv, Nurit: *Langue sacrée', langue parle'*) (<http://www.cinemotions.com/modules/Films/fiche/36361/Langue-sacree-langue-parlee.html>).

Sacred and secular, contemporary and ancient, the Hebrew language continues to evolve and engage native speakers as well as curious outsiders, striving to understand and define its impact on Jewish and Israeli identities as well as on Western culture.

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Language and Literature, Spanish

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Related Terms

[Linguistics](#); [Literary theory](#); [Philology](#)

Description

Spanish language and literature, broadly defined, have a long history of engagement with religious and scientific thought. The Iberian Peninsula was an important Roman colony and home to well-known scholars of Antiquity including Seneca. The Middle Ages witnessed a cultural flourishing in Iberia marked by significant advancements in literature, language study, and in scientific and religious thought, producing some of the most influential Arab and Jewish thinkers of the period. Medieval and early modern Christian leaders and scholars, in both the Iberian Peninsula and beyond, were deeply indebted to the work of these Muslim and Jewish scholars from Spain, and their interpretations of and original writings based on the ideas of Aristotle bear the mark of these earlier generations of Arab and Jewish philosophers and exegetes. The age of Spanish imperialism and conquest (sixteenth–eighteenth centuries) is characterized by the humanism of Western Europe, but also the realities, aspirations and even anxieties of imperial expansion, framed by many Spanish intellectuals of the period as an expression of the will of God. The early modern period also witnessed advances in the study of the Spanish language, as it became a tool for proselytization in new colonial territories. The fall of the Spanish Empire and loss of its colonies provoked a profound crisis in Spanish intellectual circles, and many Spanish thinkers of

the nineteenth and early twentieth centuries looked to the literary production of earlier periods both for the reasons of the waning of Spanish political and cultural influence and for the creation of a modern national “Spanish” European identity. Nineteenth- and twentieth-century intellectuals in the former Spanish colonies of Latin America adopted the discourses of the European Enlightenment as they forged literatures of independence. The twentieth century is defined in Spain by the fascist dictatorship of Francisco Franco and much of the literary production of the period reflects his vision of an orthodox Catholic nation. Since Franco’s death in 1975 religion has played a significantly lesser role in Spanish literature as Spain has taken the forefront among European nations in innovative scientific research. However, increased immigration from Africa, the Madrid train bombings of 2004, and Spanish involvement in Iraq as an ally of the USA precipitated a pro-Christian, anti-Islamic reaction among some Spanish scholars and in public discourse.

Self-Identification

While until the twentieth century scholars working on Spanish cultural production did not (necessarily) divorce language study from literary studies, today the study of Spanish language and literature is conducted in large part by experts trained on the one hand in linguistics or, on the other, in literary and cultural studies. The former study the formal aspects of the Spanish language, its development, dialectical and regional differences, and the social contexts of its speakers. The latter specialize in the literary productions of specific regional or national literatures in Spanish (e.g., Latin American, Peninsular, or more specifically Argentine, Mexican, etc.), and their training is based on philological textual criticism and/or literary theory and cultural studies. Today linguists who specialize on the study of the Spanish language generally identify their work as scientific, and their scholarly inquiries are based

on the scientific principles of linguistics, while literature scholars generally self-identify as nonscientific, and align themselves with the humanities and arts. However, this has not always been the case, and many of the pioneers of the study of Spanish language, literature and history, such as Marcelino Menéndez y Pelayo, Claudio Sánchez Albornoz, and Ramón Menéndez Pidal, conceived of their studies of early Spanish literary works and history as scientific (positivist and teleological) – an attitude they shared with European intellectuals of the nineteenth and early twentieth centuries in France and Germany. Even today in Spain literary studies are often considered scientific in nature, as evidenced by the existence of the prestigious Consejo Superior de Investigaciones Científicas (CSIC), a state agency designed to foster scientific and technological investigation and that is a major economic and cultural contributor to Spanish literary scholars and linguists. The CSIC has its origins in and remains closely identified with the Centro de Estudios Históricos directed by the philologist Ramón Menéndez Pidal.

Relevance to Science and Religion

In earlier periods, particularly in the twelfth through sixteenth centuries, language use and literary production in Spain was often determined in large part by religious identity. The theological debates of the Middle Ages, which often engaged the role of the natural sciences (astronomy, physics, and math) in society, found expression in all the major languages of the Peninsula and in a number of what we would consider literary texts, including prose fiction (Arabic *maqamat* and Romance *libros de caballerías*), poetic and song texts (*diwan* and *cancioneros*), and didactic treatises (Arabic *risalat* and Latin *ars*) etc. Muslim scholars writing in Arabic, such as the eleventh century writer Abu Muhammad ‘Ali ibn Ahmad ibn Sàid Ibn Hazm (994–1064) were familiar with the beliefs of Iberians of other confessional identities, particularly Jews and Christians. Ibn Hazm, who lived through the final years of the Umayyad caliphate in Cordoba

and witnessed the political upheavals that followed, engaged in a debate with the learned Jewish courtier and writer Samuel ha-Nagid over the positive and negative aspects of Judaism and Islam. Ibn Hazm also composed a treatise on the history of religion, *The Book of Religions and Sects* – a work that has survived and is considered one of, if not the first comparative study of religion. Both Ibn Hazm and Ha-Nagid are considered today as two of the foremost poets of Iberia during the Middle Ages. During the Taifa period of the twelfth century while the caliphate fractured into many smaller regional kingdoms or Taifas, the newly popularized rhymed prose *maqamat* often explored points of religious doctrine by repeatedly confronting the protagonist (and thus reader) with a dilemma that forces him/her to examine the nature of organized religion and belief (e.g., fictional accounts of street preachers fleecing the ignorant populace or repentant holy men imbibing in taverns) and the more weighty and abstract points of dogma (e.g., the role of free will and/or predestination). The latter was a topic of much debate among Arabic theologians, and particularly so for the group known as the Brethren of Purity who had many adherents in the Taifa kingdom of Zaragoza. Even after the more fundamentalist Almoravids and Almohads invaded the Peninsula in the eleventh and twelfth centuries under the pretext of restoring Islamic orthodoxy, we find Andalusí thinkers, such as Abu Bakr Muhammad ibn Abd al-Malik ibn Muhammad Ibn Tufayl (1105–1185), similarly exploring man’s natural proclivity for religious belief in his fictional tale, *Hayy ibn Yaqzan*, a story later translated into Latin and inspiration for both Daniel Defoe’s *Robinson Crusoe* and John Locke’s concept of the *tabula rasa*. It is, in fact, out of this intellectual universe, one in which Islamic thinkers had been grappling with the ways in which Aristotelian and neo-Platonic ideas about skepticism and the natural world could be reconciled to religious faith, that the two greatest intellectuals of medieval Spain emerged, Ibn Rushd and Maimonides. Ibn Tufayl recommended to his Almohad patron that the great philosopher, theologian and commentator on Aristotle, Ibn Rushd

(Averroes) (1126–1198), serve as his successor at court. Ibn Rushd wrote on many topics, including mathematics, law, music, grammar, and most notably philosophy. His best-known and most influential work, *The Incoherence of the Incoherence*, was a defense of Aristotelian rationalism in response to the work of the earlier Muslim scholar, Avicenna. Like Ibn Rushd, the Jewish thinker Maimonides (1135–1204), was also a medical doctor, and in his own philosophic work sought to reconcile Aristotelian thought with the Jewish faith. Maimonides continues to be regarded as one of the fathers of modern Judaism.

The Aristotelian rationalism of Ibn Rushd and Maimonides once translated from the Arabic and Hebrew made great waves among the scholastics of Northern Europe, most notably in the ideas of Peter Abelard and Thomas Aquinas. In addition to the philosophical, theological, and scientific methodology transmitted from Muslim Spain to Western Latin Europe, the translation process that allowed such transmission merits mention as one of the most important contributions of Spanish language and literature to world thought. This translation activity in the eleventh, twelfth, and thirteenth centuries established Toledo as an intellectual center known across Europe as a place where scholars could learn Arabic and have access to Arabic scientific and religious texts.

Medieval Christian scholars in Spain did, like their counterparts in the rest of Europe, use Latin as their main language of official culture. However, the Castilian king Alfonso X, known as “the Learned,” commissioned several translation projects and original works in the Romance vernacular (mostly in nascent Castilian) in order to establish Spanish as the official language of culture and science in the Peninsula. Alfonsine translations include Arab philosophical, religious, mathematical, astronomical, and astrological treatises, including Aristotle’s *Poridat de las poridades* (*Secretum Secretorum*) and Ibn Haitham (Alhazen)’s *Configuración del mundo* (Latin *Liber de mundo et coelo*), which would have great impact upon later Western European intellectuals’ (such as Albertus Magnus, Robert Grosseteste, Copernicus, Roger Bacon)

understanding of the world. These Alfonsine translations built upon an already established culture of translation encouraged by earlier intellectuals, such as the archbishop of Toledo, Raimundo (d. 1152 C.E.), who was the patron of several scholars, including Gerard de Cremona whose translations of Aristotle’s works were informed by the commentaries of Arab thinkers such as al-Farabi and Ibn Rushd. Several of these translators, including Adelard of Bath and Dominicus Gundisalvus also composed original philosophical works in Latin (*Questiones naturales perdifficiles*, *De anima*, *De processione mundi*) that would today be considered scientific inquiries into the natural world. These scholars also translated texts by Archimedes, Ptolemy, and Euclid from Arabic into Latin. Their translations also include treatises on the astrolabe and mathematics penned by Arab and Jewish scholars.

Translations of imaginative works, although fewer in number, are nevertheless very important and offer some of the first examples of fictional prose literature in the Castilian language. Before assuming the throne, Alfonso had the tale collection, *Calila wa Dimna*, which traces its origins to the Sanskrit Panchatantra translated into Castilian. Alfonso’s younger brother Fadrique similarly commissioned the translation of *Sendebat*, another frame tale with Eastern origins that later morphed in the Western tradition into the *Seven Sages of Rome*. Both of these works of imaginative fiction are centrally concerned with the processes through which wisdom is transmitted and reflect the ethos of East to West translation occurring in Iberia. A witness and product of this cultural milieu, Moshe Sefardí (who later converted to Christianity and took the name of Petrus Alfonsi b. 1106) physician to both Alfonso el Batallador and Henry I of England, exemplifies how the legacy of these translations and the Arab and Jewish knowledge they conveyed was transferred to the rest of Europe. Petrus Alfonsi penned the *Disciplina clericalis*, one of the most important known works to adapt Muslim and Jewish literary narrative content and forms to Western Latin culture. This work, ironically, became a basic source from which preachers

across Europe could select appropriate anecdotes to illustrate their sermons.

The growing cultural and political strength of the Iberian Church is reflected in the literature of the thirteenth and early fourteenth centuries. King Alfonso's nephew, the noted author Don Juan Manuel, portrayed the growing tension in Iberia between the ecclesiastical Latinate culture of the Church and the centuries-long tradition of Arabized Aristotelian scientific inquiry in his short narrative, "Ejemplo XI. De lo que aconteció a un dean de Santiago con don Illán el gran maestro que moraba en Toledo," included in his collection *El Conde Lucanor*, a work based in part on Arab and Hebrew narrative collections circulating in the Iberian Peninsula. In this fictional narrative Juan Manuel problematizes the conflicting epistemologies of the Church and the natural sciences, asking his reading public to question the stereotypes of the Church and Churchmen as purveyors of morality and their attempts to demonize those who pursue study of the natural sciences as necromancers. Such a narrative is an echo of earlier Arabic and Hebrew fictional narratives composed in the Peninsula that ask the reader to question not only the hypocrisy of religious leaders, but also the deeper theological import of the doctrines of free will and predestination.

These themes also dominate the work of the Catalan intellectual Ramón Llull (1232–1315), a contemporary of Alfonso X, whose works in Latin and Catalan defy contemporary classification because they deal with such disparate subject matter as theological debate, mathematics, fictional romance, and logic. Llull, who was familiar with both the Arabic and Latinate intellectual traditions, exemplifies how literary, linguistic, scientific and religious knowledge were tightly woven and interdependent in medieval Spanish culture. Like Alfonso X and the intellectuals of the Toledo milieu, Llull was also intensely interested in translation as a vehicle of religious and political power. Llull devised among many other things "thinking machines" or *Lulian circles* in which theological and philosophical principals could be combined in an attempt to systematize knowledge. Llull, a pioneer in early vernacular

literature, is considered by some twentieth-century computer scientists as a founding father of the field.

While Llull's work, mostly written in Catalan, was read into the early modern period, the unification of Spanish lands under the Castilian crown established the Castilian dialect as the predominant language of the Iberian Peninsula. The humanist and professor of poetry and grammar, Antonio de Nebrija (1441–1522), wrote the *Gramática de la lengua castellana* in 1492. This work was not only the first grammar of Castilian, but of any Romance dialect and marks Castilian as the official language of the Crown. Fifteenth- and sixteenth-century Peninsular literature was predominated by poetry and the collection of songbooks or *cancioneros*. These songbooks were compiled under the direction of noblemen and often the Crown – Juan II and Isabel la Católica were two of the most important patrons of these poetry collections. Some of the poets whose works are included in these collections were of Jewish origins and the subject of confessional and national identity is a pervasive topic in their work. One of the earliest of these collections, the *Cancionero de Baena*, opens with a poetic exchange between unidentified rabbis and the *converso* poet Pero Ferrús regarding the unity of God and the true faith. This poetry also reveals Spanish intellectuals' engagement with the humanistic inquiry and scientific investigations of Renaissance Italy. Juan de Mena's allegorical poem *Laberinto de fortuna*, for example, outlines in lengthy asides contemporary theories of geography, astrology, and natural philosophy.

The Castilian dialect subsequently expanded into the Americas where it became the language of religious conversion literature written for the indigenous population. A well-known example of the latter is "Divino Narcisco," an *auto sacramental* or religious drama by the colonial Mexican author, Sor Juana Inés de la Cruz (c. 1650–1695). Castilian also became the language of many ecclesiastical treatises concerning the rights of the indigenous peoples, which often focused on their humanity and religious nature, for example, Bartolomé de las Casas' (1484–1566) *Breve relación de la*

destrucción de la Indias. Like other Spanish thinkers of the early modern period, Bartolomé de las Casas based his philosophical attempts to fit new indigenous peoples into the Spanish conception of the world in part on his understanding of Aristotle's hierarchy of living creatures, which in turn is a legacy of medieval Iberian Arab and Jewish philosophers.

In the best known work the Spanish imperial "Golden Age," and possibly of Spanish literature, Miguel de Cervantes' (1547–1616) *Don Quijote*, the history of the Muslims in Spain and the fate of their descendants living under Christian rule, the *moriscos*, is the subject of several chapters (Cide Hamete I:9, Zoraida 1:40–42, Ricote 2:34 and his daughter 2:63 etc.). Scholars such as Américo Castro have suggested that Cervantes may have been a *converso* – a descendant of Jews – and that his early training by a follower of the ideas of Erasmus are reflected in his literary works. Others, though, feel that Cervantes' apparent satires of the Church, for example, the burning of the library in *Don Quijote*, which satirizes the inquisitorial *autos-de-fe* was done for comic effect rather than theological critique.

Characteristics

More than any other Contemporary European country, Spain's Muslim and Jewish past has continued into the modern era to shape, in part, its relationship to religion and to the modern perception that a nation's identity as a "modern" state is defined in part by its level of scientific advancement. For the early twentieth-century philologist, Menéndez Pidal, the evolution of the Castilian language and the thriving oral ballad traditions of the Peninsula were proof of the long history of a Spanish national identity as expressed in popular culture. Menéndez Pidal's friend and intellectual peer, Miguel de Unamuno (1864–1936), like the other members of the literary and generational group with whom he is most closely identified, the so-called Generation of '98 (including Antonio Machado and Pío Baroja) and like other European intellectuals of the moment, was intellectually engaged in the concept of

nationalism. The writers of this generation explore in their fictional and poetic writings the role of the Catholic faith as a constituent part of the Spanish nation. One of the best examples of the latter is Miguel de Unamuno's short narrative *San Manuel Bueno, mártir*, which portrays the metaphysical suffering of a parish priest plagued by skeptical rationalism whose own atheism is the source of his extraordinary humanitarianism. Unamuno – whose modern skepticism seemingly tended toward the agnostic or atheist – nevertheless seeks in this and other fictional works to explore what role Spanish religious beliefs and practices played in the fall of the Spanish Empire and what role they should play in the future of Spain. Trained as a medical doctor, Pío Baroja, another member of the Generation of '98, was openly anticlerical and in his fiction presents traditional Spanish Catholicism as a major contributing factor to Spain's "backwardness" and inability to engage in the modern "scientific" society of industrialized Northern Europe. Gregorio Marañón (1881–1960), a medical doctor and writer, who was active in the first part of the twentieth century, combined science and humanistic inquiry in what he described as "biological essays," physiopathological profiles of famous historical figures.

While twentieth-century thinkers such as Unamuno privileged Catholicism in their attempts to establish and define modern Spanish identity, others such as Américo Castro (1885–1972) looked instead to the medieval coexistence or *convivencia* of Muslims, Jews, and Christians to define modern Spanish identity. Castro, an exile from Franco's Spain, worked first in Argentina, and later in the United States. Castro's exile, like that of the Spanish thinkers such as Menéndez Pidal and Sánchez Albornoz, shaped the way Spanish language and literature was and continues to be studied in the Americas. The impact of the legacy of medieval Muslim and Jewish thinkers on Spanish language and literature – the subject of Castro's scholarship – is also the subject of his contemporaries, such as the Argentine writer Jorge Luis Borges. Borges composed short fictional narratives that wrangled with the questions of contemporary theoretical

physics and logic, but often did so in the context of Spain's past. Protagonists of his narratives include medieval intellectuals who, as discussed above, used fiction as a vehicle to investigate the natural world. Some of his stories explore how Muslim, Jewish, and Christian thinkers of Spain (including Ibn Rushd in "La Busca de Averroes," Maimonides in "Milagro secreto," Juan Manuel "El Brujo postergado," and Ramón Llull in *Otras inquisiciones*) were pioneers in philosophy, astronomy, mathematics, and translation. Certain of his fictional narratives such as "El jardín de senderos que se bifurcan" and the "Biblioteca de Babel" question the nature of reality, and suggest the possibility of multiple realities. Borges has become a champion of scholars of both Boolean logic and hypertext. The Chilean Roberto Bolaño's work, like that of Borges, examines, among other subjects, the history of Catholicism in Latin American history. The fiction of other Latin American authors such as Alejo Carpentier (b. Cuba 1904) and Gabriel García Márquez (b. Colombia 1927) who combine elements of indigenous and Catholic religious ideals and myths with everyday life serves as a vehicle for exploring questions about modern realities including scientific empiricism and the legacy of Spanish colonialism (and our perceptions of them) in a technique that has been called "magic realism" by many critics. The contemporary Spanish author, Juan Goytisolo (b. 1931), has explored in his novels how modern Spanish culture is defined in part by its denial of its own Muslim and Jewish pasts. Goytisolo recurrently uses the Arab and Jewish legacies of Iberia as background for his fiction, which delves into alternative sexualities and identities. Historical novels, many of which unfold in the multireligious and multilinguistic atmosphere of medieval and Renaissance Spain have become bestsellers in the first decade of the twenty-first century.

Sources of Authority

For the study of language use and literature of earlier periods manuscripts and early printed documents are the chief authoritative sources.

For more recent literary production in the twentieth and twenty-first centuries, recorded (television, radio) interviews with authors, as well as the peer-reviewed studies of prominent literary scholars are considered authoritative texts, in addition to the author's own literary works. For linguists documents and recorded interviews with speakers of the language or dialect to be studied, in addition to the peer-reviewed studies of leading experts in the field provide authoritative information.

Ethical Principles

While today scholars of Spanish language and culture generally do not identify their work as being religious in nature, the Catholic, Jewish, and Muslim past and cultures of Spain are often a topic of Spanish literary works, and consequently of the studies of them. Increasingly the study of languages, cultures, and literatures of the Spanish-speaking world has been driven by an ethical evaluation of the areas' colonial past. Representation is a central focus of most work being done by literary scholars, and to a lesser, but not insignificant degree by linguists. Contemporary scholars are also looking to the other languages and literatures of the Spanish past – the Hebrew, Arabic, other Romance dialects, Nahuatl and Quechua, among many others, to explore the ways in which Spanish language and culture has contributed to the creation of new, hybrid cultures. This focus entails not only a reevaluation of the cultural production of the Americas, but of the other dialects and literatures produced in the languages of the Iberian Peninsula such as Catalan, Basque, and Galician-Portuguese, and more recently those of the North African and Latin American immigrants. Investigations into the dialects of Latin America have revealed much about creole and pidgin languages, and about the hitherto unrecognized influence of African languages and religious beliefs in the dialects of the Caribbean. Scholars of Spanish literature and culture are currently investigating how postmodern theories about memory, colonialism, and

trauma can be applied to the literature of the Spanish past. The colonial legacy and the complex histories of cultural engagement with many different linguistic, confessional, and regional groups gives Spanish language and culture much to offer newer theoretical approaches to Diaspora, Translation, and Globalization or Transnationalism.

Key Values

Values of this discipline change over time and place.

Conceptualization

Nature/World

Historically, nature was considered by Spanish Aristotelians such as Ibn Rushd as being the material, observable world. In the eighteenth and nineteenth centuries, nature became a construction used to reflect the emotions of authors of the Romantic period, or conversely a hostile force that represented all that was not human and that stood in contradistinction to the values humans cherish most, such as civilization, knowledge, and compassion. There is a growing ecological movement in Spain in which writers and artists have major roles.

Human Being

In the Middle Ages, the human being was considered by many Spanish thinkers as material, worldly matter (the body) combined with a small part of the essence of the eternal or divine (the soul). The tension between these two constitutive parts was thought to give rise to the emotional and physical characteristics of the individual human being. For contemporary linguists the human being is defined and distinguished by language use. Much contemporary literature in the Spanish-speaking world is concerned with the human being as a being privileged over others with certain rights, such as freedom from torture and brutality, and as a witness to larger historical processes or events.

Life and Death

These concepts differ according to the personal beliefs of each author and scholar. The nature and meaning of both has found representation in a number of Spanish literary works across centuries and these reflect not only the beliefs of the author, but also the currently held notions of the time period during which they write.

Reality

Authors writing in Spanish have long questioned the limits of reality. In earlier periods, reality included both this world and the metaphysical realms associated with God – the heavens, eternity, etc. Twentieth-century authors in both Latin America and Spain have explored alternative realities beyond the observable physical world. These alternatives include other possible but unrealized futures or pasts, psychological states, and the supernatural. For authors and critics of postmodernism, reality is mediated and constructed by language (see “[Truth](#)” below).

Knowledge

For many medieval Spanish thinkers knowledge was a universal and quantifiable object, that which could be known. For many thinkers knowledge could be attained by the individual both by observing the material world and through religious texts such as the Torah, Quran, and Christian Bible. For more contemporary authors in the Spanish-speaking world, knowledge is a political category often used during imperial or colonial expansion to justify the exclusion of certain groups from the power structures that both defined and controlled the production of knowledge.

Truth

For many contemporary authors and scholars of Spanish literature truth, much like knowledge, is a constructed and ultimately mutable category determined in large part by the historical moment, geographical space, and personal circumstances of its enunciation. Many linguists and literary critics would consider truth and truth claims as both constructed and determined by language.

Perception

For many thinkers, perception would be the way an individual experiences and interprets the world around him/her. Many authors have used fiction to question the limits of human beings' modes of perception. For many linguists, authors, and critics, perception, much like reality and truth, is wholly determined and mediated by language.

Time

A manner of structuring events in a linear fashion. Some recent authors, most notably Jorge Luis Borges, have examined the relativity of time as experienced by humans.

Consciousness

What humans experience in their waking state. This condition has been explored and problematized in the work of the sixteenth-century author Pedro Calderón de la Barca and in that of the twentieth-century authors Alejo Carpentier and Jorge Luis Borges (among many others).

Rationality/Reason

Categories of central importance for Spanish authors of the Middle Ages. For many Spanish thinkers such as Ibn Rushd and Maimonides, rationalism and reason were of Aristotelian origins and described the way of thinking or structuring knowledge according to which men could observe the processes and behaviors of the natural world and from those observations predict the behavior of future events, objects, and similar processes. For these thinkers observations and rational conclusions based on them would assist men in learning the way in which God had structured the cosmos. In the twentieth and twenty-first centuries authors of Spanish-language literature have used fiction to question the assumed empiricism of reason and its role in the Spanish colonial enterprise.

Mystery

A term used to describe the unknowable, which for many authors, critics, and linguists would be that which is beyond language and therefore

beyond thought, perception, time, etc. The Spanish literary tradition includes many mystics, such as the sixteenth-century San Juan de la Cruz and Santa Teresa, who attempted to describe the unknowable through poetry. In the Middle Ages Spain was also home to many Jewish mystics, or kabbalists, who penned works in Hebrew.

Cross-References

- [Astronomy in Islam](#)
- [Caliphate](#)
- [Critical and Cultural Theory](#)
- [Critical Theory](#)
- [Cultural Studies](#)
- [European Studies](#)
- [History of Ideas \(Intellectual History\)](#)
- [Humanities](#)
- [Mysticism](#)
- [Philosophy in Islam](#)
- [Philosophy in Judaism](#)

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Language of Science

► Mathematics and Religion

Languages and Literature, Africa

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Related Terms

[African languages and literature](#)

Description

Though, studies in languages and literatures of Africa may be approached independently, but the strong connection between the two in providing holistic understanding of the African worldview has made an inclusive engagement of the two disciplines not only fashionable but also productive. The study of African languages (means of communication of cultures and symbols) addresses issues such as the number of spoken languages and their groupings. Overall, there are about 2,028 languages in Africa, representing

about one third of languages spoken worldwide, on the other hand African literature (the verbal or written forms through which the truths of different cultural dynamics are communicated) is located in the combination of oral and written literature. The contemporary written African literatures done both in local and foreign languages are largely historically indebted to transitional dynamics of oral literature built on genres of prose, tales, epics, and poetry of different forms (Beier 1967).

Self-identification

Science

While languages and literatures of Africa may not be regarded as “physical science,” however, they do come under the orbit of “social sciences,” inasmuch as they become subjects of scientific investigations, development of hypothesis, and empirical testing in discovering and predicting the African use of language in describing nature as well as literary dynamics involved in depicting the diversity of African cultures and description of the natural and social phenomena in shaping the African identity.

Religion

Though languages and literature cannot be strictly identified as a religion, they are significantly linked with it. From the perspective of language, religious beliefs and practices are language-based. Also, there exist “religious languages” which are coded formulations of specific religions. For example, African languages are central to indigenous African religion. They depict the diverse but unique religious beliefs of Africans through multilingual formats. African literature, both oral and written, has been significantly linked with religious genres. Indeed, African oral literature is basically expressions of religious ideals located in traditional myths rendered via prose, narratives, and poetic formats. In the same vein, contemporary African written literature, while not limiting its scope to only religious themes, has drawn largely from both indigenous and foreign religious backgrounds practiced by Africans in its fiction, poetry,

and theater outputs. For example, the work of Fagunwa (“The Forest of a Thousand Daemons”), written in the Yoruba language, depicts the mythological worldview of the Yoruba people with an undertone of the influence of the Christian God. In the English language, Wole Soyinka’s “Death of King’s Horseman” was based on Yoruba metaphysical belief of the afterlife. Also, Chinua Achebe’s novel, “Things Fall Apart,” characterized the tragedy represented by the arrival of Christianity and colonialism for the Ibo people of Eastern Nigeria.

Characteristics

African languages and literature, whether as independent disciplines or taken as one, are very distinctive and central to all other disciplines/studies about Africa. There is no doubt that the languages spoken by a group of people constitute the bedrock of their self-identity. In the same way, both oral and written literatures of any community usually provide the watershed for the understanding of their holistic ways of life. For the African people, languages and literature, both indigenous and acquired, have and continue to distinctively provide for all other forms of disciplines associated with Africa – the understanding and appreciation of the diverse, rich, and unique life experiences and responses of the African people.

Relevance to Science and Religion

The disciplines of languages and literatures of Africa are not only compatible with the scholarly study of “science and religion”; they, in fact, constitute the very dynamics of any meaningful engagement in science and religion with the African people by ways of expressions in languages and oral and written reflections in literature.

Sources of Authority

For languages in Africa, the pioneering work of identifying and classifying African languages

was undertaken by Joseph Greenberg (1970). He classified the languages of Africa into four categories, namely, (1) Niger-Congo (150 of about 360–400 million speakers), (2) Afro-Asiatic (300–500), (3) Khoisan (35–50), and (4) Nilo-Saharan (190–250). Further work was done by Mazrui and Mazrui (1998), whereby languages of Africa were classified into (1) Afro-ethnic, (2) Afro-Islamic, (3) Western, and (4) Afro-Western.

Today, the study of African languages and literature has become a very significant part of the academic program in Africa, Europe, and America. Universities located all over these continents have thriving Departments of African Languages and comparative literatures with extensive researches and publications on African languages and literature. Some African languages which have gained international recognition and taught in many world universities are Swahili, Yoruba, and Hausa.

Also, African literature in oral and written forms, both in the indigenous and foreign languages of Africa, has become a significant area of academic pursuit in universities all over the world. For example, works in languages such as Sesato, Ahosa, Zulu, and Yoruba, even though under the shadow of efforts associated with the translation of the Bible, have been able to weather the tension of competing Christian and indigenous African beliefs. Indeed, the importance of African literature in African languages has been stressed by many African writers as a form of intellectual protest against colonialism and imposition of foreign languages. Kenyan writer Ngũgĩ Wa Thiong'o vividly represents this position by insisting that "it is only revitalized African languages that will be best placed to give and receive from the wealth of our common (African world) culture on an equal basis" (Ngũgĩ 1990, p. 981).

African literature written in foreign languages is largely dominated by Anglophone and Francophone colonial experiences. According to Gordon and Gordon (2007), this form of literature emerged to serve dual challenges: (1) the African literary response to accounts about Africa and (2) addressing problems of African nations.

Within these contexts, authoritative African writes are found in diverse areas of literature such as fiction, poetry, and drama. African literature written in English is most prominent in Anglophone regions of West, East, and Southern Africa. In West Africa, Nigerian writers are best known and most prolific in literary works in forms of novels, poems, and plays. The impetus for these writers is traceable to two traditions – "Onitsha Novels" (market where these novels were sold) and the university College of Ibadan founded in 1948 (Gordon and Gordon 2007). The early best-known novelists in Nigeria include Cyprian Ekwensi with many popular novels including *"Peoples of the City"* (1954) and *"Jagua Nana"* (1961). Chinua Achebe also wrote many popular novels, among which are *"Things Fall Apart"* (1958) and *"Arrow of God"* (1964). In the poetry category, figures such as Christopher Okigbo and John Pepper Clark are very prominent. Perhaps the most celebrated Nigerian novelist and playwright is Wole Soyinka, the first African to win the Nobel Prize in Literature. He has numerous novels, poems, and plays to his credit, some of which are *"The Interpreters"* (1965), *"Ake: The Years of Childhood"* (1981), *"The Trial of Brother Jero"* (1963), and *"Opera Wonyosi"* (1981). The second generation of West African writers of novels, poetry, and drama includes prominent names such as Odia Ofeimun, Kole Omotosho, Ola Rotimi, Tess Onwueme, and Tanure Ojaide. From East Africa, literary authorities in English include Kenyan Gaze Ogeit and Ngũgĩ Wa Thiong'o, Ugandan Okot P Bitek, and Somalian Andrew Guor. The Southern African region has produced literary authorities in John Eppe, Tisiti Dangaremba, and Yvonne Vera, all from Zimbabwe. In South Africa, African literature has been able to survive the apartheid years with the attempted imposition of the African language and the forcing of writers such as Dennis Brutus and Alex La Guma into exile. Those who remained behind like Sipho Sepamla and Manaka Mitsemala, despite censorship, have been able to lay some credible foundation for the emergence of postapartheid writers of African literature in English, such as John Maxwell Spetzen,

Gordimer and Coetzee (both Nobel Prizes winners), Rayda Jacobs, and Zakes Mda.

The Francophone regions of Africa have also contributed authoritatively to African literature in forms of novels, poems, and plays written in French. Some prominent writers here include Yambo Ouologuem, (*La Devoir de Violence* 1966), d'Ahmadou Kourouna (*Soleils des Indépendences* 1968), and the female writer Aminata Maiga (*La Voie du Salut* and *Le Miroir de la Vie* 1985).

Ethical Principles

African languages have traditionally been guided by moral standard, which enforces the avoidance of foul and negative thoughts and words while promoting positive ones as beneficial for good character building. Africans ascribe potent and efficacious dynamics to words uttered through language. For example, the Yoruba people of Nigeria substantiate this notion in a saying that “as words could bring cola-nuts from the pocket so could words also lead to drawing of swords.” Also, African literature, both oral and written, has largely been devoted to the ethical and moral philosophy of the African people. Thus, mythical narratives of African oral literature are celebrating traditional moral values of respect, humility, honesty, kindness, hospitality, and dedication while denouncing of vices such as sexual transgressions, murder, stealing, lies, and property covetousness. Also, written African literature either in local or foreign languages has maintained this tradition, though with contemporary tendencies. Contemporary African literature (novels, poems, and plays) has taken the burden of addressing ethical issues, such as justice, freedom, and equality, both in pre- and postindependent African nations.

Key Values

Pursuits in African languages and literature have become very valuable and have been demonstrated, first, in the engagements of identifying

and classifying existing African languages and their usages with the efforts of saving them from the threat of extinction posed by foreign languages, especially English and French. Second, African literature in its different forms has become the sustainability agent of African cultural beliefs both in the traditional settings and in their contemporary comparative and competitive dynamics as distinctive worldviews. Thus, studies in African languages and literature have become valuable vestals of the African unique, yet diverse, self-identity in cultural, religious, political, social, and other human engagements.

Conceptualization

Nature/World

Through African languages and literature, nature is regarded as being holistically significant both materially and spiritually. While nature may be material in composition, its origin and sustenance are divinely driven.

Life and Death

There is the subscription to the divine creative origin and process of life. Man as a living being is made of material body and spiritual soul. Death does take place, but it is restricted to the material body, while the soul lives on. Ultimately, death is regarded as transitional process rather the end of human life (See Beier 1966).

Reality

The languages and literature of Africa depict beliefs in reality made up of both physical and spiritual components. The human reality is projected as containing both positive and negative experiences. The Supreme Being is real, and the religious and moral propensities of relationship with Him here on earth are determinants of a life after in the supernatural domain, concepted as real as the physical world.

Knowledge

Knowledge has always been valued by Africans. Thus, wisdom, regarded as synonymous

with knowledge, is not only expressed through the media of African languages but almost exclusively constitutes the themes of African literary works in novels, poetry, and drama. These have become custodians and instruments of dispensing various aspects of knowledge – ritual practices, morals, natural science, and physical as well as metaphysical beliefs.

Truth

African languages and literature understand and celebrate the existence and value of truth as epitome of human life. Truth is regarded as central to human good and integrity. This is at both individual and societal levels. Its presence guarantees not only social and earthly favors but divine ones as well.

Perception

The belief that human perception of the material and spiritual phenomena are interconnected is vividly reflected through expression in African languages and captured in various ways by African literary works in whatever languages they are written.

Time

Traditionally, African languages and literature (oral) identified time with space. Thus, time was important as of geographical (0) and immediate experience. However, with the influence of Western languages (spoken) and African literature, the concept of time in futuristic dimensions has become fashionable.

Consciousness

Human consciousnesses of both the physical and the spiritual phenomena are well located in different African languages and have been popular materials for both oral and written African literature. This consciousness encompasses the knowledge of the physical phenomena derived from the five senses and the spiritual ones derived through extrasensual awareness of rituals, dreams, visions, and other metaphysical experiences.

Rationality/Reason

The African search for understanding of human life and purpose is concretized in rational processes expressed and narrated in oral and written literature. The diverse languages and different forms of literature attempt to give meaning to both the physical and the metaphysical domains of African existence.

Mystery

African languages and literature depict the reality of a realm of existence and awareness beyond the here-and-now human consciousness. They portray an interconnection of the two that may be beyond mundane understanding – wrapped up in a world of mystery.

Relevant Themes

Issues exhaustively dealt with in (1–8).

Cross-References

- ▶ [Aesthetics \(Philosophy\)](#)
- ▶ [Bible as Literature](#)
- ▶ [Christian Cosmology](#)
- ▶ [Christian Ethics](#)
- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Eschatology](#)
- ▶ [Evil, Problem of](#)
- ▶ [Islam: An Overview](#)
- ▶ [Utilitarianism](#)

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Last Days

- [Eschatology](#)

Last Things

- [Eschatology](#)

Lateral Inhibition

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Lateral inhibition increases the sharpness of contrast in sensory responses, for example, to a contrast border in vision. It refers to a sensory neuronal network arranged in at least two layers of arrays of neurons connected by excitatory and inhibitory inputs. Suppose an array of excitatory visual input to layer-1 in the manner of a contrast border:

Excitation in layer-1: 8 8 8 8 8 8 **8** 4 4 4 4 4 4

The neurons of layer-1 will now excite via their axons the corresponding neurons of the subsequent layer-2. Via axonal branches of those axons, the laterally adjacent neurons in layer-2 are inhibited by a percentage of the excitation. Upon passing lateral inhibition (say 25% of excitation):

Excitation in layer-2: 4 4 4 4 4 4 **5** 1 2 2 2 2 2

Thus, lateral inhibition attenuates the overall excitatory input and sharpens the perceived contrast border.

Latino Studies

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Related Terms

[Colonization](#); [Mestizaje](#); [Migration](#); [Pilgrims](#)

Latina/Latino Studies: The Borderlands

The study of people of Latin America descent in the United States, or "Latina/Latino Studies,"

began as part of the current of demographic and political changes in the 1960s. While college and university departments had long studied Latin American history, society, and culture, there was a dearth in the literature on the generations of Latin Americans in the United States, now numbering some 40 million. As Latinas/Latinos increasingly enrolled in institutions of American higher education, they like African Americans and feminists, demanded courses that were relevant to their own experiences. Thus, new academic departments began sprouting up first in California and then across the Southwest and into the East. Today there are dozens of both Chicana and Chicano (Mexican American) and Latina/Latino study departments across the nation. The following entry relates the topic of Latina/Latino studies to the themes of religion and science by focusing on the ways Latina/Latino studies theorize academically Latina/Latino religions: the borderland thesis. In what follows I look first at Latina/Latino history and then to the borderland theory all with an eye toward religious expression in the last half of the entry.

Colonialism: Mestizaje

The story of contemporary religion for Latina/Latino across the United States-Latin American borders, the *borderlands*, begins with Spanish colonialism. In 1421 the *Mexica* or Aztec Mesoamerican imperial capital, Tenochtitlan, fell to an army headed by invading Iberian Christians; in 1533 the Inca Empire of South America lost its imperial capital, Cuzco, to the same fate. These victories heralded a new colonial order throughout what is now Latin America, from the Tijuana border, to the southern tip of Argentina, to the former Spanish colonial islands of Cuba, Puerto Rico, and the Dominican Republic. In the nineteenth century, Latin American colonies liberated themselves from Spanish rule and became hybrid republics, torn between their indigenous, European, and African underpinnings. For the most part, Latin American statecraft came to manage the resulting inevitable process of cultural

blending and synthesis by recognizing and celebrating its creative potential and effects, rather than complete condemnation of its perceived impurities.

In one sense, “the borderlands” name the place and result of this history – a hybrid social and geographical space, a result of imperial Christian impulses and stubborn Indian resistances, emergent in a repertoire of performances that continue to morph. This evolutionary phenomenon is in no way unique to Latinas/Latinos; indeed, it happens in all human societies. Yet, the historical and geographical contexts, the places and facts of cultural contact, are in fact dissimilar and contribute to a particular regional matrix of variations, local culture – borderland culture. And indeed, traditions develop that possess the aura of always having existed so that multitudes invest great meaning in them – they become important enough to ground personal and national master identities.

Still Nepantla

For the ancient Mexican Nahuatl speakers, the place of tradition was known as *nepantla*: the space in-between worlds. Colonial Christians were bewildered by the wonders they encountered in the fifteenth-century Mesoamerica. When one Indian wise man was asked why he continued practicing his religious traditions after having formally received Christian confirmation, his answer was prophetic. “Don’t worry father,” he reassured, “we are still *nepantla*.” The place of in-between, occupying the porous borders at once connecting and separating Maya from Aztec, Taino from African, indigenous from Spanish, Christian from pagan, and, ultimately, Latina American from the United States.

Even after colonization, the colonized peoples across the American borderlands never entirely surrendered control of their bodies, memories, and sacred places; their control remained partially in the realm of the spiritual. Religions are shaped and reshaped in the struggle for political power. Classical social theorist Emile

Durkheim once correctly noted that human nature does not explain religious phenomena; instead we must look to their social contexts for explanations.

Borderland Religions

Embedded in the trajectory of Chicano history, the borderland thesis suggests that, for many Mexican Americans, cultural production occurs betwixt and between Mexico and the United States and is thus characterized by liminality, or the processual state of in-between-ness, of becoming. The organizing principle of the borderland thesis focuses on how the international boundary between Mexico and the United States, as well as adjacent regions, creates a distinctive cultural space that paradoxically links yet divides people on either side of the border. The borderlands are not only a physical place but also a poetic device for describing perennially emergent and multiplex individual, social, and cultural formations.

The grand symbol of the border looms large in the Mexican imaginary, and the reality of its daily transgression by people who may be otherwise religious and law abiding is cause for deep reflection. Mexicans who come to the United States put their faith in the “cross,” the act itself that becomes a symbol. Metaphorically, a border-crossing consciousness means living daily with the impulse to surpass institutional, religious, legal, spatial, and symbolic barriers that keep the colonized, those on the margins, away from centers of power. Borders of all kinds are central and formative places in the production of religion, but they also serve as peripheries that must be surpassed to arrive at a place with greater promise – a meaningful and better orientation for cultural and religious migrants.

The incessant illegal crossing of Mexicans into the United States should give us pause. Each year millions of Mexicans are arrested for crossing the border. Others attempting to cross the border suffer a worse fate: each year hundreds of bodies are found in the desert between Mexico and the United States. The ocean separating the Caribbean Islands

from Florida functions as a watery burial ground for thousands of people each year who attempt to cross over from Cuba, Haiti, and the Dominican Republic. Various forms of religion provide hope and strength for these often destitute border crossers, pilgrims in a sense, on their faith journeys to the promise land.

Borderland Religious Expression: Response to Crisis

Contemporary religious expression among people of Latin American origin, Latinas/Latinos, on both sides of the United States-Latin America border – the *borderlands* – is a product of many historical collisions and social collusions. The myths and realities of Spanish colonialism interfaced and merged tensely with the indigenous Americas. In the Caribbean and on the eastern coast of South America, this religious matrix combined with the myths and realities of indigenous African traditions brought to Latin American shores by slavery to produce the radically innovative hybrid religions among existing today. Borderland religion owes its origins to at least three main sources of religious tradition and innovation: indigenous Americans (chiefly Maya, Inca, and Aztec), primitive form of Spanish Catholicism which ironically resembled the beliefs and expressions it sought to eradicate, and west African Yoruba rites and practices.

Still, however, indigenous traditions survived in processes of subterfuge, dissimulation, and outright defiance. The phrase “idols behind altars” has been used to capture the ways that the indigenous peoples of Latin America rejected the singularity of Christianity even well after formal indoctrination was imposed. In Cuba and throughout the Caribbean African, slaves were imported en masse to fill the labor void left by the largely decimated indigenous Taino populations; many Indian survivors fled to mountainous island interiors which soon attracted escaping African slaves and thus became productive venues of religious experimentation – producing fresh indigenous-Catholic African hybrids, Santería chief among them.

In African diaspora religious formations the “crossroads” mark the meeting place of the living and the dead, wherein spirits cross the border between life and death. Crossings symbolize action, movement, and transformation: the “cross” is a verb. Pilgrims carry and enact the cross from South to North America, from the Third World to the First, from certain poverty to uncertain poverty, from the old to the new, refiguring multiple covenants of grace and hope. The cross bears several meanings but becomes most significant in Latina/Latino religious practice as both noun and verb. Migrants intersecting the northern border reenact a drama of religious transformation that is centuries old, at least: a life translation. Conversion, new life, transformation, and renewal of spirit are realized in the intersections created by the cross.

Latina/Latino immigrants typically follow the seasonal patterns of crops and other labor rhythms (e.g., the demand for construction workers being greater during the non-rainy months). And inasmuch as migrants touch and inform the lives of permanent residents in the spaces they inhabit, entire communities are affected by cycles of return: various communities and social collectives experience ebb and swell as a function of migration. For a community delimited by border crossing, fluidity, and movement, religion is experienced as flux and flow; the greatest religious movements occur at times of crisis.

When people come to the United States, they bring their religious traditions with them; when they come as temporary workers, they return to Mexico with the commodities and cultural influences they accumulated while in exile – both are disseminated in their homelands. Thus, the cultural rhythms of the United States pulsate into Mexican religious systems, and vice versa, in various means of transnational exchanges. Both nations are influenced by the transnational movement of peoples – bodies and souls – a cycle that takes place again and again.

The borderlands are crossroads, functioning at once as symbol and reality for millions of Latinas/Latinos who cross boundaries of many kinds when forging plausible and effective

realities for themselves and their posterity. The cross as metaphor can be effectively used to connote Latina/Latino religious practice insofar as borders isolating traditions from one another are diminished while practitioners draw from many spiritual resources in their struggles to survive the oppressive legacy of colonialism.

Cross-References

- [Cultural Studies](#)
- [Global Christianity](#)
- [Maya Religion](#)
- [Native American Religions](#)
- [Pentecostalism](#)

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Laws of Nature

► Physics

Learning

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Related Terms

[Memory](#)

Description

The study of learning, and its outcome – memory, involves the effort to identify how we acquire internal representations of experience, how these representations are stored, and how they are expressed in thoughts, feelings, and actions. The scientific study of learning and memory study evolved separately in major academic disciplines of psychology, biology, and clinical medicine. Psychologists have most prominently focused on rigorously designed experimental studies that have generated a large body of information about how information is encoded, remembered, and forgotten. Psychological research on animal memory focused on discovering universal rules of learning in distinctive training protocols, including classical conditioning and instrumental conditioning. Psychological research on human memory has revealed an organization of the structure of memory, different stages of learning and memory, including

short-term memory, working memory, long-term memory, and distinct forms of memory, including declarative memory and procedural memory. Biologists studying the brain have focused on anatomical and physiological correlates of learning and memory, revealing how networks of brain cells are changed as a result of learning. These studies have shown that learning is most prominently associated with changes in how neurons communicate with one another at their ► [synapses](#). Clinical medicine has discovered cases of ► [amnesia](#) that shown how memory is compromised as a result of brain injury or disease, revealing much about the organization of normal memory, and has revealed that learning and memory are distinct from other mental capacities such as perception, feeling, and action. Among the most prominent recent developments in this specialty is a convergence of understanding gained by combining the discoveries from these distinct disciplines, particularly with the new discipline of ► [cognitive neuroscience](#). The main new discoveries are that there are multiple types of memory, that these types of memory are supported by distinct brain systems, that the same systems exist in animals and humans, and that the fundamental basis of learning and memory involves the organization of knowledge through changes in neuronal connections via molecular mechanisms that are common across systems and species. For further details on this issue, and on the succeeding questions, the reader is referred to recent texts on the topic of learning and memory (Schacter 2001; Eichenbaum 2011).

Self-Identification

The study of learning and memory has a rich history in philosophy and the nature of memory is a topic of examination by writers and thinkers in many disciplines, including both literary (e.g., novelists) and technical (e.g., computer scientists) perspectives. However, most of the traditional study of memory is a science because it is pursued by the scientific method in which observations are made, hypotheses about the mechanisms underlying those observations are

formed, experimental tests of those hypotheses are made, the results modify or elaborate hypotheses that are tested by further experiments, and so on. These studies have generated many theories of learning, including that learning involves record of perceptual experience; that learning involves associations between stimuli, between a stimulus and a reward or punishment, or between a stimulus and a behavioral response; or that learning involves the networking of knowledge about the world. Scientific studies at various levels of analysis, from behavior to ► [brain imaging](#), to the analysis of localized brain damage, and to the physiology and molecular biology of single neurons and synapses, have distinct traditions in what constitutes a hypothesis and in the nature of experiments used to test these hypotheses.

Characteristics

Our individuality is the product of a lifetime of learning. We are genetically programmed to babble, but we learn to speak a particular language with a personal vocabulary and a library of facts and concepts that is special to our culture, and we learn our personal autobiography. Learning is also unique because it is pervasive in our everyday life and should be viewed as a feature of plasticity and malleability in all of the ways by which we improve our skills, change our dispositions, and add to our knowledge about the world and personal experiences.

Relevance to Science and Religion

The science of learning interfaces with many aspects of education within society. The principles and processes involved in learning apply to the training of humans and animals at home and at work; to classroom education; to behavioral therapies for mental disorders including anxiety, addiction, and much more; and to the loss of learning ability in aging and disease. Religion may be thought of as a specific organization of knowledge derived from learning.

Sources of Authority

The primary sources of authority in this specialty are the record of scientific analyses typically published in journals and other print or electronic media or oral lectures. The most authoritative sources involve journal articles that are reviewed by peer scientists who judge the rationale of the studies and the scientific methods of experiments that test hypotheses against accumulated knowledge in the specialty.

Ethical Principles

The ethical principles that guide this specialty are honesty in the presentation of experimental findings and evenhandedness in the interpretation of the data as they relate to different hypotheses.

Key Values

The key value in this specialty is a deeper understanding of the underlying principles and mechanisms by which learning occurs and determines the organization of the resulting memories.

Conceptualization

Nature/World

The world is defined as the composite of stimuli, events, and their contingencies in which learning drives our adaptation to the structure of the environment.

Human Being

Humans likely have more elaborated learning capacities than other animals, but the fundamental principles of learning and types of consequent memory are shared with animals. Each individual human being is defined as unique by a lifetime of learning.

Life and Death

Life is adaptive, and adaptation to the world involves a combination of evolutionary

adaptations that are governed by our genetics and learning about the world in order to interpret and make predictions about specific future events.

Reality

Within this specialty, reality is what we learn from experience. Any other realities, such as supernatural forces, exert their independent existence by altering the experiences that are learned or, alternatively, exist in terms of an organizing principle of knowledge that is learned.

Knowledge

A major purpose of learning is the acquisition of knowledge from experiences. Within the science of learning, knowledge can be viewed as the organization of the record of experiences that can be retrieved through remembering.

Truth

The truth of knowledge acquired from learning can be tested in terms of consistency with other records of past events and in predicting future events. Within this scientific specialty, truth may also be viewed as a fundamental principle or framework for the organization of knowledge about the world.

Perception

Perception is not a passive witnessing of events but instead involves highly active and directed efforts at analysis of events. Moreover, what we perceive depends greatly on our expectations derived from prior learning as a consequence of experiences with similar stimuli and events.

Time

Time involves the order of events that occur in experience and is a fundamental feature of what is learned and incorporated into some types of memory. In particular, episodic memory is viewed as a record of time. In semantic memory, the factor of time is eliminated.

Consciousness

Memories can be conscious or unconscious, and conscious awareness reflects the operations of

different learning systems. Declarative memory is defined in terms of our ability to bring what has been learned to consciousness. Conversely, nondeclarative memory is defined as learning that occurs and can be expressed without conscious awareness of specific learning events. Some have defined consciousness as the product of declarative memory by which we experience conscious recollection when we recover the context and associations of prior experience with a memory cue.

Rationality/Reason

Rationale thought and reason can be thought of as a property of the knowledge acquired through learning. In prototypical terms, we have many learning experiences in which the acquired associations overlap and the resulting network of knowledge allows us to reason. For example, we might learn that Sally is married to Joe and, on a later occasion, learn that Sue is Joe's sister. Each of these learning events is represented within our framework of knowledge acquired from additional learning about familiar relationships. Next time we see Sally, we can reason about her association with Sue and ask about her sister-in-law. Within the science of learning, the same principles apply in religious reasoning, with a framework of knowledge specific to religious training.

Mystery

Within the science of learning, mystery is our failure to fit a perceived event into the framework of our acquired knowledge. A mystery is resolved when we can link the event to others by modifying or elaborating the structure of the knowledge framework.

Relevant Themes

Belief and learning reflect distinct ends of the spectrum of our interpretation of the world. Belief may be viewed as a closed framework of knowledge in which succeeding events are interpreted as consistent with a fixed framework,

such that fundamental abstractions (“truths”) are sufficiently vague as to incorporate any new experience. The science of learning, by contrast, highlights that the framework of our knowledge is continuously subject to change as a result of new experiences and that truth is an ever-changing abstraction of the sum of our experiences.

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Legal Medicine

- [Forensic Medicine](#)

Legal Psychology

- [Forensic Psychology](#)

Legendary

- [Myth](#)

Length Contraction

- [Relativity](#)

Liberal Judaism

- [Progressive Judaism](#)

Liberal Theology

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Related Terms

[Ritschlianism](#); [Theological liberalism](#); [Theological revisionism](#)

Description

The term “Liberal Theology” denotes various philosophically, theologically, and biblically informed religious movements and ideas that emerged within Christianity during the so-called Age of Enlightenment in the eighteenth century. These movements and ideas can in large part be seen as reactions to Enlightenment philosophy and rationalism.

There are two major strands of Liberal Theology that developed out of the reception of the philosophies of either Immanuel Kant or Georg W. F. Hegel. Liberal Theology sprang from the minds of the thinkers that still held fast to Christian belief even though this belief was attacked by the key developments of the Age of Enlightenment. It developed within the church and it tried to salvage Christianity by surrendering those ideas, assertions, and features that were no longer seen as justified and well-grounded in the modern world. Liberal theological tradition in fact paved way for a new religion which retained old terminology, but radically redefined those terms in the spirit of and in some part against certain elements of Enlightenment rationality to give them new meanings. The aim of these redefinitions was not to overthrow historic Christianity, but to salvage the central meanings of Christianity from the direct attacks of rationalism based on unbelief.

The Enlightenment gave birth to ideas that we still see today as part of the modern mind.

In theological terms, it might be argued that man during the Enlightenment saw it as possible to philosophically reason his way to God (cf. Neology). The key features of Enlightenment thought include at least the following: the beginning of scientific history, that truth must justify itself before the bar of reason, that nature is the primary source for answers to the fundamental questions of human existence, that freedom is necessary to advance progress and human welfare, that literary and historical criticism are necessary to determine the legitimacy of our historical legacy, the necessity of critical philosophy and ethics as separate and independent of the authority of religion and theology, a suspicion of and hostility to all truths claiming to be grounded in an authority other than reason (e.g., tradition or divine revelation), that it is through science that man comes to find truth, toleration as the highest value in matters of religion, and a self-conscious continuation and expansion of the humanism first developed during the Renaissance.

The beginning of Liberal Theology was Friedrich Daniel Ernst Schleiermacher (1768–1834). Schleiermacher was born into the intellectual climate of the Enlightenment and Kant's critical philosophy. The young Schleiermacher accepted the Neologians' criticism of Lutheran orthodoxy (the doctrines of the Trinity and the two natures of Jesus), but rejected their rationalistic and moralistic substitute. Around this time, Schleiermacher was drawn into the Romantic Movement which was developed in reaction to the sterile critical and analytical rationalism of the eighteenth century. Romanticism stressed the intuitive and synthetic nature of human reason, insisting that truth was to be gained by grasping the whole rather than by an abstract analysis of the parts. Romantic philosophy also led to a curiosity about and appreciation of other peoples' religions as authentic ways of expressing the human experience.

Schleiermacher's theological program, which he developed under the influence of romanticism and Immanuel Kant's philosophy, proceeded from three premises: (1) The validity of the Enlightenment criticism of dogmatic Protestant

Orthodoxy. (2) Romantic Idealistic philosophy gives a better foundation on which to ground the Christian faith than the shallow moralistic rationalism of the Enlightenment. (3) Christian theology can be interpreted in terms of Romantic Idealism and thus allow mankind to be both Christian and modern while being intellectually honest. From these three premises, it further develops two central arguments concerning religion and piety: (1) The piety which forms the basis of all ecclesiastical communions is, considered purely in itself, neither a knowing or a Doing, but a modification of feeling, or of immediate self-consciousness. (2) The common element in all howsoever diverse expressions of piety, by which these are distinguished from all other feelings (or, in other words, the self-identical essence of piety), is this: the consciousness of being absolutely dependent, or of being in relation with God.

Schleiermacher, by taking into consideration Kant's critique of pure knowledge which he saw as a destruction of the possibility of a rational knowledge of God, found a new starting point for religion and theology. This seat was not influenced by the Enlightenment critique. The feeling (*das Gefühl*), which is not to be understood as a mere emotion, opened up the view of a deep inner sense of man that he exists in a relationship of absolute dependence upon God. This god-consciousness was taken to be the center of religion.

Thus, Schleiermacher turned the traditional theological method upside down. Rather than starting with any consideration of objective revelation, religion was now seen as in its core subjective. Experience was seen as giving rise to doctrine rather than doctrine to experience. Theological statements were no longer perceived as describing objective reality, but rather as reflecting the way that the feeling of absolute dependence is related to God. It is this experience which is seen as the final authority in religion rather than the objective revelation of an inerrant Scripture.

Whereas Schleiermacher was in a sense a mystic, seeing the center of religion in the feeling of absolute dependence upon God,

Albrecht Ritschl (1822–1889) was more closely tied to Kant and construed religion in terms of morality and personal effort in establishing the Kingdom of God (a moral-ethical Kingdom).

Religious truth in the Ritschlian conception became different in kind from all other knowledge; it involved moral-ethical judgments which were subjectively determined by the individual. The system surrendered rational knowledge of God and things divine. In its place it substituted, as the essence of Christianity, a subjectively verified personal theism, a devotion to the Man Jesus Christ as the revealer of God and His kingdom, and a subjection to His moral-ethical principles. Religious truth was no longer to be found in objective, verifiable propositions but in the realm of the subjective experience, in “value judgments.” These “value judgments” were of a different nature than scientific knowledge. They gave no definite objective propositional knowledge, but set forth their subjective value for the individual.

Ritschlianism sought to separate religion and theology from philosophy and metaphysics. Following the Kantian tradition, the Ritschlians asserted that human knowledge was strictly limited to the world of the phenomena, a world which included the realm of verifiable history and the realm of personal experience. “Theology without metaphysics” became the watchword of the entire school. Knowledge of God, as He was in Himself, His essence and attributes fell outside the possibility of human experience. This is why no positive assertions concerning His nature could be made. Ritschl himself asserted (with Kant) that man could not know things “in themselves” but only in their phenomenological relations. Since man had no categories by which to perceive God in the world, knowledge of Him fell outside the realm of the “theoretic” (scientific/empirical). Since Ritschlianism was strictly empirical, the value of historical study was elevated as a means by which one could discover God’s revelation in history: the person of Jesus Christ.

Revelation of God and certainty in religion took place, for the Ritschlians, when one was confronted with the historic person of Jesus Christ.

The truth communicated in this revelation was not “theoretic” (scientific) but “religious.” Such a distinction divorced faith from reason. According to the Ritschlians, the two realms had to be kept entirely separate. For example, the existence of God could not be rationally demonstrated. But since man needs God, that was proof that He exists. However, nothing could be inferred concerning His nature, attributes, or His relationship to the world. One could not communicate objective truth about God from his revelation in Jesus Christ; the most one could say was that in Jesus Christ, one received the impression that God was present and active for him. Thus, religious knowledge (in the objective sense) became the common shared experience of God.

The comparative study of religions was also developed in the context of liberal theology. Romanticism and the increase of knowledge which came as a result of the colonization of the world by the Western European powers led to this new discipline. Vast amounts of new knowledge about the world and competing cultures and their native religions became available. The burgeoning science of archaeology opened the past and now allowed for the Bible to be studied against its cultural milieu in a way that had not theretofore been possible. All religions were viewed in their most basic form to lead to one truth (God) and to promote a common ethic of love for one’s neighbor.

Adolf von Harnack (1851–1930) was the greatest historian of Christianity among liberal theologians and his work set a standard of scholarship for the following century. Harnack operated totally within the framework of theological liberalism, seeing the pristine purity of the gospel as having been corrupted even within the New Testament era, transforming Christianity from the religion of Jesus to the religion about Jesus. Further corruption took place in the succeeding centuries as Christianity moved from its Jewish background and confronted the Hellenistic world. Controversies over the trinity and the two natures of the incarnate Christ hopelessly confused the Gospel message in Hellenistic philosophy. He argued that the task of the theologian was to get back to the kernel of the gospel by stripping

away the husks of Hellenism to find what was real and permanent.

Late nineteenth century America underwent profound sociological upheaval and this gave an impetus to the further development of Liberal Theology. The industrial revolution had thrust the problems of urban society upon a nation that had until then been primarily rural. As the problems of dynamic sociological social revolution manifested themselves in the slums and work houses, the individualistic gospel of revivalism had little to say to the problems that faced the urban dwellers every day. Walter Rauschenbusch (1861–1918) spent 11 years in the “Hell’s Kitchen” area of New York City ministering among the German-speaking immigrants. Here he saw poverty, injustice, and oppression. This led him to rethink the implications of the gospel and articulate “A Theology of the Social Gospel.” While Rauschenbusch was relatively conservative in his theological outlook, those who took up his mantle saw the message the gospel and the task of the church as working to end human suffering and establish social justice.

Cross-References

- [Biblical studies](#)
- [Christianity](#)
- [Christian Existentialism](#)
- [Faith and Belief](#)
- [Hermeneutics, Theological](#)

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Liberation, Theology of

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Related Terms

[Theology of liberation](#)

Description

Liberation theology emerged in the 1960s in Latin America as a response to the experience of economic poverty and political oppression. The theological quest for liberation took shape particularly in the Roman Catholic Church. Rooted in the praxis of the base communities, liberation theology became an influential movement within the Christian churches by confronting the sociopolitical conditions of the Third World with the Gospel of liberation and the search for radical social change. Liberation theology has been a significant political, social, ecclesial, and theological phenomenon. “Latin American liberation theology constitutes an unprecedented phenomenon in the recent history of Christian thought. For the first time in history, a theological creation of the Third World has acquired relevancy and meaning in Europe and the First World” (Tamayo 1993, 33).

There have been manifold relations between liberation theology and Europe. (1) A number of liberation theologians studied at European universities. (2) They developed their thinking not only in reaction to the Latin American situation but also to European thought which they took up

critically and creatively. (3) Europe in general and the Vatican in particular have been the center of criticism and condemnation of liberation thinking. (4) At the same time, alliances between European political theologies and Latin American liberation theologies were achieved. (5) From the beginning, there has been support and reception of liberation theological ideas and praxis by European groups and grassroots movements.

1. A considerable amount of the first generation of liberation theologians got their academic formation in Europe. The Peruvian Gustavo Gutiérrez (born 1928), who is called the founding father of liberation theology, and who in 1971 published his classic *“Teología de la liberación,”* studied in Leuven (Belgium) and Lyon (France). The Brazilian Leonardo Boff (born 1938) wrote his doctoral dissertation in Munich, and the Basque Jesuit Jon Sobrino (born 1938), who spent most of his life in El Salvador, earned his doctorate in Frankfurt. His dissertation dealt with the political theology of hope, elaborated by Jürgen Moltmann (born 1926). Those and other liberation theologians did not only take up modern European thought. At the same time, they criticized their colleagues for not making the decisive steps further. Gutiérrez maintained that for modern European theology, the bourgeois “nonbeliever” is the most important addressee and thus atheism is the significant conversation partner, whereas for liberation theology the “nonpersons,” the poor and oppressed masses, being deprived of any elementary conditions of living, are the first and foremost addressees and also the new subjects from the “underside of history.” Gutiérrez noted that the political theology of Johann Baptist Metz (born 1929) has been written “far from the revolutionary ferment of the Third World countries” and thus “cannot penetrate the situation of dependency, injustice, and exploitation in which most of mankind finds itself” (Gutiérrez 1973, 224). Sobrino saw European theology tied with the First Enlightenment, which was promoted by philosophers like Kant and directed at universal

reason, but in fact failed to respond to the sociopolitical challenges of the Second Enlightenment inaugurated by the revolutionary approach of Karl Marx.

2. European theologians who sympathized with liberation theology, especially proponents of political theology, were astonished when they were severely criticized by liberation theologians for being too academic, idealistic, and Eurocentric. They were accused of remaining in their splendid captivity in highly abstractive systems of concepts instead of joining grassroots movements and adopting materialistic methods of analyzing history and society. Furthermore, they were said not to acknowledge the fundamental differences between the center and the periphery. Conversely, European political theologians considered liberation theology as being methodologically weak and more of the kind of prophetic proclamation or testimony than of serious strong theology. Moltmann suspected liberation theology’s “theological provincialism,” accused it of uncritically adopting the theory and rhetoric of Western Marxism, and sticking more to “seminary Marxism” than to the life and pain of the Latin American people. This criticism is carried on by those who ask whether liberation theology is compatible with democratic society or whether it along with its revolutionary rhetoric opts for some kind of revolutionary populism.
3. While progressive European theologies nevertheless maintained a critical solidarity with and support of liberation theology, the unresolved conflict about its use of Marxist tools and methods of social analysis led to several interventions by the Catholic Church hierarchy. A Declaration of the Vatican’s International Theological Commission on “Human Promotion and Christian Salvation,” published in 1977, underlined the essential difference between historical human benefit and progress on the one hand and divine salvation on the other hand. At the same time, the use of Marxist methods in theology was strictly rejected by the Roman Commission.

In 1984, the Vatican's Congregation for the Doctrine of the Faith, led by Joseph Cardinal Ratzinger, issued an "Instruction on Certain Aspects of the Theology of Liberation." In this document, liberation theology was accused of adopting a rationalistic hermeneutics, of uncritically promoting Marxist ideology, of reading the Bible in a purely political sense, of turning the church for all into a class church and of reducing the Christian faith to a historical, worldly project. In 1986, the Vatican published a second "Instruction on Christian Freedom and Liberation" which emphasized the relevance of an "authentic" liberation theology and criticized that "some" theologies of liberation ignored the spiritual dimension of Christian freedom.

4. The Vatican's attacks, repressions, and the Roman attempts to split liberation theology have contributed to strengthen the links and alliances between "progressive" European and Latin American liberation theologies. Eminent European theologians like the French Dominican Marie Dominique Chenu (1895–1990) and the German Jesuit Karl Rahner (1904–1984) defended liberation theology in view of Vatican's accusations and pronounced in favor of its orthodoxy.

In the course of intensified dialogue with each other, European political and Latin American liberation theology more and more realized similarities between the two. These common traits include the interrelation of the spiritual and the political, and also the focus on the history of the victims and the memory of the suffering which Metz calls "memoria passionis." Both share an understanding of theology as a second act which follows political faith praxis and both opt for radical ecclesial and political changes stimulated by base communities and other movements from below. Following constructive conversation with one another, Moltmann insisted that both liberation and political theology are engaged in a common struggle "for life against death, for liberation against oppression" (Moltmann 1977, 17). German theologian

Dorothee Sölle (1929–2003) has moved on from political theology to a feminist theology of liberation. In the face of patriarchal religion orientated on God's power, God is to be thought of as a creative, liberating, and enabling power, to be experienced in the conflicts and new beginnings of every day. From the mystic presence of this power of relationship, women and men can resist and oppose the social conditions in which they live and under which they suffer. So they can work to change all the unjust social structures, mechanisms of compulsion and oppressive social relations which destroy the fellowship and equality that should be part of creation.

5. Liberation theology has only fragmentarily entered European academia. Although various centers of research on and dialogue with liberation theology have been established at universities in Europe, liberation theology got its main European reception in the realm of solidarity groups and social movements. It made its impact especially on Justice and Peace committees, on relief organizations and movements like the Young Christian Workers, the Christians for Socialism, or feminist groups and networks. Today, liberation theological thought and praxis is present in Europe in base communities and church renewal groups. Based on their political faith praxis, they reflect on the need and possibilities of a European theology of liberation, they read the Bible from the perspective of the marginalized and excluded, and they work for an egalitarian church "from below" and for a just and inclusive society in solidarity with the victims.

Cross-References

- [Christian Ethics](#)
- [Eschatology](#)
- [Hope, Theology of](#)
- [Memory](#)
- [Political Theology, Theological Politics](#)
- [Systematic Theology](#)

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Life

► Biology of Religion

Life After Death

► Hope (Life After Death)

Life Course, life cycle, life history, life span and life stage

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Life course means: (1) Events marking transitions and trajectories of roles extending across the life span, such as entering and leaving school, acquiring a full-time job, getting married, divorced, having children, retiring, and the like; (2) a perspective on the investigation of the

changing environment of the individual and its developmental implications; (3) an approach offering a way of linking early life experiences to later life outcomes, such as the exposure to early life risk factors and their consequences for later life health.

Life cycle means: (1) In biology, the term refers to the continuous and irreversible sequence of changes undergone by an organism from one primary form, as a gamete, to the development of the same form again. (2) In sociology, the term refers to a series of stages, across the life span, such as childhood and middle age, which are socially constructed and characterize the course of existence of an individual.

Life history means: (1) In biology, the term refers to the series of living phenomena exhibited by an organism in the course of development from inception to death. (2) In sociology, the term refers to chronology of events and activities that characterize a life.

Life span means: (1) The temporal focus of inquiry, for example, from conception to death; (2) the longevity of an individual; (3) the longest period over which the life of any organism or species may extend according to the available biological knowledge concerning it. Life span development then are the Multidimensional and multidirectional processes of growth involving both gains and losses, embedded in multilayered social and cultural contexts, involving dynamic processes of interaction of the developing organism with the social and physical environment.

A life stage is a phase in a sequence of age-graded statuses and/or roles, for example, childhood, adolescence, or old age. Finally, the life trajectory consists of sequences of roles and experiences over the life span defined by transitions or changes in statuses or life stages.

Life Sciences

- Biology
- Biology of Religion

Limbic System

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The brains of tetrapod vertebrates comprise a set of evolutionary conserved structures devoted to functions that are needed for the survival of the species. These functions involve emotion (e.g., aggression), motivation (e.g., feeding, defending, escaping, and mating), drive (e.g., hunger, thirst), reward (reinforcement), and learning (long-term memory). Basic structures of the limbic complex include olfactory bulb, septum, hippocampus (ventromedial pallium in anurans), amygdala, nucleus accumbens, anterior thalamic nucleus, hypothalamus, preoptic area, and pituitary gland.

Liminality

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Arnold van Gennep was the first to recognize the existence of the phenomenon liminality in the making of a person within the African cultural world. He used the construct of liminality to refer to the idea of a self in the condition of a transition between. He therefore used the concept to designate the experience of most African youth, inhabiting a world in between the state of “no longer” and that of “not yet.”

Linguistic Meaning

- [Meaning, the Concept of](#)

Linguistics

- [Language and Literature, French](#)
- [Language and Literature, Spanish](#)

Literary Theory

- [Language and Literature, French](#)
- [Language and Literature, Spanish](#)

Living

- [Biology of Religion](#)

Logic

- [Mathematics, Ancient and Medieval](#)

Logic in Buddhism

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Related Terms

[Buddhist dialectics](#); [Dialectic logic](#); [Indian dialectics](#); [Indian logic](#)

Explanation

Similar to other Indian religions, Buddhism is devoted to liberation from suffering, resulting in the achievement of “bodhi” (Sanskrit, meaning “awakening”) in all three traditions of Buddhism, Theravada Mahāyāna, and Vajrayāna.

As laid out by Siddhartha Gautama, the Noble Eightfold Path describes the way to the end of suffering, understood as a practical guideline to ethical and mental development with the goal of freeing the individual from attachments and delusions and to finally understand the transcendent truth about all things. Attaining the right view is hereby the beginning and the end of the Eightfold Path, which simply indicates understanding things as they really are. The right view is hereby not understood in the sense of “right vs. wrong,” rather it should be as “free from delusions,” which transcends mutually excluding categories. As a method for attaining this cognitive aspect of wisdom, Buddhist philosophers have developed a very unique form of logic of negations.

The Mahāyāna Buddhist philosopher Nāgārjuna (ca. 100–200 CE) is hereby considered the most influential philosopher for the development of Buddhist logic. He contributed two complementary concepts (Störig 2002):

1. Nāgārjuna was the first to express the Buddhist doctrine of two truths in complete modern form in the Kaccāyanagotta Sutta. The doctrine distinguishes two levels of truth (Sanskrit: *satya*):

- A “relative,” notionally categorizable, conventional truth (Sanskrit: *saṃvṛtisatya*)
- An “ultimate,” notionally noncategorizable, deepest, absolute truth (Sanskrit: *paramārthasatya*)

The two truths doctrine holds that truth exists in both forms and that they are coexistent (Störig 2002).

2. Nāgārjuna engaged the logic figure of Catuskoṭi (Sanskrit) or tetralemma (Greek) as an investigative and meditative approach to realizing Śūnyatā (Sanskrit, meaning “openness” or “emptiness”). The figure states four possibilities for any given “yes” or “no” problem, which can be answered in a variety of ways:

- Affirmation (“yes”)
- Negation (“no”)
- Double affirmation (both “yes and no”)
- Double negation (“neither yes nor no”)

In the so-called eight negations, Nāgārjuna applies the last position to the manifestations of life, by stating that there is:

- No cessation and no arising
- No annihilation and no permanence
- Not one and not many
- No coming and no going

By rejecting all firm standpoints, Nāgārjuna traces the ultimate truth beyond mutually exclusive categories of thought (Störig 2002). His philosophy of Mādhyamaka (Sanskrit, meaning accordingly “the middle way”) proposes therefore that things, including thoughts and emotions, are without essence (Sanskrit: *svabhāva*) and have existence only as they relate to other things. Therefore, it is neither true to say that things exist nor to say that they do not exist (Kalupahana 1986). Nāgārjuna would also therefore negate the fourth position (“neither yes nor no”) by adding that the “even not that” position represents the uncategorizable ultimate truth. Consequently, Mahāyāna philosophy and parts of the Vajrayāna tradition hereby hold that the relative truth and the ultimate truth are actually “nondifferent” when resolved into an experience of nonduality. In this regard, the famous Mahāyāna Diamond Sūtra (Sanskrit: *Vajracchedikā Prajñāpāramitā Sūtra*), for instance, comes to the paradoxical statement that “form is emptiness and emptiness is form” (Hanh 1996).

Buddhist logic, also called *Pramana* (Sanskrit: “sources of knowledge,” also “epistemology” or “logic”), was additionally influenced by Harivarman (ca. 250–350 CE), Vasubandhu (ca. 420–500 CE), his half brother Asanga, Vasubandhu’s pupil Dignāga (ca. 480–540 CE), and Dharmakīrti, who built on and reinterpreted his work at the turn of the seventh century (Anacker 2005). They all lived in a time of rigorous debate with the Hindu schools. Typical for Buddhist tradition, they rejected many of the premises of Hindu *Pramana*, especially the use of religious texts (*Agama*) as a source of valid knowledge alone. However, historically and culturally Buddhist logic is regarded as a particular development of “Indian logic,”

which dates back to the anviksiki school of logic, founded by Medhatithi Gautama (sixth century BCE). Indian logic, also encompassing Hindu logic (including Nyāya) and Jain logic, stands as one of the three original traditions of logic, alongside the Greek and Chinese logic traditions.

Buddhist Logic Compared to Other Traditions

From a contemporary transcultural and transmethodological perspective, the very general distinction between dialectic and classic/modern logic, as proposed by pioneer theoreticians like Johan Galtung (2008) or Erich Fromm (1989), provides a concise comparison of the great logic traditions.

1. Using the aforementioned example of Nāgārjuna, the dialectic logic can be understood as an epistemologically investigative approach to assume perspectives of higher truth and to transcend contradictions, which appear insurmountable from lower points of view. Among other dialectical traditions, Indian logic – particularly Buddhist logic – sets itself apart by tending to an approach that underlines the method of negation. Other dialectic logic methods tend to integrate contradicting positions into a higher perspective rather than completely negating them. These include, e.g., the Taoist philosophy and Yin Yang dialectics from Chinese tradition or Marxist approaches, German idealism (including Hegel), or Heraclites from Western tradition. Two examples are:

- Hegelian dialectic comprises three dialectical stages of development: a “thesis,” giving rise to its reaction (abstract); an “antithesis,” contradicting and negating the thesis (negation); and the tension between the two being resolved by means of a “synthesis” (affirmation) (Störig 2002).
- Chapter 42 of the Dao De Jing outlines a numerological cosmology based on a dialectical monism. In the following analogously: “The Tao bore One; One bore Two; Two bore Three” (Lao Tzu 1994).

On the contrary, the very unique logic of negation in Indian logic, particularly the emphasis on “emptiness” in Buddhism, does not stress the integration of thesis and antithesis, rather than the negation of thesis, antithesis, and synthesis as well.

2. Modern logic descends mainly from the ancient Greek tradition, which was particularly characterized by Plato and his pupil Aristotle. In this regard, logic can be mainly understood as a formal systematic study of principles of valid inference and correct reasoning. A very basic set of according principles is provided by the three laws of thought, which are attributed to Aristotelian syllogism. They were fundamental for the development of rational discourse in Jewish, Christian, and Muslim epistemology. The laws include:

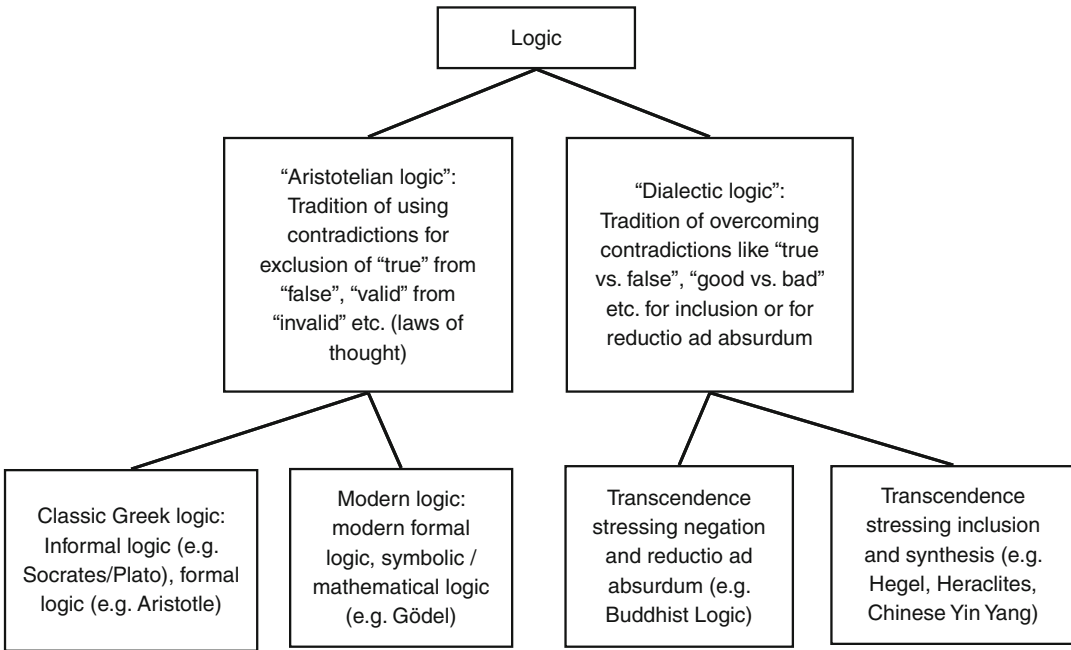
- (a) Law of identity: A equals A.
- (b) Law of noncontradiction: A does not equal not-A.
- (c) Law of excluded middle (“tertium non datur”): A cannot be both A and not-A (Boole 2009).

The resulting assumption by Aristotle is still present in contemporary fields of formal logic and positivistic sciences: existence (A) and inexistence (non-A) categorically exclude each other.

However, this postulate is not valid in the perspective(s) of dialectic logic. Two examples are:

- According to Hegel’s dialectical logic of integration, existence and inexistence are integrated into the higher category of “becoming.”
- According to Nāgārjuna’s dialectical logic of negations, neither existence nor inexistence is with essence. The ultimate truth lies in nonduality (Störig 2002).

To summarize, systematic reasoning in classic and modern logic implies using contradictions in order to distinguish between mutually exclusive aspects like “valid or invalid” and “true or false” and to isolate them. However, reasoning in dialectic logic leads to an overcoming of contradictions through inclusion or negation into increasingly holistic perspectives.



Logic in Buddhism, Fig. 1 Different logic styles

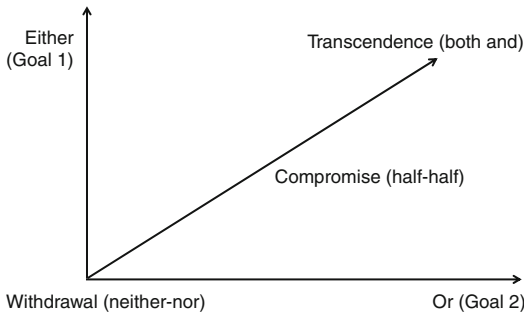
Particularly the negative dialectic Buddhist logic is a method of *reductio ad absurdum* for any concept which discerns “valid vs. invalid,” “true vs. false,” etc. (Fig. 1).

Modern Applications of Buddhist Logic

Since the mid-twentieth century, the term “dialectic logic” has increasingly been considered with regard to the question of how dialectic logic could enrich modern sciences, as these are still mostly influenced by classic logic and positivism. The sociopsychologist Erich Fromm was one of the first to establish this term (Fromm 1989), and Johan Galtung, one of the cofounders of peace studies, was one of the first to implement it within the context of holism in modern sciences (Galtung 2008). Both Fromm and Galtung discussed this term in a context of societal criticism. They attributed dialectic logic, understood as “holistic” and inclusive thinking, to Eastern cultures. By contrast, they attributed Aristotelian logic exclusively to Western culture. In this regard, Aristotelian logic is usually

understood as an “atomistic” thinking culture, which concretely determines concepts like “true” as opposed to “false” and “good” as opposed to “bad” (Fromm 1989; Galtung 2008). However, this categorical East-West attribution cannot explain the very similarly distributed appearance of fundamentalism and radicalism, which is driven by “either-or” thinking in both Western and Eastern cultures. Furthermore, neither the historical development of dialectic philosophies in Greek (e.g., Heraclites, Neoplatonism) and Western (e.g., German idealism, Marxism) cultures nor the integrative pioneering works of specifically Western theoreticians like Fromm or Galtung should be underestimated.

Due to its holistic focus, dialectic logic has increasingly been considered in contemporary emerging multidisciplinary approaches. The reinterpretation of Buddhist logic and its application to innovative methods of conflict resolution provide a very current and significant example. With this regard, Johan Galtung clarifies that theory and practice of conflict, “defined as mutually exclusive-incompatible-contradictory



Logic in Buddhism, Fig. 2 Application of the Buddhist tetralemma – five basic outcomes of a conflict

goals,” usually imply a “dilemma logic,” based on the above-mentioned Aristotelian episteme of *tertium non datur*. This implies the assumption that, if the goal of both the first and the second conflict party has been realized, they cannot both be true within the perspective of the dilemma logic. On the contrary, the Buddhist tetralemma logic opens new realities and possibilities for conflict resolution, negating the assumption that the conflict parties represent a “single truth.”

As discussed previously, Buddhist dialectic logic expands the dilemma perspective of true-false to a tetralemma, adding both true and false and neither true nor false. Galtung also introduces a half-half (including 50–50 and any other percentage division) in order to arrive at a pentalemma. His model gives an overview of possible outcomes of a simple conflict over two goals: goal 1, goal 2, compromise, negative transcendence (neither-nor), and positive transcendence (both-and) (Galtung 2008) (Fig. 2).

Another modern application of Buddhist logic in theory and practice of conflict resolution is the tetralemma work of Matthias Varga von Kibéd and Insa Sparrer, who modified the method of systemic constellations with Nāgārjuna’s logical figure, including:

- “Either”
- “Or”
- “Both”
- “Neither”
- Consequently “Nothing of all that and even not that” (Sparrer/Varga v. Kibéd 2009).

Dialectical Monism

Dialectical monism holds that the ontological reality is ultimately a unified whole. Using the example of the Yin Yang symbol, essential unity is that of complementary polarities, which are opposed in the realm of experience and perception and cosubstantial in a transcendent sense.

Nyāya

Nyāya (Sanskrit for “recursion,” used in the sense of “syllogism, inference”) is the name given to the school of logic in Hindu philosophy. It is one of the six orthodox or astika schools of Hindu philosophy.

Nondualism

Nondualism can be regarded as the very peak of consequent application of dialectical reasoning. Nondualism holds that ultimate truth is not categorizable, beyond mutually exclusive categories of thought. The famous first lines of the Chinese Dao De Jing provide an appropriate example:

The Way that can be told of is not an unvarying way;

The names that can be named are not unvarying names.

It was from the Nameless that Heaven and Earth sprang;

The named is but the mother that rears the 10,000 creatures, each after its kind. (Lao Tzu 1994)

Accordingly, any concept, implying a separative differentiation, is regarded as illusive. Paradoxical statements like “form is emptiness and emptiness is form,” cited from the famous Mahāyāna Diamond Sūtra (Sanskrit: Vajracchedikā Prajñāpāramitā Sūtra), are typical to nondualist statements. It is noteworthy that nondualist statements appear highly paradoxical to conventional thought. Any concept, even the difference between saṃsāra (meaning the cycle

of birth, life, death, and rebirth) and *nirvāṇa* (meaning the liberation from *saṃsāra*) or absolute and relative truth, is considered to be “nondifferent.” In Buddhism, nondualism is particularly considered part of *Mahāyāna* tradition (including, for instance, Zen and *Mādhyamaka*) and partly also in *Vajrayāna* Buddhism (for instance, in the *Dzogchen* practice). In Hindu philosophy, nondualism is central to *Advaita*, which is the most influential and dominant subschool of the *Vedānta* school.

Consequently, nondualist spirituality does not regard enlightenment as an achievable end of a path (as stressed, for instance, in the *nirvāṇa* concept of *Theravada* Buddhism), rather as having always been inherent to the path itself (such as, for instance, in *Mahāyāna* and *Vajrayāna* Buddhism). The ultimate truth is therefore regarded as *omni-inherent* and cannot be separated, even from relative truth.

Theravada Buddhism

Theravada (“The School of the Elders,” the most important and only remaining school of the “*Hīnayāna*” tradition, meaning “The Small Vehicle”) is the oldest surviving Buddhist school and has a widespread following in Sri Lanka and Southeast Asia. Accordingly, it is relatively conservative and generally closer to early Buddhism. *Theravada* implies meditation techniques like *saṃatha* and *vipassanā*. In *Theravada*, the individual realization of *bodhi* (awakening) is the ultimate goal and usually equated with the term “*nirvāṇa*.” On the contrary, in nondualist *Mahāyāna* and partly *Vajrayāna* tradition, *nirvāṇa* does not stand for complete enlightenment, since it still implies an opposition (*saṃsāra*).

Mahāyāna Buddhism/Vajrayāna Buddhism

Mahāyāna (“The Great Vehicle”) developed from *Theravada* and is found throughout East Asia. It includes the traditions of *Mādhyamaka*,

Zen, *Nichiren* Buddhism, *Tibetan* Buddhism, *Tiantai*, *Pure Land*, and *Shinnyo-en*, among others. According to the teachings of *Mahāyāna* traditions, “The Great Vehicle” refers to the path of seeking complete enlightenment for the benefit of all sentient beings, also called “*Bodhisattvayāna*.” In contrast to *Theravada*, the individual achievement of *bodhi* (awakening) is therefore not the ultimate goal in *Mahāyāna* Buddhism. The Buddha nature (Sanskrit: “*Tathāgatagarbha*” or “*Buddha dhātu*”) is considered to be present in all beings, creating an immanent link to the awakening, constituting the deathless “essence of the self.” As a consequence of *Mahāyāna*’s nondual philosophy, any being is therefore regarded as already enlightened, whether aware of it (meaning “awakened”) or not.

Vajrayāna (often translated as “The Diamond Vehicle”) or “*Tantric Buddhism*” is mainly practiced in Tibet and Mongolia and recognized as a part of the third branch of Buddhism, while others classify it as a part of *Mahāyāna*. *Vajrayāna* techniques, including *Dzogchen* and *Mahamudra*, are aimed at making it possible to experience the Buddha nature prior to full enlightenment.

Positivism/Neopositivism

Positivism is a philosophical approach, based on the idea of objective truth, meaning that observational evidence together with its logical and mathematical treatment is the exclusive source of all worthwhile information. The positivist approach has been a recurrent theme in the history of Western thought from the ancient Greeks to the present day but has been significantly developed from the early nineteenth century until the mid-twentieth century. Postpositivism, mainly influenced by Sir Karl Popper’s falsification theory and Thomas Kuhn’s theory of the paradigm shift, still maintains the idea of objective truth, but believes that human knowledge is based not on unchallengeable, rock-solid foundations but rather upon human conjectures.

Informal Logic

Informal logic is the study of natural language arguments, particularly the study of fallacies. The dialogues of Socrates/Plato are good popular examples of informal logic.

Formal Logic

Formal logic is the study of inference with purely formal content. The works of Aristotle contain the earliest known formal study of logic and have been expanded into modern formal logic.

Symbolic Logic/Mathematical Logic

Symbolic logic is the study of symbolic abstractions which capture the formal features of logical inference. It can be further divided into propositional logic (sentential logic) and predicate logic (see, e.g., Gottlob Frege). The latter provides the foundation of mathematical logic, which is an extension of symbolic logic into other areas, including the study of model theory and proof theory, among others.

Cross-References

- [Buddhism](#)
- [Buddhist Meditation Practices](#)
- [Formal Logic](#)
- [Monism](#)
- [Psychology in Buddhism](#)
- [Science in Buddhism](#)

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Logic in Islam

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Related Terms

[Rational thinking in Islam](#)

Description

In the Muslim middle ages, logic was a discipline borrowed mainly from ancient Greece that made it possible to establish rules of sound reasoning. It was, in other words, a way to discover truth independent of theological arguments stemming from revelation. Over the centuries, Arabic philosophers developed logic into an original system.

Logic developed through the Syriac language during the reign of the ‘Abbasid Caliph al-Ma’mūn (813–833), though a version of the *Topics* may have been made at the time of the third ‘Abbasid Caliph al-Mahdī (775–785). The translation movement focused on Porphyry

(d. 304)'s *Isagoge*, Aristotle's *Categories*, *De interpretatione* and *Prior Analytics*, Galen (d. 200)'s *Introduction to logic*, and on works by Aristotle's commentators such as Theophrastus (d. 287 B.C.), Alexander of Aphrodisias (d. 222), Themistius (d. 387), Ammonius (d. 520), and John Philoponus (d. ca. 580). In line with the Alexandrian school and Syriac tradition, the *Rhetoric* and *Poetics* were also considered parts of Aristotle's collected logical writings known as the *Organon* (instrument of reasoning); Porphyry's *Isagoge* was placed at the beginning as an introduction (Inati 1996, pp. 802-803; Street (2008)).

One of the first systems of logic was that of the tenth-century Ikhwān al-Safā' (the Brethren of Purity), which appears in their encyclopedia of sciences at the end of the first section on the propaedeutical sciences. They paraphrase with some originality the *Isagoge*, *Categories*, *De interpretatione*, and the *Prior* and *Posterior Analytics* (Baffioni 2008, p. 105).

Until the end of the tenth century, the most important logicians, apart from al-Fārābī (d. 950), were Christians. With the Baghdad Peripatetics, characterized by the work of Abū Bishr Mattā ibn Yūnus al-Qunnā'ī (d. 940) and al-Fārābī, logicians focused on the doctrines in the *Organon* of Aristotle, the "first master" of logic. The Arabic philosophers produced summaries and commentaries that merged Aristotle with Stoic doctrines, often in an original way. Among them were Abū Bakr al-Rāzī (d. 925), al-Fārābī (d. 950), Ibn Sīnā (the Latin Avicenna, d. 1037), and Ibn Rushd (the Latin Averroes, d. 1198).

The Farabian tradition passed to Spain in the tenth century, where it was enlarged by Averroes, who was concerned with this kind of exegesis. Ibn Sab'īn (d. 1269/71) would also subsume the ideas of the Ikhwān al-Safā'.

By the end of the twelfth century, Aristotle was no longer a significant source for Arab logicians in eastern Islam: his place was filled by Avicenna, who reinterpreted Aristotelian logic in an original way.

In the thirteenth century, Fakhr al-Dīn al-Rāzī (d. 1209), an anti-mu'tazilite theologian (the

Mu'tazilīs were the most rationalist among Muslim theologians; their school originated in the eighth century and it is not usually accepted by the Sunnīs), and a critic of Avicenna, founded a "western" school of Persian logicians (Rescher in Arnaldez (1991), p. 450); another major follower and commentator on Avicenna was Nasīr al-Dīn al-Tūsī (d. 1274), who criticized Fakhr al-Dīn al-Rāzī. Najm al-Dīn al-Kātibī (d. 1276) discussed logic with both of them. His *Al-Risāla al-shamsiyya* ("The logic for Shams al-Dīn": d. 1284, a patron of theology, sciences, and art.), based on Avicenna's teachings, introduced logic to the madrasa. But by this time, logic was confined to narrowly formal questions and no longer ranged over the subjects discussed in the *Organon* of Aristotle.

From about the end of the fourteenth century, Arabic logic is marked by lack of creativity and reiteration of earlier views, as demonstrated by al-Urmawī (d. 1283)'s *Matāli'* *al-anwār* ("The rise of the lights") and the commentaries on it and on al-Kātibī. The history of Muslim philosophy from this period onward requires further research, which may change this provisional judgment (Rudolph 2004, pp. 91-98).

In recent times, Arabic logicians have followed the main western schools. The Moroccan philosopher Mohammed al-Jabri, however, deserves special mention. In evaluating the history of Muslim thought, he emphasizes Averroes' scientific approaches, a basic component of which is found in the logic-based *bayān* (elucidation) of the tenth-century theologian Ibn Hazm (d. 1064): according to Jabri, these approaches should be resumed by modern Muslims to bridge the gap with the West.

Self-identification

Science

Logic – the search for truth through undisputable arguments – is self-evidently a science. But the Peripatetics saw it as a scientific "tool," and so the Arabs were soon faced with the opposition between this view, which was supported by the use of the

term *ala* (instrument) like Greek *organon* to signify logic, and that of the Stoics, who considered logic as part of philosophy. The Muslim Neoplatonists tried to reconcile these positions. For the Ikhwān al-Safā', logic was not an instrument of science but a true science, perhaps the highest: they called it "the scale of sciences" through which wise men could discern "true from false in speeches, right from wrong in opinions, truth from vanity in beliefs and good from evil in acts." Al-Fārābī called logic "the mistress of the sciences" because of its effectiveness in complementing them. Avicenna considered logic "the servant of the sciences" in that it was a means of acquiring them, but made it an integral part of his treatises.

Religion

If its instrument is human reason, logic cannot be a religion. But it was of basic importance in theological debates: logic was soon employed by Muslim thinkers in internal and external polemics, especially with Jews and Christians, on topics such as freedom, determinism, and the Trinity.

Arabic theologians and jurists had already made use of *ijtihād* (the free use of reason) in opposition to *taqlīd* (imitation). The Hanbalīs (followers of the school of theology based on the teachings of Ahmad Ibn Hanbal (d.855), hostile to speculative theology (*kalām*) and to esoteric Sufism, accepted that reason is a gift of God in that all knowledge comes from God; the Ash'arīs (The followers of the school of theology on which Muslim Sunnism is based after its founder's name, Abū 'l-Hasan al-Ash'arī (d.935–936), a former Mu'tazilī), distinguished between various types of ► [demonstration on the basis of two terms](#), the most important of which infers what is hidden – for example, the unity of God – from what can be perceived – for example, the multiplicity of existing beings. These demonstrations were probably influenced by Roman and rabbinical laws, but they are roughly contemporary with the earliest surviving logical translation by 'Abd Allāh ibn al-Muqaffa' (d. 757). According to al-Shāfi'ī (d. 820), analogy is a form of reasoning more rigorous than the simple comparison of similar cases.

Characteristics

Logic has its own rules and subject matter on which all other disciplines, including theology, should rely.

Relevance to Science and Religion

Muslim philosophers and scientists considered the relationship between revelation and reason or religion and philosophy to be crucial. Philosophers, who were deeply influenced by Aristotle, considered reason to be a major gift of God and believed that science had to be grounded on Him. This implied that logic was "justified" in a religious-oriented system of thought such as that of the Muslims. Many Muslim theologians such as the *zāhirī* Ibn Hazm and the *ash'arite* al-Ghazālī (d. 1111) developed Greek logic to suit their culture and aims. The *zahirī* is a theologico-juridical school that relies exclusively on the literal sense of the Quran and of tradition, rejecting rational opinion analogy: although the latter is retained by al-Shāfi'ī, d. 820, usually considered at the origin of this school.

Ibn Hazm knew Aristotelian logic well, but he also considered conditional syllogisms following the Stoics. His aim was precise understanding of the divine word without human interpretation, as part of which he justified logic by means of Qur'anic verses (e.g., 55: 3), arguing that if logic were ignored, the structure of divine language would remain hidden. Without rejecting logic, Aristotle's in particular, Ibn Hazm reduced it to an instrument for the evaluation of names and of their meanings and whether they are isolated or connected in speech. In doing so, he transformed the logic of Aristotle into *Zāhirī* logic (Arnaldez 1991, p. 446).

Al-Ghazālī introduced Greek logic into judicial issues, arguing that it was the basis of juridical syllogisms against the claim that it could be harmful to religion. But of course logic cannot refute or prove religion.

Other theologians refuted logic completely: Ibn al-Salāh (d. 1245) saw logic as a means of access to philosophy, of which he had

a low opinion; Ibn Taymiyya (d. 1328) reproached al-Ghazālī for introducing Greek logic into the *usūl al-dīn* and *fiqh*, though he conceded that as a formal system logic was unobjectionable; and al-Suyūṭī (d. 1505) condemned Hellenistic logic because for him every speculation should be submitted to religious tradition.

Another basic and much debated issue was whether God himself was subject to logical rules.

Sources of Authority

The first authorities were the translators. The most famous translators of Greek logic into Arabic besides Ibn al-Muqaffa' and Abū Bishr Mattā were Yuhannā ibn al-Bitrīq (d. 830), Hunayn ibn Ishāq (d. 877), his son Ishāq ibn Hunayn (d. 910), his nephew Hubaysh ibn al-Hasan al-Dimashqī (d. 890), Abū 'Uthmān al-Dimashqī (d. 920), Ibrāhīm ibn 'Abd Allāh (d. 940), and Yahyā ibn 'Adī (d. 973).

Their authority depended on the accuracy of their collation of available manuscripts, their knowledge of Greek, and their comprehension of the ancient authors.

Then came the philosophers, who developed ancient logic in new ways.

In the Ikhwān al-Safā', who earlier examined the "quadrivium" sciences – arithmetic, geometry, astronomy, and music – the logical treatises appear to substitute the "trivium" – grammar, rhetoric, and dialectics. There is no place for poetry or dialectical and rhetorical devices in the encyclopedia, which would increase dissension among the learned (Baffioni 2008, p. 108; Baffioni (2008)). And although grammar is the basis of verbal communication, the Ikhwān never approached it as a science: instead, they examined the technique of the "universal" form of language – logic – distinguishing linguistic logic and philosophical logic, the first as a premise of the second. The Ikhwān appear to be only partially in accordance with their contemporary al-Fārābī, perhaps because of the religious aims of the encyclopedia, which was premised on a sound method for discovering

truth. In the context of the new form taken by Aristotle's *Organon*, the Ikhwān added the "individual" to the five predicables – genus, species, difference, property, and accident – discussed in the *Isagoge*, and al-Fārābī spoke of five types of syllogism: demonstrative, dialectical, sophistical, rhetorical, and poetical, which expressed certitude, presumption, falsehood, persuasion, and imagination.

In his commentaries, which followed the method of the commentaries on the Qur'ān, al-Fārābī aimed to clear away misinterpretations of Aristotle's text. This task was taken over in Andalus by Ibn Bājja (the Latin Avempace, d. 1139) and above all by Averroes, who was the most faithful to Aristotle, whom he is reputed have followed to the letter. He began his commentaries on logical works with the *Categories* and ended them with the *Sophistics*; he also commented on the *Rhetoric*, *Poetics*, and *Isagoge* but did not consider them parts of logic.

In the thirteenth century, Arabic logic influenced by Greek passed into the Latin tradition. The Latin distinction into *logica vetus* and *logica nova* is inappropriate in Arabic, as the whole range of Aristotelian logic was available by about 900. Rather, it is Avicenna – who emphasized the novelty of his "Oriental philosophy" against the "Christian simpletons of Baghdad" – who has to be considered as marking the beginning of a new phase in the history of Arabic logic, at least in eastern Islam. But medieval Latin translators set aside Arabic texts dealing with Avicenna's system and translated other less influential texts by al-Fārābī and Averroes that concentrated on Aristotle and addressed thirteenth-century western logical concerns. The insignificance of Aristotle's logical system in the Avicennian tradition distorted western appreciation of the importance of logicians writing in Arabic.

Tony Street (2005, p. 247) considers al-Kātibī's *al-Risāla al-Shamsiyya* to be an important reference text because until the twentieth century, it was commonly the first text on logic studied by Sunni Muslims. Thus, foreign science came to be embraced by Islam at its educational heart, the *madrasa*.

Ethical Principles

Poetry, rhetoric, and above all dialectics do not aim to discover truth, and so do not advance religious queries and debates. Hence, an entire part of ancient logic was ignored at the beginning of the translation movement. The *Posterior Analytics* were introduced later after a break with the Syriac tradition that stopped the study of logic at the assertory syllogisms (end of *Prior Analytics* I, 7). Al-Fārābī's great innovation was to enlarge inspection to the whole logical *corpus*. But his statement that the Syriac limitation was due to a decree by the Synod was later recognized as a forgery: it probably corresponded with the shortened version of the sixth-century Alexandrian *curricula* available to the Syrians, which was translated into Arabic in the second half of the eighth century.

On the other hand, logic was for Muslim philosophers no longer just a key to knowledge: it was also a key to happiness – the ultimate aim of religion in that the more learned each soul becomes regarding intelligible objects the closer it is to the Universal Soul and to celestial pleasures (Abed 1991).

Key Values

Logic was also called *mīzān*, the balance, because it weighs arguments and proofs; it was also known as *mī'yār*, the standard, and *mihaqq*, “the test.” Logic assumes for itself a universal value insofar as it is concerned with intelligible things before which all men are equal (Inati 1996, p. 808).

Conceptualization

Nature/World

The Ikhwān al-Safā' link logic with cosmology in that it deals with concepts corresponding to things, that is to say, entities emanated by God on to the neoplatonic hypostases subsumed in their system and later on to individual human souls. Concepts are intelligible objects that

people represent in their minds having experienced them through the senses.

The Ikhwān preach the conformity of logic with existing beings, so logic is linked to their neopythagorean conception of the correspondence between numbers and existing (= numbered) beings.

Human Being

Nutq, language, is in Arabic the distinctive mark of humans among animals. The Arabic name for logic derives from the same radicals – *mantiq*, a synonym of *kalām* (language) has come to refer almost exclusively to peripatetic traditions of distinguishing a good from a bad argument; it was developed in this sense in the translation period.

Life and Death

The concepts of “life and the origins of death” are not of interest within Arabic logic.

Reality

In line with Aristotle, knowledge is divided into two types: conception (*tasawwur*) and assent (*tasdiq*) (Inati 1996, p. 806). Conception is the mental grasping of an object independent of any assertion as to its correspondence with external reality. Assent is based on asserting the correspondence of a mental object and the external reality; this assertion can be true or false, even though occasionally the term “assent” is used in the sense of true judgment. Following Themistius and the Stoics, the Arabs also studied conditional propositions.

Knowledge

Science is the form of what is known in the soul of him who knows.

Truth

A sound syllogism leads to the discovery of truth, just as demonstrations in juridical matters are based on the divine books.

Perception

As in Aristotle, intelligible objects come to be represented in minds only after they have

been experienced through the senses. Sensory perception is hence the essential first step in acquiring abstract knowledge.

Time

Logical demonstration obviously develops in time. But Avicenna emphasized how prophets received knowledge from God all at once, which is unlike logical processes. He calls such prophetic knowledge *hads*, intuition (on intuition in Avicenna see Street (2008)). Although it is immediately acquired, this knowledge is the same in terms of quality as syllogistic knowledge, which is acquired gradually.

Consciousness

A famous debate occurred in about 932 between the leading logician of his time, the nestorian Abū Bishr Mattā and the Muslim grammarian Abū Saʿīd al-Sīrāfī (d. 979), a commentator of Sībawayh (Endress 1986; Inati 1996, p. 810; Urvoy 2006, p. 241; Baffioni 2008, p. 109).

The basic issue was that while languages are each proper to a single people, logic may claim to be a universal language because it concerned with intelligible things and ideas, at which level all men are equal. The subject of logic is intelligible things in that they have different states that in the course of the explanatory phrase and proof lead from the known to the unknown. There is a connection between logic and language, but neither language nor grammar is the objective of the logician, and although logic cannot be reduced to the grammar of a language spoken by a particular people, grammarians need logic.

This is denied by Abū Saʿīd, who states that intelligible things are only reached through a language with its nouns, verbs, and particles. Logicians are criticized for putting people off with their technical terms. The specificity of a language has greater value than logic, the more so when in a translation logic may no longer explain original significations. According to Abū Saʿīd, it was a Greek who instituted logic according to the language of his people. How could this logic be imposed upon other people?

To preach the study of logic is to preach the study of the Greek language. And logic did not prevent the Greeks from falling into error and moral evil.

But the fact that Abū Saʿīd did not recognize a logic common to everybody brings to light a central issue: can logic suppress differences in opinions and in speculation? How could a single individual succeed in this? Are there not diverse mentalities that are irreconcilable in their diversity? (Elamrani-Jamal (1983) in Urvoy (2006), p. 240).

Abū Saʿīd demonstrates the existence of a certain Arabism that opposed everything Hellenic on the religious basis that God revealed the Qurʾān in “clear Arabic language” (16: 103). Logic was seen as an element of foreign civilization that threatened the Arabic language and grammar and even Islam. Only Yahyā ibn ʿAdī, a pupil of Abū Bishr, succeeded in identifying a universal grammar – logic – from the particular grammar that governs each language. That the Holy Book considered to be the true Word of God, and that God spoke in Arabic, implied that everything linked to Islam can also be considered as “Arabic,” independently from its geographical origin.

Rationality/Reason

Reason is the main basis for logic. It is not to be thought, however, that reasoning was unfamiliar in Islam before the foreign sciences passed into Arabic. Juridical sciences had already developed a method of reasoning whose function was similar to that of logic with respect to philosophy.

Mystery

The concept of “mystery” is not of interest within Arabic logic.

Relevant Themes

Logic involves the relationship between revelation and reason and, in the case of Arabic logic, the attitude toward Islam. Many medieval theologians tried to reconcile literal observance of the

divine Word with the existence of universal and necessary logical laws, and even tried to define the relationship between them and God. On the other hand, philosophers – perhaps for the sake of consistency – tended to ignore this issue and place God “beyond” such laws. The problem has continued to exercise scholars since the early twentieth century.

Cross-References

- ▶ Allah
- ▶ Hermeneutics, Theological
- ▶ Humanism in Islam
- ▶ Islam: an Overview
- ▶ Muhammad, Prophet
- ▶ Philosophy in Islam
- ▶ Philosophy of Language
- ▶ Science in Islam, Classification
- ▶ Science in Islam, Transmission

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Logic, Informal

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Related Terms

Applied logic; Argumentation theory; Critical thinking; Practical logic; Practical reasoning

Description

Under the heading of informal logic are comprehended several expressions of the practical turn in logic: from technical, artificial, and formalized language to natural language; from deduction and demonstration in science to argumentation in everyday life; from scientific and theoretical models of reasoning in search of laws and principles to practical patterns of reasoning leading to action; and from pure to applied logic to arguments. Although there are differing emphases among them, all these expressions, namely, theory of argumentation, practical logic, applied logic, and critical thinking, share a common ground with informal logic.

Informal logic is a young discipline that emerged during the last quarter of the twentieth century. But in another sense, it is one of the oldest for its themes and concerns are somehow the same as those found in a substantial part of Aristotle's *Organon* (adding his rhetoric which was excluded very early from the logic corpus). Informal logic is not always sensible to the

history of logic and does not have to be. On taking the history of logic into account, it is easy to see that this new age of logic is equal to a renaissance of dialectic and rhetoric, both excluded from the formal, mathematical, and symbolic logic of the twentieth century. However, it is not necessary to go as far back as Aristotle to try to understand the main traits of informal logic. The most important features of informal logic will rather be made manifest through a contrast with contemporary formal logic.

But this relation to formal logic is not without problems or, at least, it is not univocal. First, it can be characterized as a strong contrast between formal and informal logic in different ways: (1) Informal logic rivals with formal logic in order to do what the other cannot, namely, to account for the everyday reasoning and real argumentation that occur in a natural language. That is something informal logic does as far as it questions the concept of validity in the deductions of formal logic. It even questions the traditional difference between deductive and inductive arguments. Consequently, it opens a new and unknown field of research which cannot be approached with the mere instruments of formal logic. (2) It can also be characterized as a complement to formal logic (Jacquette 2007) in as far as it conceives of informal logic as a branch of logic (Johnson 2006). (3) Finally, it can be characterized as a continuum with formal logic thus keeping the formal ideal alive, something that can also be assumed for natural language and for arguments in everyday life (Gabbay et al. 2002).

The contrast between informal and formal logic begins with the challenge of the notion of validity in formal logic. This makes the strong commitment of traditional formal logic to deduction characterized as deductivism manifest. When informal logic distinguishes between bad and good arguments, the privilege and hegemony of deduction comes to an end. The traditional formal criterion of validity/invalidity gives way to a new manner of analyzing arguments according to their power of persuasion, in other words, to their effectiveness. But the good/bad distinction diverges from the valid/invalid one by

admitting degrees (better/worst), and in this respect, it looks like the strong/weak distinction of the inductive arguments. The difference rests on the fact that whereas in the inductive arguments the strong/weak criterion is measurable, therefore quantifiable, as probability and statistics make evident, the good/bad distinction is a qualitative criterion which depends on subjective appreciation. For this reason, the strong/weak distinction in the inductive arguments is calculable although not necessarily apt to formalization, while the good/bad criterion is neither calculable, at least within the scope of statistics and probability, nor liable to classical formalization. The other consequence of this new approach is that it makes the previously unchallenged distinction between deductive and inductive arguments irrelevant.

Formal logic has depended on its distancing from natural language which is plenty of ambiguities and paradoxes. Formalization was the strategy used to simplify language and to make it univocal and consistent. The consequence is a formal language, rigorously regimented but lacking in power of expression. Informal logic emerges, then, as a necessity for linking logic back to argumentation in natural language and everyday life.

This now leads to a final contrast concerning the content of thought. Formal logic had developed infallible models of inference, that is to say, models which are valid independently of the content. This was possible thanks to the previous formalization of language which eliminated its vagueness and ambiguity. But, when informal logic begins considering arguments in natural language and relevant for everyday life, content also begins to matter. It even inverts the traditional relation between form and matter. Instead of the precedence of forms which are to be infallibly applied to diverse cases and contents, informal logic is sympathetic to the pragmatist thesis that formal inferences are to be explained through the capacity to distinguish between a good and a bad material inference.

Besides these contrasts, the following are the main themes or essentials of informal logic: (1) A broadening of the notion of argument

(Blair 2006) that includes everyday discourses, advertising, and public opinion. (2) Dialogical argumentation (Vega Reñón 2007). (3) Evaluation of arguments, including the task of detecting implicit premises and the reconstruction (repair) of arguments, as well as the evaluation of premises in relation to the participants in a discussion or to the particular audience. (4) A special concern with fallacies, beyond the traditional formal approach. That means considering fallacies as contextualized habits of inferring and not just as cases of formal incorrectness (Groarke 2011).

Self-Identification

Science

Teaching logic is one of the main components of informal logic, basically, because one problem had been the lack of relevance of traditional formal logic for the instruction leading to involvement in public argumentation and to the analysis and evaluation of arguments. The classroom turned into an artificial environment where examples were prepared with the preconceived aim of instructing the students in some aspects or schemes of demonstration. But students demanded something more involved with reality, with real arguments, with arguments on vital issues, issues that had not yet been resolved, and issues that were still alive. Informal logic, however, is not just an area concerned mainly with the teaching of logic. It is also an area of theoretical research linked to other disciplines such as linguistics, communication, rhetoric, argumentation, artificial intelligence, cognitive psychology and theory of discourse.

Characteristics

Informal logic is different from traditional formal logic in the way it depends, first, on natural language; second, on context; third, on social interaction; and finally, on agent, that is to say, on practice. All of these dependencies have intentionally been overlooked in traditional formal

logic because this is precisely the aim of examining pure thought: the laws of thought or the principles of reasoning considered independently of the contingencies and ambiguities of natural languages and of the diverse particular practices. Such principles are also considered for all possible contexts and situations and are, therefore, valid for all audiences, which is the same as being independent of the audience.

Relevance to Science and Religion

When religion competes with science because science has somehow lessened the authority of its doctrine and beliefs, religion is found in the situation of having to defend herself against the loss of consensus by getting involved in disputes with the representatives of science who sustain the incompatibility of the two ways of approaching life and reality. Informal logic has to do with the argumentative dynamic of this confrontation. Nevertheless, religion does not always adopt an attitude of rivalry toward science. Likewise, science is not always in conflict with religion.

Sources of Authority

There are some antecedents of informal logic which express different ways through which this new approach to logic has emerged. In 1958, two significant works appeared: Toulmin's *The Uses of Argument*, calling attention to the practical circumstance of arguments, and Perelman's and Olbrechts-Tyteca's *The New Rhetoric: A Treatise on Argumentation*, putting forward the problem of persuasion of the audience. In 1970, Hamblin published *Fallacies*, offering for the first time an informal approach in which fallacies are not just violations of the rules of formal deduction.

Since the 1970s, the discipline of informal logic has become known through the names of Ralph H. Johnson (2006; Johnson et al. 1996), J. Anthony Blair (2006), Douglas Walton (2006), and John Woods (2004) and their

multiple books and articles. On the side of the theory of argumentation, the relevant names are Frans H. van Eemeren (1996), R. Grootendorst, and C. Plantin.

In 1978, the First International Symposium on Informal Logic took place and the *Informal Logic Newsletter*, which later became the review *Informal Logic*, began to appear. Other journals in the field are *Argumentation, Philosophy and Rhetoric* (since 1968), *Teaching Philosophy, Rhétorique et argumentation*, and *Argumentation et Analyse du Discours* by the group ADARR (Analyse du Discourse, Argumentation et Rhétorique).

The discipline is also active through the following organizations: The Association for Informal Logic and Critical Thinking, International Society for the Study of Argumentation, Centre for Research in Reasoning, Argumentation & Rhétoric, and the ADARR group (Analyse du Discourse, Argumentation et Rhétorique).

Ethical Principles

Informal logic is committed to the idea of pluralism and tolerance; every individual or person is in the situation of having to defend her own opinions, to revise them in connection with her most important beliefs. At the same time, every person has the duty of considering others' reasons and motives. Informal logic encourages dignity and respect for diversity of opinion and belief, not in the sense that "anything goes" but in the sense of taking part in the game of giving and asking for reasons.

Key Values

Since informal logic promotes a pluralistic worldview, tolerance and respect are the primary key values. Insofar as informal logic is concerned with argumentation and the role agents play in it, honesty is another key value. And, since it is a logical approach of the arguments in everyday life, rigor is also a key value. This also supposes freedom of thought and expression as a value and,

thus, implies the option for democracy against any kind of authoritarianism and totalitarianism.

Conceptualization

Nature/World

From a scientific and formal point of view, world and nature are the place where we can verify our knowledge or that which is the object of our knowledge, this object being very complex and approached only through its manifold aspects, thanks to manifold disciplines. All of this implies a certain order among the disciplines according to their dependence on others. But from the perspective of informal logic, nature and the world are the place where we humans act rationally. Action configures the world different than knowledge and the sciences do. Whereas knowledge gives an objective, nonperspective view of the world, action configures the world according to means and ends. This happens in the social context of human action where agents coordinate their interests and practices, and the result is a world consisting on a web of interrelated references. While the world, from a scientific perspective, tends to be one and the same for everyone, from a practical perspective, multiple world views are the result of multiple social practices and ways of interacting among agents, thus, generating multiple contexts. The resultant pluralism and relativity to context is something to be accounted for by informal logic.

Human Being

From the point of view of informal logic, the most salient feature of human beings is their rationality. However, human rationality is not merely an individual's attribute or something that can be examined only in respect to individual persons but something that is to be analyzed in a social context and in the context of action.

Life and Death

Informal logic is not directly concerned with life/death concepts, save in the sense of supposing the contingency and finitude of human life and rationality.

Reality

Used to be the hardest concept on which to rely because it designates the most stable, the most independent from ourselves and the least subject to arbitrariness and relativity. But informal logic does not rely on the hard concept of reality which is provided by traditional sciences in the sense of the given “once and for all.” On the contrary, the sense of reality is constructed according to human agency, which, in its turn, proceeds on the basis of beliefs as rules for action. Since there is no univocal set of beliefs on which to base human action, reality becomes plural, the diverse constructions resulting from the different sets of beliefs which rule action. In this sense, reality is subject dependent, agent dependent.

Knowledge

Before the emergence of informal logic, knowledge was easily identified with science and scientific knowledge. The formal approach to logic was then directly linked to science in the sense of being considered the canon of demonstration and proof. But in the last decades, sciences have evolved from the pure logic of demonstration, which used to distinguish them from other kind of discourses, to a more argumentative, therefore pluralistic and contingent way of explanation. Over more, knowledge and science were defined as opposed to opinion, also assuming the corresponding opposition between demonstration and argument, so that science was not a matter of argument. But, as far as science has been permeated by argument, its opposition to opinion ceases as does the opposition between demonstration and argument. Compared to the traditional definition of knowledge as “justified true belief,” informal logic would rather agree with a concept of knowledge in which the justification plays the central roll, prior even to truth itself.

Truth

Traditional formal logic is concerned with schemes of inference insofar as they are truth-preserving, meaning that they are forms of transmitting truth from the premises to the conclusion in an argument. However formal logic is not directly concerned with truth but with validity,

that means, with the infallible forms of transmitting or composing (by means of the logical connectives) truth. Therefore, formal logic does not decide on the truth or falsity of our atomic statements and beliefs but merely on the validity or nonvalidity of passing from the premises to the conclusion, no matter the content. In this sense, the sciences, traditionally considered, strongly depend on formal logic since their search is for objectivity, which is the same as truth in respect to reality. Their demonstrations, therefore, are regimented by the laws and principles of formal logic.

Informal logic is still farther from truth than formal logic is because it does not even rely on the concept of formal validity and the truth preserving function. For informal logic, the content of the premises is important, and, therefore, the relationship between consequence and conclusion acquires other nuances: ¿how strong or how good are the premises for the conclusion? Content is now relevant for the argument. Instead of being true or false, premises are to be accepted or rejected, and that is something that occurs contingently according to the agent or interlocutor and her beliefs. The acceptability of the premises now occupies the place of truth. Goodness of the argument occupies in informal logic the place validity had in the formal approach to logic. Whereas formal validity is a matter of “yes” or “no,” goodness of an argument admits degrees which are determined according to the acceptability of the premises and their relevance for the conclusion.

Perception

It is no longer a neutral input for knowledge but something which, besides our beliefs and opinions, accompanies our action and takes part in our decisions. Perception is no longer the natural and central connection to reality, since it is now contextualized and framed by several attitudes of our mind toward reality.

Time

Two meanings for the concept of time are as follows: first, as a limitation to reasoning, which means a scarcity of time to decide and to act according to a limited set of premises and

conclusions, and second, in the sense of opportunity, the right moment (*kairos*), the context of action in which we happen to reason.

Consciousness

This concept is not explicitly defined within the discipline of informal logic.

Rationality/Reason

It used to be traditionally understood as an impersonal (or suprapersonal) entity which governs human wisdom and behavior, such as a tribunal or court where conflicts among humans were to be resolved, but not by humans. This concept of reason and rationality implied that reason was one and the same for everyone and that rationality was unique. This is what is known as the substantial concept of reason. However, the concept of reason has evolved from this impersonal and substantial view to a human-related one in which rationality is conceived of as essentially committed to the variety of human circumstances and contingencies. Additionally, reason is also involved in human action, not in the traditional sense of being the precedent for action (i.e., what makes it rational) but rather in the sense of reason and rationality being the expression of human practical life and action in a social context. Thus, reason becomes a socially ruled procedure by means of which individuals and groups try to negotiate their interests. This is not a strict logical procedure but one that is better characterized as argumentative and pragmatic, hence its concern with informal logic rather than with traditional formal logic.

Mystery

Considered as something that is not reachable to human understanding, or something that does not belong to the space of reasons, mystery is not an issue for informal logic. However, in a negative sense, informal logic could contribute to the framing of mystery, as the realm on the outer frontier of the space of reasons: inside the space of reasons, all the things humans can argue for or against and act in consequence; outside, the things no one can argue for or against but decide to believe in.

Relevant Themes

From the point of view of informal logic, there are no further issues regarding the engagement of science and religion.

Cross-References

- Formal Logic
- Metaphysics
- Ontology
- Phenomenology
- Pluralism (Religious)
- Pragmatism on Religion and Science
- Rationality (Philosophical)
- Truth

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Logic, Predicate

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Related Terms

[First-order logic](#)

Description

Predicate logic is a subdiscipline of logic that had its roots in the last quarter of the nineteenth century, though it had to wait until the second decade of the twentieth century for a solid foundation. Like any other logic, it is concerned with the validity of arguments, though not of any kind: its interest lies in reasoning about what is universally true. As such, predicate logic is especially suited to reason about mathematical statements and can be considered a generalization of Aristotelian syllogisms. Predicate logic goes beyond syllogisms by introducing predicates with arbitrary numbers of arguments and quantifiers that allow to refer either to all or to some of the elements in the universe that is under consideration. It has a proof theory, which consists of a set of rules that describe how to mechanically derive sentences from a given set of premises (and such derivations are called “proofs”), as well as a model theory that assigns meaning to the sentences with respect to structures so that a given sentence is either true or false in a given structure. Predicate logic is sound, meaning that every sentence that can be derived using the rules in its proof theory holds in every possible structure. More importantly, a fundamental result by Gödel in 1929 shows that predicate logic is also complete in the sense that if a sentence is true in every structure, then it can be derived from the empty set of premises (Enderton 2001; van Dalen 2004).

Self-Identification

Science

Logic, and in particular predicate logic, is a formal science. As opposed to natural sciences, knowledge in predicate logic is not obtained through observations and empirical study but from the analysis and processing of certain symbols and rules. It is also formal in the sense that it provides a framework in which reasoning can take place, the form of the argumentation being the only element that determines whether it is valid or not (disregarding any purported meaning).

Characteristics

Predicate logic, with its focus on universally true statements, has proved to be sufficient in principle to formalize and reason about the main bulk of mathematics. In addition, predicate logic satisfies many good properties (such as completeness) that not all variants of logic possess, and it has been shown in a precise manner that a logic more expressive than predicate logic must give up some of these properties in exchange of its additional power (Ebbinghaus et al. 1996). A logic L is said to be at least as expressive as another logic L' if, for every sentence in L' , there exists a sentence in L such that the structures that make the first sentence true are exactly the same as the structures that make the second true. However, different disciplines (like computer science) require other kinds of reasoning, such as probabilistic, subjunctive, temporal, or fuzzy, to name a few. Dealing with that kind of arguments in predicate logic is convoluted at best, while other branches of logic are more appropriate and should be used instead: probabilistic logic, temporal logic, fuzzy logic, etc.

Relevance to Science and Religion

Predicate logic is not interested in the area “Science and Religion; its field of study abstracts from the real world and focuses instead on mental constructions.” It is relevant to it,

though, in the same broad sense that logic in general is: it is a useful tool which provides a universal language with which to reason about any subject matter.

Sources of Authority

The sources of authority in predicate logic are the peer-reviewed papers published in journals and conferences, where new results are proved in a rigorous mathematical manner. Among the many prominent logicians, Kurt Gödel (1906–1978) and Alfred Tarski (1901–1983) can be singled out as two of the most influential and important of all time: neither created this subdiscipline, but they both changed it profoundly and set forth research in new and unexpected directions (Gödel 1986; Tarski 1983).

Ethical Principles

Since predicate logic has no direct effect and is not affected by the physical world, ethical or moral considerations have no especial application here. Being honest, as in any scientific discipline, would be the main guiding principle.

Key Values

It provides an abstract framework in which to reason in a precise manner about any subject and, especially, about mathematics, for which it offers a way of attacking many interesting problems (Simpson 2000). It is a potent tool to avoid ambiguities when posing an argument as well as when solving it.

Conceptualization

Nature/World

The empirical world is of no concern to predicate logic due to its formal character. Thus, there is no explicit treatment of these terms within this subdiscipline.

Human Being

Again, this concept is not part of the field of study of predicate logic and thus the human being is not defined within this subdiscipline.

Life and Death

By the same reason, questions about life and death do not apply to this subdiscipline.

Reality

As a formal science predicate logic is not directly concerned with reality. At most, it can be said that predicate logic's principles of inference are not arbitrary but inspired on "what happens in reality," as in the case of the principle of identity (A is A) or noncontradiction (it cannot be the case that both A and not A).

Knowledge

Reasoning about knowledge is more suited for other subdisciplines of logic such as modal logic. Though not concerned with knowledge, the renowned Gödel's (first) incompleteness theorem has been widely put to philosophical uses with regard the limitations of what can be known. Roughly, this theorem states that given a set of axioms for a sufficiently strong (mathematical) system, there is always a sentence such that neither it nor its negation can be derived from the axioms using the proof theory; this implies that there are truths in the system for which no proof can be found.

Truth

Truth as an absolute notion was abandoned by logicians during the first thirty years of the twentieth century. A predicate logic sentence on its own is, in general, neither true nor false but requires a context, a given structure with respect to which it does have a truth value. Moreover, the completeness of predicate logic allows to deal with this semantic notion in a mechanical way: logically valid sentences, those which are true with respect to every structure, are exactly those that can be derived by means of the rules in the proof theory. (Different logics may use different classes of structures, so that logically valid sentences may vary from one to another.)

Note that this is in sharp contrast with truth in concrete mathematical systems where, by the incompleteness theorem, there are true sentences which are not provable.

Perception

Predicate logic is not concerned with perception since it does not have to deal with sensorial experiences.

Time

Time is not treated explicitly within this subdiscipline. Even though time could be formalized so as to reason about facts that take it into account, there are many variants of temporal logic more suited for this purpose (Gabbay and Guentner 2001).

Consciousness

Consciousness is not treated within this subdiscipline.

Rationality/Reason

Predicate logic does not define what reason is nor treats it. However, as a formal science it is driven by rationality alone, with complete disregard of the physical world.

Mystery

Mystery has no place in this subdiscipline. On the contrary, predicate logic has played an enlightening role in the clarification of the nature of many semantic paradoxes in the natural language through their rephrasing as logical sentences.

Relevant Themes

A critical issue, already sketched in the previous sections, is the notion of proof and the distinction between true and provable sentences. In particular, the results by Gödel and Tarski show that the notion of provability in a given system is definable within the system itself (assuming minimum requirements about its expressive power), whereas the corresponding notion of truth can only be defined in another system that adequately extends the original.

Cross-References

- [Logic, Informal](#)
- [Mathematics, Formal and Contemporary](#)
- [Mathematics, Modern](#)
- [Rationality \(Philosophical\)](#)
- [Semantics](#)
- [Truth](#)

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Logical

- [Rationality \(Philosophical\)](#)

Logos

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A Greek word meaning reason, word, or message. In ancient Stoic thought, Logos referred to the ordering principle of the cosmos. In the Greek Old Testament wisdom literature, it referenced the wisdom of God, sometimes personified in

feminine form (Prov. 8:1–36; Wis. 7:22–30; Wis. 9:1–2). New Testament writer John, drawing on Hellenistic and/or Hebrew thought, presented Christ as the *Logos* through whom all things were made, in whom dwelt the life of humanity, and who became flesh and made a dwelling among us (Jn. 1:1–14).

Love

- [Altruism](#)
- [Grace](#)

Love (Affective, Sexual)

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Related Terms

[Adoration](#); [Affection](#); [Attraction](#); [Desire](#); [Eros](#); [Infatuation](#); [Passion](#); [Romance](#)

The dimension of human life known as love seems unique. In fact, theologians have occasionally proposed that in order to balance out the overemphasis on the capacity for abstract thought in defining humanity, the capacity for love should be underlined instead. As it is, though, affectual bonding between parents and their offspring or an individual and a particular sexual partner is seen in many taxa of birds and mammals. Hence, when it comes to love, humans are clearly not alone. Based upon the terminology used in Ancient Greek texts, one should distinguish between at least four types of love: the ► [romantic](#) and sexual *erōs*, the friendship oriented *philia*, the parental *storgē*, and the selfless, forgiving *agapē*. Of these, the present entry concerns only the first.

As Andreas Bartels and Semir Zeki comment, romantic love, celebrated throughout the ages as perhaps the most overwhelming of all affective states, has been the inspiration for some of the

loftiest achievements of mankind. Characteristically directed toward a single person, it is a complex sentiment involving cognitive, emotional, and behavioral components. Any study of it is thus a study of a phenomenon with a myriad of components, some of which (e.g., the erotic aspect) can also act independently of the others. The converse, however, is not true – all the noted components constitute essential ingredients of love (Bartels and Zeki 2000, p. 3829). As Carl Gustav Jung points out, studying love is further complicated because love reaches into every aspect of human life. It may be studied from ethical, social, psychological, philosophical, aesthetic, religious, medical, legal and other standpoints. But above all love is still an intensely *individual* experience which means that all generalizations about it – be they scientific or otherwise – are rough approximations at best (in the same way, religious beliefs – although constantly codified in the course of history – are always an individual experience which bows to no general rule) (Jung 2008, p. 27f).

According to Barry Komisaruk and Beverly Whipple, the word *love* derives etymologically from “desire,” “yearning,” and “satisfaction,” sharing a common root with “libido.” These authors define love as *one’s having stimulation one desires*. The nature of the stimulation may range from abstract cognitive (as in romantic fantasies) to direct sensory (as during sexual activities). Thus, love encompasses having a bond with someone for whom one yearns as well as stimulating one’s desires (Komisaruk and Whipple 1998, p. 927). The strength of this definition is that it is applicable also to nonhuman species (important in tracing the evolutionary origins of love) and directly points at the *motivational* quality of love in relation to reproduction (see below). Its weak spot is the emphasis on sexual desire. As Helen Fisher and colleagues point out, the existing studies of romantic love routinely conflate ► [the sex drive](#) with love’s motivational system. Yet it is well known that the sex drive and courtship attraction depend on different neurochemical systems (Fisher et al. 2006, p. 2174). This is an apt remark because even though one may use the phrase *to make*

love interchangeably with *to have sex*, most adults know from firsthand experience that having sex has often very little to do with love. Hence, for a mature scientific approach to love, more structured models are needed.

One of the ways to clarify the issue is to start from the evolutionary *origins* of love. From this perspective, love represents an “end solution” in developments relating to the concern for survival. This “solution” is manifested in various responses that involve transcending self-oriented behavior. It is impossible for an organism to exist completely through itself; its well-being and identity do not depend on internal relations only but also on the relation to otherness (Kather 2008, p. 27). Hence the evolutionary background for motivational states that promote non-self-oriented behavior and communication. This might, perhaps, be called the transcendent function of love.

In good accordance with the foregoing, it has been proposed that love should be viewed in terms of motivational complexes rather than emotions. Fisher and colleagues define emotions as affective states of *feeling*; motivational complexes are systems related to the pursuit of a specific *want*. In this sense, romantic love is not primarily an emotion. Love is not associated with a distinct facial expression as are primary emotions. Unlike emotions, love is focused on a *specific* reward - a specific individual. Rather, love is a motivation system designed to build and maintain an intimate relationship with a preferred partner. In fact, romantic love may be considered a fundamental *drive* distinct from the sex drive: love motivates an organism to pursue a *preferred* mating partner (note – the sex drive is aimed at seeking copulation with a *range* of partners). Unlike the sex drive which is often temporarily quelled when satisfied, love does not decrease with coitus, persisting for months; also, one can be in love with someone with whom one has had no physical or sexual contact. The sex drive is mediated via androgens and estrogens. Individuals with higher levels of testosterone (T) engage in sexual activities more frequently; women show more sexual interest around ovulation when the T levels are higher than at other times.

Romantic love, however, does not linearly depend on gonadal hormones – taking T in order to boost sexual interest does not cause one to fall in love (Fisher et al. 2006, pp. 2176f, 2181). In fact, romantic love seems to result in untypical changes in T-to-E (E standing for estrogens) ratios. The concentrations of T (relative to E) vary in opposite directions in the two sexes ($T > E$ in males, $E > T$ in females). Intriguingly, men in love demonstrate decreasing T levels, but women produce more T (Esch and Stefano 2005, p. 184). It is as if in love, males come hormonally closer to females and vice versa. Theoretically, these changes should at least in males reduce libido.

The motivational complex we know as love, thus, does not coincide with the sex drive: they are associated with interrelated but distinguishable neural networks. This statement can be approached on several levels. First of all, in nonhuman species, one can observe what Fisher and colleagues call the *courtship attraction system*. Courtship attraction is characterized in mammals by increased energy, focused attention, obsessive following, affiliative gestures, possessive mate guarding, and motivation to win a preferred mating partner (Fisher et al. 2006, pp. 2173f, 2181). These features are so obviously similar to human behavior during intense romantic love that the evolutionary linkage between the two seems clear. That, however, is not all. As noted above, romantic love is a derivative of parent-offspring bonding. The evidence for this is that even though there are courtship attraction systems in fish, amphibians and reptiles, these taxa do not seem to have any affectual bonds between individuals. Affectual bonding with a sexual partner thus seems to have originated from the parent-offspring bonding characteristic of birds and mammals. Among other aspects, these links deserve an emphasis because in humanities love has often been thought of as a purely cultural construct. It is not difficult to show that our current Western concept of romantic love is historically recent. Moreover, different cultures have different understandings of love. And cultural ambience strongly influences an individual's experience of love. However, the

physiological substrate of love goes back to pre-human species. Therefore, no matter how different the particular concepts of romantic love may be in different societies, they are still just variations on the same main theme. Biology influences culture and vice versa.

Thanks to the continuity of human romantic love with its prehuman prototypes it is not surprising that romantic love is a cross-cultural universal – Fisher and colleagues refer to a survey of 166 societies of which evidence for romantic love was found in 147; there were no negative data – in the remaining 19 cultures anthropologists had failed to ask the appropriate questions, all were cases of ethnographic oversight (Fisher et al. 2006, p. 2175). Some authors have interpreted this universality quite boldly. Jonathan Lear, for example, reconceptualizing the Freudian doctrine of libido, argues that love is a *basic natural force* (Lear 1990, p. 181). Jung has likened love to a “force of destiny” (Jung 2008, p. 27). As Fisher and colleagues put it, romantic love begins as an individual starts to regard another individual as *special* and *unique*. The beloved’s worthy traits are aggrandized and the flaws minimized. The lover feels energized and ecstatic when near the beloved (this is expressed via a host of sympathetic nervous system reactions such as sweating, heart pounding, etc.) and suffers separation anxiety when apart from the beloved. The lover is emotionally dependent upon and exhibits empathy (to the point of self-sacrifice) and sexual desire for the beloved as well as intense sexual possessiveness. However, the lover’s craving for *emotional* union supersedes her/his craving for sexual union with the beloved. Most characteristically, the lover *thinks obsessively* about the beloved. Romantic love is involuntary, difficult to control, and generally impermanent – in humans, it typically lasts from 6 months to 3 years (Fisher et al. 2006, p. 2174f).

The ecstatic feelings associated with romantic love are the result of the release of dopamine, norepinephrine, and serotonin. The latter combination has a pleasure-evoking effect which is quite similar on the brain level to that of the amphetamines (Fisher 2004). There are two

brain areas that reliably display love-specific activation: the ventral tegmental area (part of the brain’s reward system) and the caudate nucleus (mediates reward expectation). Cortically, neural activity associated with romantic love concentrates in the main areas of the middle insula and the anterior cingulate cortex. Other structures activated are the hippocampus, putamen, and cerebellum. Task-specific deactivations relate to the right prefrontal, parietal and middle temporal cortices, the posterior cingulate gyrus, medial prefrontal areas, and the posterior amygdaloid region (Fisher et al. 2006, p. 2175f; Bartels and Zeki 2000, p. 3831).

Bartels and Zeki have also studied the parallels and differences in the neural correlates of romantic vs. maternal love. They have discovered that several activated regions overlap precisely, including those in the striatum (putamen, caudate, and others), insula, and the anterior cingulate cortex. The most intriguing difference between the two varieties of interpersonal love is that the hypothalamus activates during romantic love but shows no change in maternal love. This is in accordance with the proposition that romantic love ought to be thought of as a motivational complex rather than a primary emotion: the evolutionarily ancient hypothalamus, forming the key link between the autonomic nervous system or ANS, the brain, and the endocrine system, is the main generator of basic motivational states (such as thirst, hunger, and sexual desire). Romantic love also specifically activates the hippocampus. Activity specific to maternal love concentrates to the lateral orbitofrontal cortex and the periaqueductal gray (Bartels and Zeki 2004, p. 1161). Thus, maternal and romantic love should not be played out against one another. They represent motivationally different variations of the same basic pattern.

From a certain perspective, romantic love may be viewed as a transitional state between everyday, baseline consciousness and altered states of consciousness such as intense religious and mystical experiences (d’Aquili and Newberg 2000, p. 43). Given the transcendent aspects of (romantic) love, it is no coincidence that from times immemorial people have perceived

of a link between love and religion. As Jung put it, “Love has more than one thing in common with religious faith. It demands unconditional trust and expects absolute surrender.” (Jung 2008, p. 44)

Cross-References

- [Affective/Emotional Computing](#)
- [Agape](#)
- [Attachment: Theory and Patterns](#)
- [Emotion](#)
- [Empathy](#)
- [Happiness](#)
- [Love \(Alterity, Relationship\)](#)
- [Passion and Emotion, Theories of](#)
- [Sex and Gender](#)

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Love (Alterity, Relationship)

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Love constitutes a central issue in every human life. Furthermore, persons can only understand their own self through the perception of others, through “otherness.” The overwhelming psychological evidence points to the role of the mother as a condition to the child’s awakening to self-awareness, an experience of being loved which is condition to further extend the ability to love others. The received love is a precondition to love-giving. Such a dynamic reveals a close link between love, relationship, and otherness.

Otherness or alterity refers to the reality of other person, to the difference he/she makes, and his/her insurmountable diversity. The access to the other calls for a special kind of relationship, of respect and communication, different from the relation with other things and beings.

A philosophical distinction reveals three different ways to understand love: distant love, instant love, and constant love. It corresponds to a treatment of the other as an object, as a person, and as a “neighbor.” After humanism has grown during the Enlightenment, with its characteristic individualism and solipsism, a crisis arises since the second half of the twentieth century becomes more aware of the negative consequences of this anthropologic model, prompting a critical awareness in philosophy, psychology, social sciences, and literature. Only overcoming the individualistic pattern would be possible to avoid the catastrophes witnessed in the last century.

Philosophers and anthropologists of Hebrew and Christian inspiration (F. Rosenzweig, M. Buber, E. Lévinas, G. Marcel, F. Ebner, P. Ricoeur) have outlined the dimension of love focusing on otherness, on the ability to overcome a self-centered view and welcome the presence of the other as a gift, revelation, and ethical calling. This approach has been paramount to all the efforts to overcome the abuses linked to an

objectivation of the other and to its manipulation and every kind of abuses.

M. Buber and E. Lévinas have elaborated a radical philosophy which recognizes absolute primacy to the other and deduced the ethical consequences of such a new perception (Buber 1962; Lévinas 1999). Part of the contemporary psychology has evolved into this new paradigm, trying to discern the healthy and the pathological elements which arise from this way of understanding relationships and love (Kernberg 1995).

An anthropology that points to the centrality of otherness in the constitution of the self has long-standing effects in the dialogue between science and theology. From a side, this model could be understood as a bridge trying to link both disciplines around a kind of “normative common ground” (Entralgo 1988). On the other hand, the weight recognized to otherness can mean a blow to several scientific anthropologies, especially those of biological foundation, as it subverts the dogma of self-interest guiding such views. Theology is called to a reelaboration of

key concepts to make place to this new view of other-centered self. In any case, the concept of love, as a disposition opening and orienting to others, should be welcomed as a healthy complement to more individualistic standard views, both in science and theology.

Cross-References

- [Revelation](#)
- [Self](#)

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Machine Intelligence

► [Artificial Intelligence, General](#)

Machine Learning in Robots

► [Robot Programming](#)

Magic

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Related Terms

[Anthropology](#); [Mental process](#)

Magic has been and is likely to continue to be a contested concept in disciplines such as the study of religion, anthropology, sociology, and to a lesser extent history. Caught in a negative relation to the, usually, positive valued concepts of “religion” and “science,” magic has all too often functioned as a dustbin category used to designate ritual practices that did not fit into prevalent definitions of religion or to attempts to manipulate the world that did not fit into current definitions of science. Further the concept has

a troubled history functioning as polemical ammunition used to denigrate competing ritual practices (e.g., Protestant polemics against Roman Catholic understandings of the Eucharist as “hocus pocus”), and as an integrated part of ideological primitivism, according to which “their” (primitive) rituals are magical, whereas “our” (civilized) rituals are religious. This has led several scholars to argue that the concept is best abandoned from scientific discourse. This, however, is premature for several reasons. A troubled past is a problematic reason to abandon concepts as this potentially could lead to a cascade of other concepts also having to be abandoned for similar reasons. Most general concepts in the study of religion and anthropology have a problematic history and most have been used for politically dubious purposes and outright polemics. Abandoning such concepts might deplete the disciplines of useful conceptual tools. Further, a troubled past does not necessarily mean that the concept does not circumscribe a class of real world phenomena. Therefore, a more sound strategy would be to redefine magic as a scientific concept in much the same vein as concepts such as myth, ritual, and even religion have been more or less successfully redefined in the study of religion and neighboring disciplines during the last four to five decades. That being said, it is also evident that such a definition of magic will not be based on necessary and sufficient condition but, rather, will delineate a number of core features that show a high probability of coexistence and, perhaps, causal interdependency. Magic does not

refer to a natural kind but to a number of cultural and social practices unified by family resemblance. As such, like myth, ritual, and religion, magic is a synthetic category that circumscribes a number of features, each of which must be explained before attempting a more thorough investigation of the synergetic or functional effects. A more serious challenge to the viability of the concept would be that it does not delineate any real world phenomena – that it is a mirage of scholarly imagination. There is, however, no reason to believe that the phenomena traditionally circumscribed by the concept of magic will disappear together with the concept – people are still likely to pierce dolls with needles, burn the hair of their enemies, and ingest substances believed to contain desirable essences. Finally, even though the concept has been criticized, few scholars have been able to come up with viable alternative concepts and most have instead continued using the concept, even with some reservations. However, asking for a direct correspondence between a concept and phenomena in the world seriously disregards the established model-dependency of all human concepts: Concepts are related to mental and/or public models that to some extent fit the world by eliciting certain aspects of reality relevant to humans. As such, they will never correspond *in toto* to any real world phenomena, even though the degree that this is the case depends on the kind of phenomena designated as well as the type of concept employed. Natural kind concepts (such as “dog”) are thus able to elicit a larger degree of correspondence than social kind concepts (such as “family”), but in both cases, the relation is mediated by cognitive and social models highlighting some and not other aspects. In the case of second-order scientific concepts, these models should be made explicit, founded in theories and related to theoretical models of relevant neighboring concepts as well as to relevant higher and lower level scientific theories. Thus, magic should be relegated to its proper position as a synthetic concept that designates a range of potentially interrelated phenomena each of which are susceptible to scientific investigation. In order to arrive at such an understanding, however, we need to look at

(1) the history of the concept; (2) different scientific approaches; and (3) recent cognitive investigations of underlying mental processes.

Conceptual history: The concept of magic has a long history in European languages, even if its diffusion and actual use was severely limited until the Renaissance and the later emergence of the modern science of anthropology. As a cognate of the IE *magh* (to be able, to have power), the modern form has its origin in the Greek *mageia* (the arts of the *magos*) and more particular in *magos*, a word allegedly designating ritual specialist of Persian or Median origin. As such, it designates ritual specialists of a foreign origin in contrast to local cult. There is, however, no indication that these practices were considered less efficacious or morally dubious. As a more abstract concept, magic was employed to distinguish medical treatment from ritual counterparts in the emerging Hippocratic medicine. Epilepsy, generally considered to be a disease indicating divine intervention (*The sacred disease*) calling for ritual treatment, was reclassified as a physical disease in need of medical treatment by Hippocratic writers in the late fifth or early fourth century BCE. Thus, early on, we find two of the characteristics later used to define magic: (a) a ritual practice of foreign or exotic origin (b) aimed to produce a stipulated effect. As such these practices could be seen as competing with both established ritual practice as well as with emerging “scientific” technologies based on a non-ritual, instrumental, and, partly, material understanding of the world (Lloyd 1979). Whereas the dichotomy to science receded to the background during the Middle Ages only to be reinvigorated in the Renaissance, its opposition to established religion was vividly endorsed in the Middle Ages. Exemplified by the New Testament figure Simon Magus, magic referred to ritual power made for monetary purposes in contrast to the morally superior miracles performed by the apostles (Acta 8,5–24). Thus, another distinction was introduced – that between miracles and magic. Whereas the former result from or are related to legitimate rituals, involve the direct intervention of a deity, and are made for morally superior reasons, the latter was

understood as a class of illegitimate rituals not needing the intervention of deities (or even forcing these) to be effective, and made for morally dubious and often monetary reasons. The distinction between “our” legitimate and moral rituals and “their” illegitimate and immoral rituals can also be found in both Jewish and Muslim rhetoric and magic has this conceptual function during most of the Middle Ages. This distinction might be thought of as a result of attempts by monotheistic (or monolatric) religious authorities to establish an institutional hegemony, thereby excluding competing ritual practices. Such polemics of legitimacy and authority indicate, however, that non-authorized ritual performance was indeed widespread and that institutional control over ritual behavior was hard if not impossible to achieve. Further, competing ritual practices were often incorporated into the official cult and, as such, the concept’s polemical aspects should be seen in a wider context of ritual competition, institutional dynamics of rationalization, and routinization, as well as contrast between ritual practices of an urban elite and those of the rural population.

The polemical aspects of magic as a concept were further emphasized in the Renaissance due to two independent factors. First, the emergence of diverse forms of Protestant Christianity entailed that magic became part of the newly emerging demarcation between “right” and “wrong” interpretations of central Christian rituals and dogmas. Magic thus came to designate not only ritual practices outside mainstream tradition (whether Jewish, Christian, or Muslim), but also a particular ritual attitude, i.e., the belief in automatic ritual efficacy. This was most obvious in the cases of Protestant polemics against Catholic interpretations of the Eucharist, in particular the dogma of ritual efficacy based on *ex opere operato*, but this was generalized into a conception of magical rituals as based on automatic efficacy in contrast to religious rituals that involved the intermediary intervention of a god or another types of superhuman agent. Second, magic came to designate a range of special intellectual and technical endeavors in the renaissance based on ideas of micro-macrocosmic

correspondences, astrology, alchemy, kabbalah, and hermeticism. Encouraged by the resurgence of neo-platonism, renewed interest in non-Christian philosophy and theology, and the decline of the Middle Age distinction between the celestial and earthly spheres, circles within the intellectual elite attempted to expand human mastery of its surroundings by means of a range of techniques including “natural magic” (Yates 1964). Correspondences between the human body, nature, and the celestial spheres enabled the renaissance magus to predict future events and to manipulate both the human body and nature, exemplified by the alchemical search for the philosopher’s stone. Renaissance magic thus combined notions of a reanimated universe, containing numerous forces that could be manipulated by the knowledgeable, with a reevaluation of magic, epitomized by references to the “wise kings of Matthew” of the New Testament and their prediction of the birth of Jesus by means of astrology. Renaissance magic was thus intimately connected to the emerging sciences and its ideas of lawfulness of nature – in fact most scientific pioneers such as Kepler, Brahe, and Newton had strong interests in astrology and alchemy – and this connection was not severed before the Enlightenment.

Scientific approaches: In summary, a semantic cluster can be discerned through this short historical survey of the meaning of the concept of magic: Magic was considered in opposition to both religion and science; it was believed to be directed toward instrumental efficacy based on lawfulness of nature; it was efficacious but immoral and heathen ritual; it was the ritual of the Other; and its efficacy was more or less automatic rather than mediated by a superhuman agent. Early anthropology and science of religion inherited this understanding of magic, even if different schools have put its emphasis on different aspects. Three major approaches can be discerned in the first 100 years of scholarship. First, Victorian anthropologists understood magic in the framework of a general evolutionism and in what was later called an intellectualist approach. Intellectualists understood the phenomena of magic, religion, and science in terms

of individual mental processes aimed to explain and control aspects of the environment. Combined with the gradualist evolutionism and progressivism prevalent of the late nineteenth century, magic was explained as the attempt by primitive humans to control the environment through essentially rational but futile actions. Inspired by empiricist ideas of human reasoning, James Frazer (1854–1941), undoubtedly the most famous Victorian theorist of magic and religion, argued that magic rests on the misapplication of two ordinary mental operations: association by means of prior contact, and association by means of similarity. Primitive humans mistake such ideal associations for real connections, leading to the two basic principles of magical actions: contagious and homeopathic magic. Using these principles, people attempt to control their environment by means of associative relations, e.g., throwing water into the air in order to attract rain or hurting an enemy by burning something that used to belong to him or her, such as hair, nails, or clothing. These manipulations are believed to have an automatic efficacy as they build upon a sensed (but ultimately flawed) appreciation of natural lawfulness, and therefore, Frazer could describe magic as the “bastard sister of science.” He believed that sooner or later, people would recognize the futility of magical attempts to control the environment and, instead, see the contingency of events to be the result of an active but invisible agent, a god, spirit, or ancestor, thereby heralding the age of religion that would, eventually, itself be supplanted by modern science (Frazer 1922). In Frazer’s view, all humans, past and present, can be positioned on this unilinear evolutionary trajectory, enabling the scholar to understand modern “primitives” as a contemporary image of the Western Europeans’ own cultural past and, *vis versa*, understand past cultures through the lens of modern-day “primitives.” Nobody today accepts such a simple evolutionary schema, but Frazer’s two principles of magic still form a basic, if somewhat dated, conceptual bedrock to scientific investigations into magical rituals. Thus, two ideas should be extracted from the intellectualist approach, which have a continued importance in the contemporary

study of magic – the focus on the underlying mental processes in magical rituals and the instrumental purpose of the rituals involved.

The second approach is symbolist. It rejects the understanding of magic as being primarily directed toward the manipulation of the environment in favor of the view that magic is a type of ritual behavior distinct from ordinary instrumental action and that it therefore is primarily expressive and symbolic, i.e., consisting of signs that point to something else. Symbolists tend to disagree about what the symbols point to and what methods should be used to decipher the symbols. Thus, different theories have been presented from Freudian unconscious feelings of omnipotence and schizophrenia to central values and structures of society. Prominent among the symbolists was the French sociological *Annale* school represented by figures such as Émile Durkheim, Marcel Mauss, and Henri Hubert. Rejecting that a universal phenomenon such as religion can be explained in terms of mistaken mental operations, Durkheim (1858–1917) famously linked the emergence and stability of human society to religion through the process of a ritual celebration of Society in the form of a totemic emblem. Accordingly, magic was understood as derived from religion – in fact as its antisocial mirror image in which sacred objects are used for private purposes. Whereas religions form a church and thus are eminently social, magicians have clients that buy ritual favors in exchange of some material payment and as such magic is rightly scorned by religion because it works for the benefit of the individual in contrast to the encompassing social effervescence of religion (Durkheim 1912). Even if not all symbolists agree with this negative assessment, all agree in pointing to a hermeneutic method in order to extract the underlying and implicit meaning and function of explicit magical performance. Disregarding the purported instrumental aspects of magic, symbolists instead understand magic as symbolic, and the symbols must be deciphered by means of an interpretational “key.” This raises two problems. First, magic must be distinguished from other types of behavior and second, one must somehow make the chosen interpretational key plausible by

reference to an overarching theory. The first problem was solved by pointing to the obvious ritual aspect of magic – an aspect disregarded by intellectualist in their understanding of magic as a mistaken but instrumental and rational behavior. The second problem is trickier as the choice of overarching theory is hard to justify by reference to the subject matter under investigation without ending up in a circular argument. Thus, by grounding the inherited distinction between magic and religion in its social function and not in any overt characteristics, symbolist designation of some practices as magic often ended being based in local polemics between established and less established ritual traditions, or between institutionalized and noninstitutionalized ritual practices. Recognizing this problem led many scholars to argue that the concept is best abandoned, as magic seems impossible to distinguish from religion from an etic perspective. Even if this consequence is rejected here, for reasons that should be apparent below, symbolist accounts have pointed to two important aspects. First, that magic is best understood as a type of ritual behavior and second that magic employ established symbolic relations in order to enact particular types of ritual manipulations.

The third scholarly approach is pragmatic and performative. Championed by the Polish-British anthropologist Bronislaw Malinowski (1884–1942). Pragmatists focus on the pragmatic and performative embedding of concrete rituals and they are generally less interested in magic *per se* as in how its performance accomplishes particular social and psychological tasks. Having said that, most uphold the distinction between magic and religion due to function and scope. Malinowski, for instance, argued that both magic and religion have the primary function of ensuring the stability in social institutions by acting directly on the emotional well-being of the individual. In short, religion appropriates the inevitable life-crises, relates them to basic mythic structures and thereby alleviates emotional distress, and confirms institutional authority and belief in Providence. As such, religion works in the long perspective, as no direct instrumental effect is represented in relation to its rituals. In

contrast, magic works in the short perspective. It aims to alleviate anxiety related to particular pragmatic endeavors that are imbued with high degrees of uncertainty. Magical rituals thus install a sense of security in participants and thereby ensure that uncertain but vital actions, such as those related to agriculture, are performed. Therefore, magical rituals are closely intertwined with pragmatic actions such as fishing or planting a garden, but Malinowski emphatically denied that participants fail to distinguish between ordinary instrumental actions informed by common sense causal principles, and magical actions informed by traditional authority. Even if the latter are conceived as instrumental, their instrumentality derives from the performative aspects of ritual magic. In line with later performative approaches to language, Malinowski emphasized how language in practice effects a change in behavior rather than refers to or describes some aspects of reality. Adopting this view to ritual, he pointed out that ritual performance could effect a change in, for instance, social status (e.g., through a wedding ritual) and that this change is produced by particular words being uttered by the right person. There is only a short step to allocate the same performative power to rituals aimed to change aspects of the environment other than social status. Accordingly, magical rituals are understood as powerful due to ordinary experience of words being able to alter social reality (Malinowski 1948). Three aspects should be extracted from the performative approach: First, magical rituals are intimately related to non-ritual pragmatic endeavors, even if participants have a clear understanding of the difference between instrumental and ritual behaviors. Second, magical rituals manipulate the emotions of participants and as such have a direct effect on human behavior. Third, representations of ritual efficacy is, at least partly, a product of the performative aspects of ritual language as well as the conceived authority of the agents performing central parts of the ritual sequence.

These classical approaches to magic continued to influence anthropology and the study of religion throughout the twentieth century.

Discussions between intellectualist and symbolist approaches were particular evident in the so-called rationality debate in the late 1960s and early 1970s (Wilson 1970), whereas performative approaches gained prominence from the early 1970s (Tambiah 1990). With the rise of postmodern, poststructuralist, and postcolonial approaches, the concept of magic was, however, criticized as being an instrument of power and its polemical history was highlighted as an argument for its scholarly inappropriateness. To the extent that its use was inevitable, it was used in a rather narrow, emic way as a means to describe localized ritual practices that for some reason were considered illegitimate, socially marginalized, or part of folk religion in contrast to institutionalized religion. Thus, no universal definitions were given, a fact that made cross-cultural comparison difficult and interests turned instead toward the genealogical explorations and critical examination of the concepts history in Western scholarship (Styers 2003). At the same time, however, a growing interest of the mental processes underlying magical practices can be found in cross-cultural psychology, cognitive psychology, and evolutionary psychology as well as in cognitive linguistics. Instead of rejecting magic as a product of the researcher's imagination when engaging "the Other," these approaches seek to "normalize" magical thinking and argue that the underlying mental processes are a part of ordinary human cognition found in all societies, at all times, and in all people. Two aspects of this research should be mentioned here. First, building on a long tradition in developmental psychology pointing to the existence of magical beliefs in children, psychologists began to wonder if this indicated a more general proclivity to magical thinking among adults as well. Thus, Rozin, Nemeroff, and colleagues found mental operations similar to those described by Frazer when investigating contemporary Americans' notions of contamination and disgust. Subjects consistently reacted toward a potential transfer of undesirable essences when presented with relations solely based on contagion and similarity. Drinking from a glass that had previously been in contact with a cockroach, even if the glass was

later disinfected, was represented as able to transfer undesirable essences. Wearing a jumper claimed to have belonged to Hitler was judged to be repellent, even if dry-cleaned or reknitted. In a similar fashion, relations based on similarity were thought to transfer unwanted essences as when subjects consistently refused to drink sugar water from a glass with the sign "poison" written on it, even when having observed the sugar and water being mixed. Of particular interest was the finding that this also holds for backward causation. People felt uncomfortable if their lost hairbrush should fall into the hands of an enemy or the picture of a loved one into the hands of a despised person (Nemeroff and Rozin 2000). At this point, it is crucial to bear in mind that these findings do not entail the existence of conscious beliefs about the importance or efficacy of such sympathetic relations nor the endorsement of such beliefs, should they be there. Rather the studies are testimony to a number of cognitive systems activated by very particular perceptual cues and often when lacking other relevant types of information.

That the cognitive systems underlying magic is indeed basic and universal is also testified to by findings in cognitive linguistics. Already in the 1950s, linguist Roman Jakobson pointed to the fundamental similarity between metaphor and metonymy, on the one hand, and magic based on similarity and contagion, on the other hand. Since then, metaphor and metonymy have ceased to be considered purely stylistic features of language and are now considered to be expressions of very basic cognitive processes, underlying features such as categorization, formation of stable conceptual structures, as well as meaning construction. Our brains are apparently well suited to reason by means of conceptual relations created through relations of contact or similarity. Recent research, however, indicates that these underlying cognitive processes might be domain specific, i.e., activated by a circumscribed number of perceptual cues. Thus, contamination avoidance is a likely candidate for a specialized cognitive system due to its adaptive role in human evolution. Several of the examples mentioned above do seem to indicate

that a substantial number of magical practices are concerned with or exploit contamination fears, but whether positive contagion, i.e., appropriation of positive essence through contact or similarity, is parasitic on such an evolved contamination system or whether other systems are activated remains to be seen.

Based on these and other findings that all indicate the universal substratum of cognitive processes underlying magical behavior, the question naturally arises why connections based on similarity or contact are sometimes judged to be able to effect real world changes, whereas in other cases, and likely the majority, the same relations are regarded as inferential tools without any real world efficacy. In order to answer this question, we need to recognize that most magic is performed as an integral part of a ritual and that ritualization of action sequences effects our cognitive system in a particular way. A number of scholars have pointed to characteristics of ritualized behavior such as iteration, scriptedness, formalization, exaggeration, etc. Different theories have been proposed to account for these phenomena, but in this context, we are more concerned with the cognitive effects of these features, of which two should be mentioned. First, rituals are intentionally underspecified. In contrast to most ordinary actions, the agents performing the action usually have no saying in how the actions should be performed. Rather these are specified by tradition and often the very efficacy of ritual is described as dependent on obedience to this formal specification. Second, rituals are causally underdetermined. There are no inherent causal connections between the actions performed and any effect claimed to result from it. Rather, correct performance is generally claimed to have particular effects by reference to tradition and non-efficacy or even reverse consequences are claimed to result from failure to perform the ritual in the correct way, even if differences of opinion often exist as to the exact effect of a particular ritual, not to mention how these alleged effects are produced. These characteristics of ritualized behavior have led some scholars to understand magic as a heuristic

strategy activated in an attempt to relate ritualized actions to its immediate pragmatic context. Instead of the strong causal predictions involved in ordinary actions, in which the human cognitive system predicts particular outcomes based on domain-specific inferences, the causal underdeterminacy of ritualized behavior redirects cognitive operations toward perceptual cues that might help relate the actions performed to the immediate pragmatic context. Searching for relations of similarity, contagion, and temporal and spatial contiguities between entities is a default strategy when lacking stronger causal or intentional cues in events or actions observed, a fact that is testified by its predominance in the learning strategy of operant conditioning described by behaviorist psychology. As such, magic can be explained as pointing to a number of cultural practices that exploit particular features of human cognitive processing resulting in representations of ritual efficacy. This representation of efficacy, in turn, leads to promulgation of the ritual practices best fitted to activate such cognitive processing as they are deemed to be more relevant in relation to the performance of local pragmatic endeavors (Sørensen 2007).

In summary, it should be clear that magic is not a natural category and that it does not refer to a natural set of causally connected phenomena that can be explained by means of a single theory. Rather, the concept refers to a number of phenomena that for historical reasons are connected in a synthetic concept organized by family resemblance. Some of these phenomena *might* be causally interrelated and thus amenable to a unified explanation, whereas others have only spurious or contingent relations. A host of different theoretical approaches each directed toward explaining particular behavioral and/or social phenomena are therefore needed to further investigate the phenomena underlying the concept of magic.

Cross-References

- [Action Control](#)
- [Astrology](#)

- [Religion, Theory of](#)
- [Ritual](#)

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Magical Powers of Blood

- [Transfusion Medicine](#)

Magnetic

- [Magnetoencephalography \(MEG\)](#)

Magnetic Storage

- [Computational Memories](#)

Magnetoencephalography (MEG)

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Related Terms

[Brain imaging](#); [Connectivity](#); [Inverse problem](#); [Magnetic](#); [Neural activity](#); [Oscillations](#); [Source localization](#)

Magnetoencephalography (MEG) is a noninvasive brain imaging technique that records the small magnetic fields associated with electrical activity in the brain. The same electrical brain activity leads to fluctuations of electrical potentials that can be recorded at the scalp with the related measurement technique electroencephalography (EEG) Niedermeyer (2004).

MEG provides noninvasive recordings of brain activity with good spatial resolution and very high temporal resolution (about 1 ms) Hamalainen (1993). Measurements are challenged by the small amplitude of the neuromagnetic field that is typically below 10^{-12} T. The earth magnetic field for comparison is several orders of magnitude larger (about 10^{-4} T). Consequently, MEG recordings require highly sensitive detectors and efficient attenuation of environmental magnetic background activity. State-of-the-art MEG systems are equipped with about 300 highly sensitive superconducting quantum interference devices (SQUIDS). These sensors have to be cooled with liquid helium and operate at a very low temperature of about -269 °C in the state of superconductivity Preissl (2005). The sensors are arranged in a helmet-shaped dewar and cover most of the head at a typical scalp distance of about 2 cm. The many sensors allow precise measurements of brain activity in all cortical areas.

During a typical experiment, sensory stimuli may be presented, and the participant is asked to

perform a specific task Hari (1999). Stimuli and participants' response are repeated many times (about 100 repetitions are common). Information processing in the brain is associated with the activation of neurons that is characterized by changes in their membrane potentials. The MEG signal is caused by magnetic fields that are associated with postsynaptic potentials and thus reflects fluctuations in local field potentials. Prerequisites for a measurable MEG signal are the simultaneous activation of several thousands of neurons and a preferred spatial orientation of these neurons (such that summation of the tiny individual magnetic fields increases the total magnetic field measured outside the head). The magnetic fields are recorded at high temporal resolution. The data can be used to localize the corresponding activated brain areas and track information processing noninvasively in the human brain Hari (1997), Hari (1997b), Lu (2003), Schnitzler (2005).

MEG has been used in cognitive neuroscience to study language, neural plasticity, attention, memory, consciousness, motor control, etc. In addition, detailed studies of sensory processing in primary sensory areas have been conducted using the excellent temporal resolution of MEG.

A large number of studies have used MEG to investigate pathological mechanisms in many diseases Papanicolaou (2008), Schnitzler (2005).

In general, MEG is ideal for applications that require a high temporal and good spatial resolution. Although the spatial accuracy is better for functional magnetic resonance imaging (fMRI), no other noninvasive imaging technique offers a better temporal resolution with coverage of the entire brain combined with a good spatial resolution.

Cross-References

- Cognitive Neuroscience
- Methodology in Psychology
- Neuroimaging
- Neuroscience
- Perception

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Mahāyāna Buddhism/Vajrayāna Buddhism

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Mahāyāna (“The Great Vehicle”) developed from Theravada and is found throughout East Asia. It includes the traditions of Mādhyamaka, Zen, Nichiren Buddhism, Tibetan Buddhism, Tiantai, Pure Land, and Shinnyo-en. According to the teachings of Mahāyāna traditions, “The Great Vehicle” refers to the path of seeking complete enlightenment for the benefit of all sentient

beings, also called “Bodhisattvayāna.” In contrast to Theravada, the individual achievement of bodhi (awakening) is therefore not the ultimate goal in Mahāyāna Buddhism. The Buddha nature (Sanskrit: “Tathāgatagarbha” or “Buddha dhātu”) is considered to be present in all beings, creating an immanent link to the awakening, constituting the deathless “essence of the self.” As a consequence of Mahāyāna’s nondual philosophy, any being is therefore regarded as already enlightened, whether aware of it (meaning “awakened”) or not.

Vajrayāna (often translated as “The Diamond Vehicle”) or “Tantric Buddhism” is mainly practiced in Tibet and Mongolia and recognized as a part of the third branch of Buddhism, while others classify it as a part of Mahāyāna. Vajrayāna techniques, including Dzogchen and Mahamudra, are aimed at making it possible to experience the Buddha-nature prior to full enlightenment.

Man-Machine

► [Control Theory \(Cybernetics\)](#)

Māra

► [God and Devil in Buddhism](#)

Markov Process

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In probability theory and statistics, a Markov process (the name is due to the mathematician Andrey Markov), is a time-varying random phenomenon (stochastic process) for which a specific property (the Markov property) holds. A stochastic process satisfies the Markov

property, if the probability of what is going to happen tomorrow conditioned to what is happening today is the same that the probability of what is going to happen tomorrow conditioned to what have happened previously. This property is informally known as memorylessness or non-memory property.

Marxism

► [Critical Theory](#)

Materialism

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The view that all entities and phenomena in nature are material (as opposed to immaterial/supernatural). Materialism has played a decisive role in philosophical theories about the nature of reality since the dawn of western philosophy. In contemporary debate, the term is used to designate theories that claim all reality to be material and therefore reject the existence of immaterial things such as thought, consciousness, angels, ghosts, or gods. This rejection can be carried out in several ways. In philosophy of mind (philosophical theories about the nature and function of the human mind), the rejection is often done in one of two ways: by means of a reduction of the apparently immaterial phenomena and experience to material entities and explanations (Reductionism) or by way of a forthright elimination of such impalpable phenomena that are held to be subjective illusions (Eliminative Materialism)

Cross-References

► [Functionalism](#)

Mathematics and Empirical Sciences

► [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)

Mathematics in Islam General

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Related Terms

[Islamic](#); [Islamicate mathematics](#); [Medieval Arabic](#)

Description

By “Mathematics and Islam” we mean the mathematics practiced and developed in countries whose predominant religion was Islam, before the advent of Western colonialism. In time, this covers the eighth century CE down to about the nineteenth century, and in place from India to Muslim Spain. Despite the vast expanse of time and territory, mathematics in Islam can be said to constitute a continuous tradition, though one must always be aware of local conditions and influences.

The Cultural Background

By the time the Umayyad dynasty succumbed to the ‘Abbāsid revolution in the middle of the eighth century CE, the Islamic empire reached from the Atlantic coasts of North Africa and the Iberian peninsula to the Indian subcontinent. The unprecedented political expansion of the Muslim state in the preceding two centuries made the Arab conquerors masters of regions previously under the control of the civilizations of India, Persia, and Greece.

Out of this setting came, for complex social and political reasons, the Arabic translation

movement. From roughly the middle of the eighth century to the end of the tenth century the aristocracy and other wealthy groups within Muslim society provided an enormous outlay of funds for the appropriation of all practical and scientific knowledge at their disposal. Translators busied themselves rendering Indian, Sasanian, and especially Greek books into Arabic (sometimes through Syriac intermediaries), and mathematicians set down on paper the native traditions in arithmetic, algebra, and mensuration which had hitherto been communicated orally by trade groups. It was not just the mathematical sciences (arithmetic, geometry, optics, mathematical astronomy, etc.) which were sought out, but also works on geography, astrology, philosophy, medicine, agriculture, alchemy, and even falconry.

Not only did Greek works form the bulk of the material translated, but the more scientifically oriented mathematicians adopted the Greek structure of definitions, axioms, and propositions with rigorous proof, while astronomers embraced the Greek idea of geometric models of planetary motion. Even the philosophical underpinning of the mathematics derived from Greek philosophy. It is within this framework that Indian and Iranian techniques were incorporated into this new Arabic/Islamic mathematics.

Conjointly with the production of the translations, scholars wrote commentaries and criticisms of the ancient mathematics and made their own original contributions. We see this, for example, in Thābit ibn Qurra (d. 901), who translated several works of Archimedes, wrote commentaries on Euclid’s *Elements* and Ptolemy’s *Almagest*, criticized Euclid’s definition for the composition of ratios of numbers, and derived and proved new formulas for volumes of solids of revolution.

When the sources of Greek and other foreign texts finally dried up, scientists continued to produce new results in all branches of mathematics. Ibn al-Haytham, for instance, made major contributions to optics and geometry in the eleventh century, and al-Khāyyamī wrote his book on algebra near the start of the twelfth century. Other examples are the innovative work in astronomy conducted in association with the

thirteenth-century “Maragha school,” supported by the Ilkhanids in northwest Iran, and at Ulugh Beg’s madrasa and observatory in Samarqand in the first half of the fifteenth century. One important book which came out of the activities of scientists at the Maragha observatory is Naṣīr al-Dīn al-Ṭūsī’s *Memoir on Astronomy* (thirteenth century), in which he proposes non-Ptolemaic models of planetary motion. Parts of this work found its way, through an as yet unknown route, into Copernicus’ *De Revolutionibus*. In Samarqand, al-Kāshī (early fifteenth century) and other astronomers compiled a highly accurate set of astronomical tables whose influence reached from Europe to China.

Research and teaching in medieval Islam did not take place within western-style institutions. Translators and scholars were patronized by wealthy individuals mainly associated with the ruling court, though such personal compacts could be part of large-scale projects. And while later endowed institutions such as the madrasa (school) provided settings for teaching and learning, the transmission of knowledge was still regulated by individual teachers who conferred on students the authority over particular texts. And contrary to what many secondary sources claim, there is no record of any translation of Greek works at the House of Wisdom (*bayt al-ḥikma*). This library was most likely established by al-Manṣūr in the eighth century “to house both the activity and the results of translations from Persian into Arabic of Sasanian history and culture.” (Gutas 1998, pp. 58–59)

There was a general shift in the nature of the mathematics produced over the centuries, similar to the shift which occurred in Greek mathematics from the innovative and scientific work of Hellenistic times to the more reflective and practical work of late antiquity. By the early thirteenth century the “ancient sciences” began to be taught in the *madrasa* (school). Teachers molded their mathematics instruction to conform to the structure of the traditional (religious) sciences. In this way mathematics education became more widespread in the Islamic world, so instead of a few highly trained court specialists, one now sees broadly educated individuals.

This “naturalization” of mathematics is seen in the surviving texts, which in later centuries are on the whole more teaching-oriented and elementary. The regional variations characteristic of such large-scale social change make it difficult to put dates on this shift, but it appears to have occurred largely from the thirteenth to the sixteenth centuries. Nor can we expect uniform change across all branches of the mathematical sciences (Brentjes 2002, 2008). One area in which innovative work continued well into the sixteenth century is planetary astronomy. George Saliba and F. Jamil Ragep have documented the non-Ptolemaic theories of al-Qūshjī (d. 1474), al-Birjandī (d. 1525), al-Khafīrī (d. 1550), and others. Courtly patronage of the sciences was maintained by the various Islamic dynasties right down to the nineteenth century, but even there the values of the educated religious scholar appears to have replaced those of the earlier court specialist (Saliba 1994; Jamil Ragep 2001).

The majority of mathematicians working in the medieval Islamic world were Muslims. But some, especially those working during the translation period, were Christians, Jews, or even Sabian pagans. And although the dominant language was Arabic, many scientific treatises were written in Persian, Turkish, and Urdu.

Classification of the Mathematical Sciences

Medieval Arabic scholars adopted, with various modifications and refinements, the classification of the sciences from Hellenistic Greece. The core mathematical sciences include arithmetic, geometry, and mathematical astronomy. Cognate areas include astrology, optics, mechanics, trigonometry, music (harmonics), and magic squares. See the individual entries “Arithmetic and Islam,” “Algebra and Islam,” “Geometry and Islam,” “Optics and Islam,” and “Astronomy and Islam.” I will briefly address the background and nature of Islamic trigonometry.

Just as in earlier civilizations, people in Islamic countries had a need for astronomical calculation. Astronomers relied on instruments and tables founded on either Indian or Ptolemaic

planetary theory, whether they were calculating the rising time of a particular constellation in astrology, or determining crescent visibility conditions for the regulation of the Islamic calendar. Analog instruments, such as the armillary sphere, quadrant, sundial, and most importantly the astrolabe, were manufactured in large numbers. Based on Greek examples, the Arabic planispheric astrolabe utilizes stereographic projection of the hemisphere of the sky onto a disk. The instrument can be used for a variety of calculations, such as determining the altitudes of stars or planets and for telling time. Astronomers also relied on astronomical tables, or *zījes*. These typically consist of a couple hundred pages of tables of various sorts with explanatory text. The tables usually include trigonometric functions and the mean motions, equations, and latitudes of the planets (including the sun and moon). Some geography and astrology is also usually included.

The trigonometry necessary for the study of astronomy in Islam was a hybrid between Indian and Greek ideas. The Greeks worked with the chord of an arc, while the Indians computed with the sine function, or half the chord of half the arc. Muslims adopted the sine function, but with the Greek base 60 system. Typically, they worked with a circle of radius 60, so that their sine of an arc equals our $60 \sin \theta$. The Indian shadow function (our cotangent) was tabulated for use in timekeeping and was united with the sine and the other four trig functions by Abū'l-Wafā' (tenth century).

Tables of trigonometric functions are common in the many astronomical tables composed in Arabic from the eighth century on. Trigonometric identities can be used to find the sines of angles which are multiples of $2'' \cdot 3^\circ$, including 3° , $1\frac{1}{2}^\circ$, $\frac{3}{4}^\circ$, etc., but the tables require $\sin 1^\circ$. To find this value, from which $\sin 2^\circ$ and the others can be derived, astronomers relied on interpolation and iterative methods. In the fifteenth century al-Kāshī used algebra to find the $\sin 1^\circ$ by setting up a cubic equation whose root he extracted by an iterative technique.

Interpolation techniques were not only useful for $\sin 1^\circ$, but also for filling out tables to avoid the tedious job of evaluating all the values directly.

Various linear, second order, and iterative schemes were applied with great success by astronomers like Ḥabash al-Ḥāsib (ninth century), Ibn Yūnus (tenth century), and al-Bīrūnī (eleventh century). The most accurate tables were compiled under Ulugh Beg in Samarqand, ca. 1440. In his *Sultānī Zīj* sine and tangent functions were calculated in increments of $1'$, to an accuracy of five hexadecimal places, equivalent to about nine decimal places.

Plane trigonometry alone cannot handle many calculations in three-dimensional astronomy. Arabic astronomers inherited different approaches to spherical astronomy from India and Greece, and they eventually derived superior results. One Greek method is the analemma, used for solving problems in which the motion takes place in two planes. One plane is rotated into the other, so the calculations are reduced to two dimensions. The other Greek method, found in Ptolemy's *Almagest*, is the Theorem of Menelaus. This is a truly spherical result, but it is cumbersome for making calculations. In the tenth century, Abū'l-Wafā' derived the much more efficient sine law,

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$

A , B , and C are the angles of the triangle on the sphere, and a , b , and c are the arcs (sides) of the triangle opposite a , b , and c (these arcs can regard as angles from the center of the sphere).

Trigonometry eventually became an object of study in its own right. The first book on trigonometry may be al-Bīrūnī's (973–1048) *Book on the Derivation of Chords in a Circle*. Later in the eleventh century al-Jayyānī produced a book on spherical trigonometry in al-Andalus, and Nasīr al-Dīn al-Ṭūsī (thirteenth century) wrote a comprehensive work on the same topic in western Persia (Van Brummelen 2009).

Self-identification

Science

There was no word in Arabic corresponding to the modern English "science." The closest word

is *'ilm*, which was given to any kind of theoretical knowledge, religious or secular. *'Ilm* (let us call it "science") was often distinguished from *ṣinā'a*, which refers to an art, craft, or trade. For example, practical mensuration such as we see in al-Khwārizmī's *Algebra* was considered to be an art, while theoretical Greek-style geometry was a science. (This distinction was not rigorously maintained, as many fields were called by both names even by the same author.) The Islamic arts and sciences informed each other throughout the medieval period. Mathematicians developed the art of algebra in scientific directions, while practitioners adopted the book of Euclid as a foundation for mensuration.

Characteristics

The mathematical sciences covered a vast portion of both practical and theoretical knowledge. One cannot pinpoint what is distinctive about a discipline which covers topics ranging from music theory to algebra to geometric models of planetary motion, and is used in cooking, tax collection, and astrology.

Relevance to Science and Religion

Contrary to what many earlier studies have proposed, there was no natural antipathy between religion and science in Islamic societies. Of course there were some scholars who objected to the study of the "foreign sciences," most notably the theologian al-Ghazālī (d. 1111). His book *Incoherence of the Philosophers* was seen by orientalist as signaling the victory of religious orthodoxy over Greek-inspired philosophy and science. But not only were mathematics and philosophy taught in Islamic lands alongside the *Qur'an* and *hadith* right down to the nineteenth century, but many of the leading scientists were also important theologians. Naṣīr al-Dīn al-Ṭūsī (d. 1274), Qāḍī ʿIzādeh al-Rūmī (fifteenth century), and al-ʿAmilī (d. 1622) come to mind.

Mathematics and religion crossed paths in different ways. One is the application of

mathematics to problems in the practice of Islam, another concerns the association of astronomy with the religiously condemned science of astrology, and still another is the religious objection to physical and philosophical foundations of mathematical astronomy.

Three problems in the practice of the Islamic religion attracted the attention of astronomers: (1) to determine the times of the five daily prayers, (2) to find the *qibla*, or the direction to Mecca from one's location, and (3) to know the conditions under which one can first see the crescent moon, which signals the beginning of the month (David 1993). There were two different approaches to these problems, one based on Arabic folk astronomy and the other on mathematical astronomy. In pre-Islamic times the Arabs had a good knowledge of the motions of the sun, moon, and the stars, but without any theory or calculation. Their folk astronomy was shared by cultures extending at least from India to Europe, and became the foundation on which religious scholars provided approximate answers to the three questions. With the development of mathematical astronomy Muslims found themselves equipped to answer these questions precisely. The numerous treatises devoted to the three problems were not initiated because of any need within Islamic society for precise solutions, but rather because the problems are interesting in themselves, and they provided a way for astronomers to legitimize their science.

The five daily prayers are to be performed within these specified intervals:

1. Between sunset and nightfall
2. Beginning at nightfall and lasting until one third or one half of the night has passed
3. Between daybreak and sunrise
4. Beginning when the shadow of a gnomon is observed to lengthen just after midday, and until the time of the fifth prayer begins
5. Beginning when the length of the shadow of a gnomon is the length of the gnomon greater than its midday minimum, and ending at sunset

Prior to the thirteenth century the *muezzin* regulated prayer times by the methods of folk astronomy, without instruments or tables. In the

thirteenth century we see the emergence of the new office of timekeeper (*muwaqqit*). This astronomer was usually associated with a mosque, and many who held the office compiled astronomical tables, built sundials on the principles of conic sections, and even developed models of planetary motion. Ibn al-Shāṭir, the fourteenth century timekeeper of the Umayyad mosque in Damascus, did all three.

Muslims are instructed to pray toward the *kaaba* in Mecca. This sacred direction is called the *qibla*, and early Muslims adopted a variety of methods for finding it. Some based it on wind direction or folk astronomy. Still others prayed due south no matter what their location, because that was the direction the Prophet prayed while in Medina. In Cairo alone at least seven *qibla* schemes were used to orient mosques by the fifteenth century, which varied by 114 degrees!

Astronomers calculated the *qibla* as an angle from the meridian knowing the latitudes of Mecca and of one's location, and the difference in longitude between the two points. Already, in the ninth century astronomers had found an exact (and complicated) formula as well as easier, approximate solutions. The only impediment to determining the *qibla* for a given location lay in obtaining accurate coordinates. The longitudinal difference was particularly difficult to determine.

Many *qibla* tables were compiled over the centuries, and some ingenious instruments were constructed for the purpose as well. But even confronted with the astronomers' calculations, the judges responsible for the orientation of mosques would typically choose a traditional direction to Mecca.

To predict the day the new crescent moon will become visible above the western horizon at sunset is a problem with many parameters. One must take into account that the moon and sun do not orbit in the same plane or travel across the sky with constant velocity, and that both will set at angles which vary with the seasons and with latitude. Astronomers tackled the problem based on planetary models, and they produced many sophisticated tables.

There was one application of arithmetic to Islam. The rules for the division of estates

outlined in the holy writings can be complex, so a sound understanding of arithmetical problem-solving is necessary to evaluate many cases. Al-Khwārizmī and some later mathematicians promoted algebra as a tool for calculating the shares of an estate. But some, like Ibn Khaldūn (fourteenth century), insisted that cases difficult enough to require algebra were rare.

There were two aspects of astronomy which were regarded at best with suspicion by religious authorities. One is astrology, which attributed powers to the stars which should be reserved for God, and the other concerns the physical and metaphysical foundations of mathematical astronomy. Astronomy and astrology were integrated in the astral sciences of Greece, Sasanian, Persia, and India, and the close ties between the two were inherited by early Muslim astronomers. Astrology was always popular with ruling Islamic courts, thus providing many astronomers with a steady source of income. But not only was there a conflict with religion, many astronomers did not believe that astrology was a valid science. For these reasons, beginning with Ibn Sina (d. 1037), astrology came to be treated as a branch of physics, while astronomy retained its status as a purely mathematical discipline.

Astronomers in medieval Islam continued the debate which already existed in Greek antiquity regarding the place of physics in astronomy. They also came under fire from theologians for their occasional assertion of Aristotelian natural causation. Al-Ghazālī and others generally accepted the mathematical part of astronomy, but rejected its physical underpinnings. This led astronomers to look for ways to free astronomy from physics. While some astronomers insisted that we need physics to establish a stationary earth, others believed this could be established by mathematics. Al-Qūshjī (d. 1474) was even able to dispense with physics by admitting the possibility of a rotating earth (Jamil Ragep 2001).

Sources of Authority

The writings of well over a thousand mathematicians from Islamic civilization survive, about half

of whom worked before the fifteenth century. I list below in chronological order a few of the authors whose works were highly regarded both in their own times and by historians today.

- Al-Khwārizmī (Muḥammad ibn Mūsā al-Khwārizmī). Mathematician and astronomer, worked in the first half of the ninth century in Baghdad. Composed books on practical arithmetic, algebra, astronomical tables, and wrote an astrological history.
- Ḥabash al-Ḥāsib. Worked in Baghdad, ninth century. Astronomer noted for his contributions to trigonometry.
- The Banū Mūsā. The three “sons of Mūsā,” Muḥammad, Aḥmad, and al-Ḥasan, worked in Baghdad, ninth century. Their main interests were geometry, optics, astronomy, and mechanics.
- Al-Kindī. Ninth century, Baghdad. This very important philosopher wrote several treatises on mathematics.
- Thābit ibn Qurra. Polymath from Ḥarrān and Pagan star-worshiper who worked in Baghdad, d. 901. Translated many Greek books and did original work in number theory, geometry, astronomy, and mechanics.
- Qusṭā ibn Lūqā. d. ca. 910. Christian mathematician, astronomer, physician, and philosopher. Translated many Greek works into Arabic.
- Abū Kāmil. Worked in Egypt, second half of the ninth century. Wrote on algebra, including indeterminate analysis and applications to geometry.
- Al-Nayrīzī. Worked in Baghdad, ninth–tenth centuries. Wrote on astronomy and geometry, including a famous commentary on Euclid’s *Elements*.
- Ikhwān al-Ṣafā’. Tenth century. The “Brethren of Purity” was a group of Ismā’īlī scholars centered at Basra. They incorporated Neopythagorean number theory into their philosophy.
- Al-Uqlīdīsī. Tenth century. Wrote an important book on Hindī numerals.
- Abū’l-Wafā. Lived 940–998, worked in Baghdad. Wrote on astronomy and practical arithmetic and geometry.
- Al-Kūhī. Worked in Baghdad, tenth to eleventh century. Worked in geometry and astronomy.
- Ibn Yūnus. d. 1009, worked in Cairo. Astronomer, astrologer, and poet. Noted for his book of astronomical tables, the *Ḥākimī Zij*.
- Al-Sijzī. Persian, lived ca. 950–ca. 1025. Worked in geometry and astronomy, and made instruments.
- Kūshyār ibn Labbān. Lived ca. 970–ca. 1030. Worked in arithmetic, astronomy, and astrology.
- Al-Karajī. d. 1025. Worked mainly in algebra, number theory, and practical mathematics.
- Ibn Sīnā. 980–1037. Known in Latin as Avicenna, this philosopher and physician also worked in geometry and astronomy.
- Al-Baghdādī. Worked in Nishapur, d. 1028. Mathematician, jurist, and poet.
- Ibn al-Haytham. Early eleventh century. Known as Alhazen in the West, worked in Baghdad and Egypt. Revolutionized the science of optics, and conducted research in geometry and astronomy.
- Al-Jayyānī. Eleventh century, worked in Egypt and Seville. Worked in geometry and astronomy.
- Al-Bīrūnī. 973–1048. Prolific scholar who produced fine work in many areas, including anthropology (his *India*), history, astronomy, chronology, astrology, meteorology, and even pharmacology.
- Al-Khayyām. Lived 1048–1131. Better known as Omar Kayyām in the West. Famous not only for his work in geometry and algebra, but also for his poetry.
- Al-Samaw’al. d. ca. 1175. Jewish mathematician and physician. Worked in arithmetic and algebra, furthering the algebraic theory of al-Karajī. He converted to Islam in his mid-60s.
- Ibn al-Yāsamīn. Worked in Spain and the Maghreb, d. 1204. Wrote popular textbooks on arithmetic and algebra.
- Sharaf al-Dīn al-Ṭūsī. d. 1213. An algebraist who improved on the work of al-Khayyām. Wrote also on astrolabes.

- Naṣīr al-Dīn al- Ṭūsī. 1201–1274. Astronomer, mathematician, and Shi'ite theologian. Founded the Maragha observatory and developed non-Ptolemaic models of planetary motion.
- Kamāl al-Dīn al-Fārisī. Iranian, d. ca. 1320. Worked in number theory, arithmetic, and optics.
- Ibn al-Bannā'. Worked in Marrakech, lived ca. 1260-ca. 1340. Worked in arithmetic, algebra, and astronomy.
- Al-Kāshī. Worked in Samarqand, d. ca. 1430. Famous for his work in astronomy and for his textbook *Key to Arithmetic*.
- Shams al-Dīn al-Khafri. d. 1550. Astronomer who developed multiple models for the motion of Mercury.
- Al-‘Āmilī. 1547–1622. Persian mathematician and theologian whose *Essence of Arithmetic* became the standard textbook in many parts of the Eastern Islamic world down to the nineteenth century.

Key Values

Muḥammad stressed that knowledge (*‘ilm*) is “the driving force in religion and, thereby, in all human life.” (Rosenthal 1975, p. 5). Muslims, and indeed all those mathematicians who participated in the culture, interpreted “knowledge” in a broad sense. Whatever one’s religion, the acquisition of knowledge was viewed as a high virtue.

For the scientist of the ‘Abbāsid court, Sabra expresses the search for knowledge (*‘ilm*) as “to perfect the human soul and prepare it for a state of eternal happiness” (Sabra 1987, p. 23). The later more broadly educated religious scholars found that the study of mathematics, like the study of other disciplines, serves to demonstrate God’s glory.

Conceptualization

Even in its applications mathematics is not intimately connected with many of the following concepts.

Nature/World

This concept is addressed indirectly through the foundations of astronomy.

Reality

The notion of “reality” is not present in most of Islamic mathematics. There was a debate over the reality of the mathematical models of the astronomers.

Knowledge

Two forms of knowledge (*‘ilm*) were distinguished: the native Islamic sciences, which include religion, jurisprudence, and grammar, and the foreign or ancient sciences, which include the mathematical sciences.

Truth

Truth in scientific mathematics was decided by formal proof, following the Greek model.

Perception

Visual perception is described in the optics of Ibn al-Haytham and others. See the entry “Optics and Islam.”

Time

Following Aristotle, most geometers relegated time to the realm of physics and astronomy, not to mathematics proper. But some, in their work on the parallels postulate, defined a line as the path of a moving point.

Rationality/Reason

Mathematicians inherited the Greek conception of rationality, founded on syllogistic logic and formal proof.

Cross-References

- [Algebra in Islam](#)
- [Arithmetic in Islam](#)
- [Astrology in Islam](#)
- [Astronomy in Islam](#)
- [Geometry in Islam](#)
- [Mathematics, Ancient and Medieval](#)
- [Science in Islam, Classification](#)
- [Science in Islam, Transmission](#)

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Mathematics in Judaism

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Description

“Mathematics and Judaism” concerns the interface between mathematics and Judaism and examines the use of mathematical principles within Judaism. This domain has not yet established itself as a discipline. Rather, one finds references to this subject matter in analyses of mathematical elements within Jewish literature: the Hebrew Bible, the Mishna, and the Talmud. The analyses of these tracts suggest basic level of mathematics and little interest within Judaism in mathematics per se, with almost no

presence of mathematical abstraction. Ancient Jewish literature adduces concise and practical mathematical information pertinent to daily life and religious matters and helps ensure precise adherence to Jewish law (Hebrew: *Halakha*).

In the Book of Exodus one finds a wide range of numerical data on sizes and weights which are part of the prescription to the Israelites of how to build the various parts of the temple and the elements within. In 1Kings 7:23, the ratio between the circumference of the round vessel “Sea of Solomon” and its diameter (in modern mathematical language: “pi”) is given the rough value of 3.

In the Mishna and Talmud, there are numerous discussions which touch upon an array of mathematical fields: geometry, arithmetic, some elements of game theory, combinatorics, and probability. Geometrical considerations are called for in the legislation on the sowing of fields. According to Leviticus 19:19, two kinds of seeds (Hebrew: *Kil'ayim*, which is the name of the relevant tractate in the Talmud) may not be sown within a certain distance of each other, and thus, different geometrical arrangements for the distribution of seeds are considered.

The square root of 2, an irrational number, that is, a number that cannot be represented as a ratio of two integers, is given a very rough approximation, 1.4 (Babylonian Talmud, tractate Sukah, 8a). Pi is given the value 3, as in the biblical example given above. The rabbis may have been well aware of a more accurate value developed in Greek mathematics, but they may have considered 3 good enough for Talmudic “working purposes.”

An arithmetical theme, which bears calendrical importance, is the rule of divisibility by seven, which helps determine whether a given year is a sabbatical (Hebrew *Shmita*), every seventh year in the cycle, in which any agricultural activity is prohibited (Babylonian Talmud, tractate Avodah Zarah 9b). The Talmud does not provide an explanation for this rule, neither does it present a general discussion of divisibility rules for other numbers. The Talmud solely presents the mathematical rules necessary for the application of Jewish law.

Tractate Kinim (Hebrew for “nests”) in the Babylonian Talmud involves elaborate counting methods regarding possible errors in bird offerings by certain groups of people in the temple service, a very rare and unusual area of Jewish law. One also encounters elements of game theory, that is, the study of strategic decision making in the study of a bankruptcy problem (Aumann and Maschler 1985). The Talmud also makes indirect use of probability and combinatorics rules (Rabinovich 1973).

The mathematical language found within the classical Jewish literature is very basic and lacks the sophistication and abstraction of the Greek mathematical language (Sarfatti 1969).

Relevance to Science and Religion

“Mathematics and Judaism” is extremely relevant to “Science and Religion” since its essence concerns the interaction between the science of mathematics and the Jewish religion and examines the attitudes from within Jewish thought toward the study of mathematics, in particular in the Middle Ages.

During the Middle Ages, the study of sciences in general, and mathematics in particular, seems to have been legitimized and encouraged by Jewish polymaths only inasmuch as it was either propaedeutically or practically useful. In his highly influential *Treatise of the Eight Chapters*, Maimonides (Cordoba 1135 – Fustat(?) 1204) expresses the idea that questions of mathematical nature must not be pursued as ends in themselves. They are commendable only inasmuch as they serve to sharpen the intellect and make one attain the knowledge of the true existence of God. The medieval Hebrew scientific corpus clearly shows great interest and innovation in astronomy but only little original mathematical creation with the exception of Gersonides from Provence (1288–1344) (Freudenthal 1995).

Maimonides uses mathematics to shed light on difficult matters in the Mishna. He addresses the measure of “pi,” stating that its exact value will never be known (even to God) due to its intrinsic nature (or, in modern language, its being an

“irrational number”). In his seminal work, *Mishneh Torah* (Hebrew for “a repetition” of or “second” to the Torah), Maimonides analyzes the role of science and the Greek texts, such as Ptolemy’s *Almagest*, in the context of mathematical astronomy. The eighth part of *Mishneh Torah*, *Sanctification of the New Moon*, is dedicated to the calculation of the Jewish calendar. Maimonides explicitly justifies the study of mathematical astronomy for calendrical purposes, in particular as a tool to calculate the visibility of the lunar crescent (Lévy 2004).

Sources of Authority

The sources of authority for “Mathematics and Judaism” include past and present scholars who wrote on science among Jews in different periods and analyzed the interface between mathematics and Judaism from a scientific, linguistic, social, or philosophical perspective (see references for the (partial) list of scholars).

Conceptualization

Nature/World

Nature/world is not defined explicitly within this domain.

Human Being

Human being is not treated or defined explicitly within this domain, but its mere existence is directly related to human existence and the practice of the Jewish religion.

Life and Death

Life and the origins of death is not treated explicitly within this discipline.

Reality

Reality is not defined explicitly within this domain but several areas in which mathematics is applied within Judaism are closely related to reality. For example, the mathematical principles underlying the Jewish calendar aim to approximate the astronomical reality.

Knowledge

Knowledge is the kernel of “Mathematics and Judaism” since it focuses on the mathematical body of knowledge in service of Judaism.

Truth

Truth is not defined explicitly within this domain but is assumed to be part and parcel of any mathematical framework, and therefore, any mathematical application to Judaism will be assumed to possess intrinsic accuracy and veracity.

Perception

Perception is not defined explicitly within this domain, but it is highly relevant to it, for example, astronomical observations which are embedded into a mathematical model.

Time

Time is a central element within “Mathematics and Judaism” because the practice of many Jewish precepts, such as prayer, requires calculation of a precise time interval.

Consciousness

Consciousness is not of interest within this discipline.

Rationality/Reason

Rationality/reason is not defined explicitly within this domain, but the practice of mathematics is directly linked to the use of logic and reason.

Mystery

Mystery partly belongs to “Mathematics and Judaism,” especially when it comes to the belief that the Hebrew letters possess powers. One often finds calculations of the alphanumerical value of words and analysis of their meaning in the larger context, a practice known in Hebrew as *Gimatria*. For example, the Hebrew word for pregnancy, הריון, has the numerical value 271, which is the number of days a pregnancy lasts, according to Talmudic interpretation (Babylonian Talmud, tractate Niddah 38b).

Cross-References

- ▶ [Astronomy in Judaism](#)
- ▶ [Judaism: An Overview](#)
- ▶ [Kabbalah in Judaism](#)
- ▶ [Mathematics in Islam General](#)
- ▶ [Mathematics and Religion](#)
- ▶ [Mathematics, Ancient and Medieval](#)
- ▶ [Mathematics, Early](#)
- ▶ [Natural Sciences in Judaism](#)
- ▶ [Physics in Judaism](#)

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Mathematics and Religion

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Related Terms

[Discipline](#); [Language of science](#)

Description

Mathematics and religion is a subdiscipline of the science and religion discipline, which studies the relations between mathematics and the meta-physical language of religions.

We can distinguish three historical stages in the relations between mathematics and religion (Leach 2010).

First Stage: Deductive Rationality

In this first stage, situated in time in the Greece of Pythagoras and Euclid of Alexandria, mathematics used deductive rationality to demonstrate theorems for the first time. Previous to the Greek epoch, several types of algorithms and mathematical relations were known in Egypt, India, China, and Babylon, but the deductive demonstration of mathematical theorems such as the theorem of Pythagoras or the theorems which appear in *Euclid's Elements* had not been developed. As from Greek mathematics, deductive rationality was incorporated as a fundamental characteristic of mathematical language.

At the same time as Greek mathematics was developing its deductive capacity, Aristotle also introduced the deductive method into his metaphysics. In particular, in Book 12 of his *Metaphysics*, Aristotle deductively demonstrates the existence of the *unmoved mover*. The demonstration of Aristotle was again taken up by Saint Thomas Aquinas as one of the ways which demonstrate the existence of God. The unmoved mover is the cause of movement, but, unlike other causes, which, on moving others, they themselves move, the unmoved mover is not moved.

However, on analyzing the logical structure of these metaphysical demonstrations, we see that the difficulty in accepting their demonstrational value, from an analytic-scientific perspective, does not so much lie in the correctness of the argumentation but in the acceptance of the truth of the premises of the argumentation. Once the validity of the premises is accepted, it is easy to check that the argumentation is correct, and

the validity of the conclusion is derived from the validity of the premises. Those who do not admit the argumentations generally do so because they do not admit the validity of the premises.

Second Stage: The Public Language of Science

In the second stage, which commenced in the Europe of the seventeenth century, mathematics acquired the category of the language of science. Mathematicians such as Galileo, Descartes, Newton, and Leibniz used mathematics as the language of physics, expressing their observations through mathematical formulas. Modern physics differs from Aristotelian physics especially due to the mathematical formulation of the laws of nature. In this regard, the mathematical descriptions which Galileo makes of his physical observations and the mathematical descriptions of the laws of physics and astronomy made by Newton in the *Philosophiæ Naturalis Principia Mathematica* are famous.

The use of mathematics as the language of science brought a mechanistic ideal with it. Modern science is distinguished due to defining causes through mathematical formulas. For example, the formula $F = ma$ represents that, for an equal mass, an increase in force is the cause of an increase in acceleration. When expressing causes through mathematical formulas, modern science standardized and mechanized the causes. With the mechanization of the causes, the rationalism of mathematics was incorporated to philosophical and metaphysical language in the seventeenth century. For the rationalists (and in a similar fashion for the empiricists such as Hume), causes can be expressed in a rational-mechanical language. Rationalism may be both believer and nonbeliever.

G. Leibniz is an example of a rationalist believer. He is famous for his idea that nothing occurs in nature without a sufficient reason to explain what has occurred. For Leibniz, everything in the world follows a harmonic plan which preexists in the mind of God and, consequent with this plan, God created the best of all possible

worlds. All the natural and supernatural aspects of this Leibnizian world can be sufficiently understood by rational methods in accordance with the model of mathematics.

While Leibniz attributed the determinism of the world to the mind of God, Pierre-Simon Laplace reached the conclusion that modern science no longer required the hypothesis of God in order to explain the functioning of the world. Laplace's belief that everything has a mathematical explanation suggests the total rejection of metaphysical knowledge. This affirmation is made more explicitly by the British philosopher, David Hume, in his essay of 1748 *An Enquiry Concerning Human Understanding*. This essay is a direct attack on all metaphysical thought. It is also a manifesto in favor of modern empirical science as the sole and true form of knowledge.

We can say that rationalism was a consequence of the scientific use of thought in the eighteenth and nineteenth centuries. As we will see, the mathematics of the twentieth century opened up interesting new perspectives on rationality.

Third Stage: Intrinsically Limited Formal Language

In the third stage, which began at the end of the nineteenth century, mathematical language was formalized. Thanks to the work of mathematicians such as T. G. Frege, G. Cantor, D. Hilbert, K. Gödel, A. Tarski, A. Turing, and A. Church, this formalization made it possible to deduce very important consequences concerning the truth value of mathematical certainties and the intrinsic limitations of mathematical methods.

Thanks to the studies on the foundations of mathematics at the end of the nineteenth century and in the first half of the twentieth century, we have much better knowledge of the cognitive value of mathematics. Together with the attempt by Hilbert to lay the foundations of mathematics, it is also important to study the attempted alternative constructivist foundation of mathematics, found especially in the mathematics of L.E.J. Brouwer.

The constructivism of Brouwer shows that, besides the classical view of Hilbert, there may be other points of view concerning the existence

of the mathematical objects, and it also shows that there is no logical argument which enables a decision to be made regarding whether one point of view is better than the other. Moreover, this pluralism was confirmed, even within the classical view, when K. Gödel made Hilbert's program for the foundation of mathematics fail.

Currently, a large number of mathematicians are not concerned with the foundation of mathematics. The mathematical systems grow, but we do not have the demonstration that each case is consistent, complete, and decidable. Moreover, we do not know for certain whether arithmetic, the central system of mathematics, is consistent. We can say that the trust we have that the building of mathematics is and will continue to be consistent is sufficient.

It is important to draw attention to the point that, although mathematical systems are currently plural, the pluralism of the systems does not deny but rather reinforces the importance of consistency in the interior of each of the mathematical systems. Mathematics is plural but each one of its systems must be consistent. At the present time, we accept consistency perhaps as the final and inevitable point of support of logical thought, and we build a multitude of reasonable systems around this logical nucleus.

The plurality of logical-mathematical systems leads us to also accepting the logical possibility of a plurality of metaphysical options, all of which are consistent. Each of these metaphysical options is forged, in particular, in the personal consciousness, in the context of a community. The metaphysical options are linked to fundamental personal values, shared in community.

The plurality of personal and community options leads us to distinguish between the public language of the sign (proper although not exclusive to mathematics and the empirical sciences) and the personal language of the symbol (proper although not exclusive to metaphysics and theology). The models of the language of the sign are objective and external to personal consciousness. On the contrary, the models of the language of the symbol are inseparably linked to personal and community values. Their meaning is understood and transmitted from personal and community

consciousness. Their translation from one culture to another and the language spoken by a community to another language spoken by another community is not automatic and entails a process of adaptation and integration in another culture.

Self-identification

Science

The subdiscipline of mathematics and religion is a science which studies the relations between mathematics and the language of metaphysics.

Mathematics is a science which, unlike the empirical sciences such as physics or biology, does not study the reality perceived by the senses but through mental intuitions. The semantics of mathematical language is given by the formal models of mathematics which represent mental perceptions.

The study of metaphysical language is also a science distinct from the empirical sciences. Metaphysics uses a type of perception and a language other than the languages of mathematics and the sciences of nature. The meaning of a scientific term refers to an object measurable through the senses. A metaphysical or religious symbol is only understandable within a history, a tradition, and a community which uses this symbol. The meaning of metaphysical symbols depends largely on the community which uses them in order to speak of realities which go beyond the empirical. Metaphysical perception and language seek to achieve absolute knowledge, a framework of reference which can serve us as a permanent view of reality and of the values which flow from this.

When the metaphysical symbols are put together, they give rise to what are called myths or grand narratives common to all the religions and to stories about the origins of the universe or about how the singular human reality appeared. Myth, in this sense, does not mean falsity, but it is rather a traditional story which attempts to meaningfully join together the events and the mysteries of life (Helge and Marie 2010).

Characteristics

Mathematics and religion is distinguished by studying the influence of mathematics and mathematical logic on human rationality in general and on the rationality of religions in particular.

Relevance to Science and Religion

The academic relevance of mathematics and religion in the area of “science and religion” is important for studying the logic proper to scientific propositions and its relation with the logic of religious propositions.

Sources of Authority

The sources of authority for the subdiscipline, mathematics and religion, are those of mathematics and those of religions. In a first approach, mathematics does not have sources of authority as it is thought based on the intuitive perception of certain propositions based on which others are logically deduced. However, mathematics is practiced in schools of logic which are not always compatible with each other. The schools which study the logical foundations of mathematics are sources of authority of mathematics.

Religions, however, are based on personal options which have a strong community component. The communities which practice a religion determine how the sources of authority are established within each religious community.

Ethical Principles

The ethical principles which guide the subdiscipline, mathematics and religion, are respect for and acceptance of the value of the propositions of mathematics and those of the religions. These principles make it possible to reconcile the semantics of mathematical propositions with the meaning of religious propositions. The semantics of the mathematical propositions is intended to be public, equal for all, while the meaning of the religious

propositions is personal and depends on personal values shared in community.

Key Values

The key values of this discipline are rationality, the search for certainty, and the beauty of the thought.

Conceptualization

Nature/World

Mathematics and religion defines relations between two distinct ways of conceptualizing nature/the world, the mental, and formal proper to mathematics and the symbolic-metaphysical proper to religions.

Human Being

It conceptualizes the human being as the subject capable of producing mathematical thought and of expressing himself religiously as a person and as a community.

Life and death

It conceptualize the relations between the mathematical signs which make it possible to describe the evolutionary origin of life and death and the metaphysical symbols by which the religious answers to the question on the meaning of life are expressed.

Reality

It defines concepts which explain the certainty, the applicability, and the formal beauty of mathematics and its relation with the values and meanings which religions attribute to reality.

Knowledge

It defines concepts which relate the formal and public knowledge of mathematics with the knowledge proper to religions which has a personal and community component which characterizes it.

Truth

It defines relations between mathematical truth, conceptualized through formal functions between mathematical objects and religious truth conceptualized through symbols which are interpreted in religious schools and communities (Leach 2008).

Perception

This discipline defines concepts common to the different types of perception of reality, proper to mathematics and religion.

Time

It defines relations between the mathematical concept of time, considered as a formal variable, and the concept of history and evolution in religions.

Consciousness

It defines relations between the consciousness of the consistency of thought proper to mathematics and the consciousness of the values proper to religions.

Rationality/Reason

It defines the relation between the rationality which is expressed in a language of the sign, proper to mathematics, and the rationality expressed in a language of the symbol, proper to religions (Leach 2007).

Mystery

It defines relations between the incomprehensible mystery of mathematics, related to applicability, beauty and the incomprehensible beauty, certainty and mysteries of religions, related to final, global views of reality.

Cross-References

- [Formal Logic](#)
- [Mathematics, Ancient and Medieval](#)
- [Mathematics, Early](#)
- [Mathematics, Formal and Contemporary](#)

- [Mathematics, Modern](#)
- [Myth](#)
- [Metaphysics](#)

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Mathematics in Human Learning

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Description

Mathematics Education is the teaching and learning of mathematics, as well research on these matters. The researchers in this field seek conceptual and methodological tools and implement approaches which facilitate their study and use. In Europe, research into Mathematics in Human Learning is known as the Didactics of Mathematics (a common denomination, at least, in France and Germany) or Mathematics Education (denomination in United Kingdom).

From the twentieth century, in the developed countries, mathematics began to be implemented as an obligatory nucleus of the syllabus or curriculum. This is when the didactics of mathematics was established as a field of research, and several events contributed to this:

- The creation of the chair of Mathematics Education at the University of Göttingen, in 1893 coordinated by Felix Klein.
- The contributions of Felix Klein, David Eugene Smith, Max Simon, Hans Freudenthal, André Revuz, George Polya, and other mathematicians who encouraged Mathematics Education.
- The foundation of the International Commission on Mathematical Instruction (ICMI) in 1908, which was responsible for promoting scientific work in the area based on the collaboration of mathematicians, psychologists, mathematics teachers, and mathematics professors.
- The training of an international scientific community in the area of Mathematics Education as a result of the First International Congress on Mathematical Education (ICME), held in Lyon in 1969.

From the seventies in the last century, the research area began to be organized. In France, the IREMs (Instituts de Recherche en Didactique des Mathématiques) were created. These were institutes dependent on the Mathematics Departments of the universities and were directed by a mathematician. In Italy and Hungary, Mathematics Education was institutionalized through the university Mathematics Departments, which led to close collaboration between researchers in Mathematics Education and mathematics professors, as in France.

The constitution of Mathematics Education in the Anglo-American area took a different route. In the United Kingdom, the Association of Teachers of Mathematics (ATM) has served as the main support for the articulation of national research projects in Mathematics Education, such as the Low Achievers in Mathematics Project (LAMP) in 1987 or the Shell Centre for Mathematical Education which was set up in Nottingham in 1968. In North America, the researchers in Mathematics Education may be members of Mathematics Departments or professors ascribed to the Education Science faculties (e.g., the National Center for Research in Mathematical Science Education in the USA).

As stated above, if we compare it with other sciences (physics, philosophy, or pure mathematics), Mathematics Education is a very young discipline; however, it does have social relevance as can be judged by the proliferation of journals (Educational Studies in Mathematics, Journal for Research in Mathematics Education, Journal For the Learning of Mathematics, Journal of Mathematics Teacher Education, etc.) doctoral programs, scientific associations and organizations (e.g., the National Council of Teachers of Mathematics (USA), National Centre for Excellence in Teaching Mathematics (England), SEIM (Spain), Homi Bhabha Centre for Science Education (India), etc.), and congresses (ICME, PME, ...).

Self-Identification

Science

Mathematics Education is identified as a science and as a scientific discipline.

If an attempt is made to formulate to what extent this discipline self-identifies among the professionals in the area of Mathematics Education, it will be seen that basic epistemological options constituted by beliefs and conceptions formed from collective and individual experiences related to mathematical knowledge and how the teaching and learning of mathematics comes about and should come about come into play. The underlying mathematical epistemologies in these professionals configure a horizon for the understanding of the identity of a varied discipline (Sierpinska and Kilpatrick 1998) which is at the base of the structuring of their didactic proposals. Thus, we will obtain different characterizations depending on whether we subscribe to objectivist epistemologies with affiliations to Platonism, based on a view of mathematics as a static unified body of knowledge, in which mathematics is only discovered, or a dynamic views of mathematics, heirs of a critical view of science (e.g., constructivist positions, perspective on the resolution of problems), which understands mathematics as a field of human creation in continual expansion, and for

which mathematics is an open science, in construction, and its results are provisional and remain open to revision. In this chapter, dynamic perspective is adopted, in the terms explained above. We consider mathematics as a science with an object of specific study closely linked to historical and sociocultural human development and for which the actions of creating and discovering are the motor forces.

Research into Mathematics Education has two main objectives, one pure (basic science) and the other applied (engineering). The purpose of basic research is to understand the nature of mathematical thought and its teaching and learning. In these studies, work is done on theoretical perspectives in order to understand this nature, and to do so, descriptions of aspects of cognition are developed (e.g., thinking mathematically, what the students understand or fail to understand as regard the concepts of function, limit, etc.) or descriptions of the influence of the emotional, social, and cultural dimensions in mathematical knowledge.

Applied research seeks the applicability of the knowledge achieved in basic research in order to improve instruction in mathematics. Some of these studies are conducted based on proofs of existence (evidence of cases in which the students can learn to resolve problems, induction, the group theory; evidence of the feasibility of diverse types of instruction) and descriptions of the consequences (positive and negative) of different forms of instruction.

Religion

In order to ensure a determined state of opinion, as our starting point we will adopt the definition which the Spanish Royal Academy Dictionary gives of the term religion, “the set of beliefs or dogmas regarding the divinity, feelings of veneration and fear of the divinity, moral norms for individual and social conduct, and ritual practices, principally prayer and sacrifice in order to worship the divinity.” According to this definition, religion is an element of human activity, whose components refer to different environments of individuals and of collectives: comprehension and understanding (beliefs), affective

existential experience (feelings, the supernatural dimension), and conduct (ethics and morality of behavior).

If we apply this definition literally to the concept of Mathematics Education, we can affirm that this knowledge does not comply with the parameters established for a religion and it should be added that the dialogue with religion does not become a necessity for mathematics nor for Mathematics Education. Nevertheless, as was noted in section “[Religion](#),” Mathematics Education as a scientific discipline is structured based on a determined epistemological foundation; therefore, it participates in a view and ways of accessing knowledge marked by systems of beliefs of the collectives which work on these. Beliefs do not only refer to the human construction but also, very especially, to mathematical production and the view of the world. Therefore, we could state that religion and Mathematics Education share similar grounds (mathematical metaphysics, philosophical presuppositions of what knowledge is), whose foundations are supported by systems of beliefs and ways of conduct founded on ethical attitudes. This common substratum makes it advisable not to reduce the environment of mathematics and of Mathematics Education to web of systems and results which, however rich and complex they may be, seem to us to be insufficient.

It may be pertinent to point out here that, throughout the history of mathematics, we find mathematicians and collectives of mathematicians who have been led to perceive mathematics as a model and mirror of what human conduct must be and as the object inspiring astonishment and mystery (so linked to the religious phenomenon) by the “certainty” of mathematical knowledge, the order and harmony of the universe discovered through the contemplation of the structures and rhythms of nature. In the case of the Pythagorean school, the revelation of the harmony of the universe expressed in the harmony of the numbers provided a path to union with the divine. It could be said that, on contemplating the independent force and autonomy of the relationships which are created or discovered in mathematics, mathematics can reasonably suspect the

presence of something superior to it, which precedes it in intelligence. This conviction crosses the history of mathematics, and we can trace it to Hermite (and Gödel), in its affirmation of the divine origin of the world of mathematical ideas and on the construction of a rational religion based on its logical-philosophical thought or in the formal proofs of the existence of God (Anselm, Leibniz, Gödel).

Characteristics

Mathematics Education is not a particular case in general education. It is important to point out that, although the object of Mathematics Education is mathematics, the epistemological status of this knowledge is different from the mathematics investigated by mathematicians; the nature of the evidence and of the argumentation is different in both disciplines. Mathematics Education must necessarily refer to the person in his global nature, a person still to be conformed, integrated into a specific society, and modeled by the culture in evolution of the society he belongs to; Mathematics Education must unfailingly have the human and material resources required at a specific time and must be aimed at the finalities assigned to education by a determined society, through its political authorities, finalities which can be extraordinarily varied.

Mathematics is characterized by the fact that its studies mental creations, it does not work with objects or physical phenomena, and by the form in which its declarations are justified. Mathematics has its own characteristics such as abstraction, induction, hierarchy, globalization, rigor, which entails an epistemology of its knowledge. Mathematics is a discipline which requires a certain effort for its assimilation and the use of cognitive strategies of a superior order. Mathematics Education is characterized by the application of forms, methods, and strategies which inform the conscious action of the mathematical work in the person learning. To achieve this, it is necessary to have an interdisciplinary approach, which takes into consideration a variety of theoretical frameworks: epistemology, psychology, the sociology of mathematical knowledge.

As the necessary interdisciplinary condition is not sufficient, Brousseau and Artigue in the ICMI Study Conference (p. e., Artigue 1998) pointed out that the questions of meaning and genesis of the mathematical notions are a meeting point for researchers into Mathematics Education and researchers into mathematics. Without this specific contribution, Mathematics Education would run the risk of becoming didactics of a general type.

Relevance to Science and Religion

In relation to the subject *Science and Religion*, we tend toward an approach which makes it possible to have elements of differentiation, dialogue, and integration between both disciplines and we consider that a pertinent relationship between *Science and Religion* can be established based on *complementariness*. In the first place, the differentiation is sustained because *Mathematics Education* and *Religion* conserve their legitimate identities and autonomy in the domains recognized for each of them by the respective scientific communities. Each of these disciplines is autonomous when defining their universes and each is free to advance along its own path.

It should be asked whether, despite being disciplines with such different identities and languages, a space, a common territory can be established in which both can dialogue and interact. The response would be affirmative. On the one hand, science (Mathematics Education) is an instrument which forms the subject as regard his perception of the world and the nature of the person who it humanizes and perfects (the human mind, system of values, etc.); on the other hand, religion needs consistent subjects, who provide sense to human action considered globally (the holistic dimension).

From this point of view, it could be stated that *Mathematics Education* incorporates elements which are related to the metaphysical dimension. In the mathematization process, the human mind finds indications, clues which make him suspect the existence of something in the universe beyond him; this opens up the question on reality, on

existence, on being, on the how and the when, on where from and where to; all these questions involve interrogations on axiology and meaning. In this opening of the mind to intellectual mathematical knowledge, being is present as a horizon and a possibility in its infiniteness and the perception of an infinite horizon in knowledge, which stimulates the search for its foundations. Thus, the mathematical mind is opened up to the possibility of moving with no difficulty from specific thought on a specific problem to what is mysterious and transcendent, entering a dynamic search for what the mysterious and the inexpressible/ineffable represents in the mind.

The opening up of our minds is not only the opening up and the dynamism of intelligence but that the person intervene holistically (the whole person; with his willingness; with his capacity for desire, love, freedom, structure of values, etc.).

The teaching and learning of mathematics which is rooted in humanist approaches, undoubtedly, contributes to the fact that the person who learns gradually discovers human values with all their nuances (including absolute values). This discovery acquires more significant qualities to the extent in which it is supported by person to person and person to reality interaction (including mathematical reality). Educational action from mathematics can help to identify and discover dimensions of value within the framework of these interactions. The learners not only discover values but also live them; they transform these into conduct, thoughts, actions, and all kinds of experiences.

Among pure mathematics and technological applications, there is a wide spectrum of mathematical activities which have the search for coherence, clarity, certainty, and effectiveness in the development of knowledge in common. During the learning of mathematics, coherence and the needs of mathematical work do not enclose the learner in a mechanical and automatic control of reality but bring him close to the unexplored and the unknown, to creativity and intuition, to the passion to discover new worlds. It also opens them up to the nonformal world of metaphysics and theology.

If this process is to be feasible, a determined type of mathematical epistemology must govern the learning. An epistemological approach of an ahistorical, amoral nature, isolated from the scientific disciplines, deprived of cultural emotions and values, only formed by a body of facts and truths, a conception which has dominated many of our syllabuses (curriculum) for a long time, would not be feasible. It would be advisable to propose mathematics and education of a humanist type. In the humanist approach, the perspective of the professor, of the educator as a mediator in the learning process, is vital. The professor and his conceptions of mathematics are irreplaceable as regard the revelation and the development of values which can make the learner ask questions on the nature of certainty, truth, existence, limits.

Finally, it should be mentioned that, in some countries, in the *Science Religion* dialogue, materials have been published on the learning of mathematics at secondary school level, taking the social responsibilities which this science assumes in each context (the axiological structure of the science) as the reference and production framework. We refer to the Charis materials, drafted by members of the Association of Christian Teachers (Scott et al. 1996). These decide for the option to establish connections between spirituality, charity, and social justice, connections which lead the subject to a search for an explanation of the world in terms of religion, philosophy, science, and mathematics.

Sources of Authority

As in other disciplines, one of the sources of authority of Mathematics Education lies in the methods which make the validation and feasibility of research possible. The results of the research in education are not “proved” in the sense that mathematics is proved. Frequently, experimental methods or direct statistics (of the type used in the physical sciences) are inadequate or insufficient due to the complexity of deciding what is meant by educational conditions being “replicated.” Thus, in Mathematics Education, it

is necessary to have recourse to a wide variety of methods of a heuristic or interpretational nature. For example, a look at the study of research into the teaching of calculus in university Mathematics Education in recent decades shows this variety (Schoenfeld 2000). Along the same lines, we find reports of detailed interviews with students, comparisons of calculus courses under the reform with traditional courses and a broad study on the development of the comprehension of calculus in students through the use of learning technologies. These studies, which use anthropological and sociological techniques of a qualitative nature, are increasingly more common in Mathematics Education.

It is also usual that the use of these types of techniques gives rise to questions on their validity and feasibility. In order to neutralize the suspicion, Mathematics Education has a number of criteria for evaluating models, theories, and, in general terms, any empirical or theoretical work; these criteria are the following: descriptive power, explanatory power, scope, predictive power, rigor and specificity, the possibility of refutation, replicability, availability of multiple sources of evidence (“triangulation”). The findings achieved are rarely definitive. With these types of techniques, the results always become provisional and, frequently, they are tentative, like human existence. The evidence, in these cases, does not adopt the form of mathematical proof but is accumulative, progressing toward conclusions which can be considered to be tendencies or reasonable models with explanatory power for the reality they study.

Ethical Principles

Mathematics as a science is one of the fundamental axes of culture and contracts a singular responsibility with culture for its proper development; a development which could be said to be *at human scale*. Mathematics, as a formal science, cannot assume the pretension of neutrality; together with other disciplines, it is unfailingly linked to the improvement of the standard of living of the citizens. In this same regard, numerous

aspects of mathematical work and its teaching strongly involve our sense of responsibility as members of a global society. This orientation is included in declarations of institutions and the contributions of mathematicians (American Mathematical Society Ethical Guidelines (<http://www.ams.org/secretary/ethics.html>); interview with Reuben Hersh, What Kind Of Thing Is A Number? A Talk With Reuben Hersh [2.10.97] (http://www.edge.org/3rd_culture/hersh/hersh_p1.html; Moslehian 2005; Guzmán 2000). Among the ethical principles we can point out the submittal to reality; the joyful acceptance of truth and beauty; professional integrity; the deep sense of humility in the search for knowledge; the sense of freedom, of community, and cooperation with others; the respect for mathematical capacity wherever it may be, regardless of race, gender, ethnicity, age, religious or political orientation, etc.

Key Values

In the last two decades, much effort has been made to identify the set of values associated to mathematical knowledge and its teaching (Brown 1996). As a suggestion, and with the provisional nature of all contextualized knowledge, we propose the categorization of Bishop (1988) which, based on the four components of culture of White (1959): sentimental, ideological, sociological, and technological, organizes six sets of values grouped in three binomials: *rationalism– empiricism*, *control–progress*, and *opening–mystery*.

Rationalism is related to the discussions, reasoning, logical analysis, and explanations. This value is revealed by the teacher when he evaluates the development of the capacities of the students for argumentation, logical reasoning, and mathematical proofs. *Empiricism* is related to the processes of conversion into objects, specification, and the application of ideas in mathematics. The teacher will show this in his classes when he estimates the development of the practical capacities of the students for the use of the mathematical ideas and symbolism in modeling through diagrams and in the collection of experimental data.

Control relates to the potentiality inherent to mathematical knowledge for the use of established rules, procedures, and criteria; of facts; and of predictions. This value is inculcated by the teacher when he appreciates the capacities of the students when presenting routines and algorithms, when working with mathematical precision, and when exploring mathematical ideas which predict events. *Progress* is related to the development of mathematical ideas, of individual freedom and creativity; the teacher can foster this in teaching through the stimulation of creative explanations.

The *opening up* refers to the democratization of knowledge through proofs and through individual explanations. The teacher can foster this value when he stimulates the development of the capacities of the students to structure their own ideas in proofs, verifications, discussions, and in the freedom to express different points of view.

Finally, *the mystery and the search for truth*, this value is related to the fascination for scientific mathematical ideas and with submittal to the truth and to reality, so rooted in the scientific. This value, undoubtedly, constitutes one of the important features which we should appreciate and encourage in the teaching of mathematics. The teacher can stimulate the imagination of the students in discussions on the nature of the object knowledge and the meaning of the scientific ideas.

Therefore, besides being a determined class of symbolic technology (rules, concepts, algorithms, etc.), mathematics is the carrier and, at the same time, the product of determined values. If we only wish to understand mathematics as a specific symbolic technology, we will only understand a small part of these, perhaps the least relevant for education and for our future as human beings.

Conceptualization

Some of the concepts which are defined below are not the objects of study, not of definition in Mathematics Education. In the event that this is done, it should be pointed out that it is not

possible to establish a univocal definition because this will depend on the theoretical framework of reference which is adopted. Therefore, we will define these, taking this into account.

Nature/Word

Mathematics is an exploration of certain omnipresent and more or less complex structures which appear in nature, in the world; which admit this rational approach, which can be manipulated through symbols; which provide us with a certain domination of the reality they refer to; and which we call mathematization. For example, in the *mathematics for a realist education* focus, mathematics begins and remains in reality. Mathematical activity commences in processes of mathematization of the real and is expressed in rules, in *structures*, which in turn become the base material for superior abstraction, generating a hierarchy which is distant from the original common sense until it is converted into the reality most distant from this.

Human Being

In Mathematics Education, focuses such as the resolution of problems and the constructivist perspective place special stress on the human being as the person who creates and constructs mathematics. The human being is not a concluded being but is a being who becomes within the evolutionary framework.

The transmission of mathematical knowledge is carried out by paying attention to specific persons under a holistic perspective of the integration of the cognitive, affective, and social dimensions of the subject.

Life and Death

These are not the objects of definition by the discipline.

Reality

In relation to this concept, it seems to us to be significant to point out one of the facets which is most worked on in Mathematics Education, the objective view of reality. Mathematics fosters a view of reality which is more objective than subjective. The ideas are essentially ideas on objects.

Mathematics deals with abstractions, and Mathematics Education puts substantial efforts into developing what is usually called *abstract thought*. The power to *convert these abstractions into objects* is what makes it possible to handle these with such precision. In addition, the network of logical connections developed with mathematical ideas through proofs, extensions, examples, counter examples, generalizations, and abstractions helps to give them objective meaning, and consequently, it makes it possible to *address these as if they were objects*. The language of if; we suppose and the conditional tense of the verb also force an imagined reality at conscious level and, thus, it permits this to be manipulated *as if it were* an objective reality. Therefore, when encouraging the students to develop their capacity of abstraction, we encourage the ways to specify and “convert abstract ideas into objects” through a wide range of symbols.

Knowledge

Mathematics, like any other type of knowledge is created, applied, and taught within the framework of institutions whose use and values have significant repercussions on the way to focus learning and on the approaches of Mathematics Education. For example, in the constructivist positions on Mathematics Education, knowledge refers to the ordering and organization of our experiences and not to the understanding of an objective ontological reality. In order to provide grounds for their proposals, the constructivisms found several psychological referents, Piaget and Vygotsky, whose theories of knowledge are wider than the epistemology of mathematical knowledge. There are philosophical presuppositions on what knowledge is, and there is an option to decline any type of correspondence with the world in order to define truth and objectivity. The proposals of radical and social constructivism are important examples of these types of conceptions which give rise to beliefs which influence the teaching and learning of mathematics.

Truth

From its beginnings, mathematical knowledge has been considered to be sure, absolute, and

eternal knowledge. However, in the twentieth century, epistemological approaches appeared and, currently, these have an important influence on the teaching of mathematics and present mathematical work as fallible. The mathematical truths, propositions, and ideas in general are open to the examination of any properly trained person. According to this focus, the education process must be centered on a heuristic focus which is set against the deductivist focus of the formalist school (e.g., Lakatos 1976). The deductivist focus starts from the acceptance of primary truths and definitions, without explaining how these arose, and from these, the theorems and proofs are presented. On the contrary, the heuristic focus shows the counter examples; it does not separate the definitions from the proofs which have generated them; it places emphasis on problematic situations and stresses the *logic* of the discovery which has given rise to new concepts. The perspective opened up by the approach of heuristics endeavors to show the side of mathematics hidden below the Euclidean rigor and presents it in its process of genesis toward a new level (Polya 1945). The creative phase in mathematics is not governed by logical analyses, but by inquiry which must opt for new views, to relate concepts or properties and create new ones. The consequences of this approach for Mathematics Education are substantial, and, in recent decades, their effects have begun to be seen. Among its more disseminated tendencies is the accent on the transmission of processes of mathematical thought and, in particular, on the mental processes for the resolution of problems.

Perception

Perception and action are bases of mathematical thought. We understand *perception* to be the exercise of a first level of awareness faced with contact with reality. The development of perception implies extending the capacity to be aware, to note, to highlight elements and aspects which configure what surrounds us until it is configuring the subject which it constructs more and more actively. In Mathematics Education, attention is paid to the blocks which more specifically affect our cognitive functioning, the perceptive blocks. These are

obstacles which prevent anyone from solving a problem from clearly perceiving the problem in itself or the information required to solve it.

Time

In some subdisciplines such as the didactic of mathematical analysis, the changes and transformations in space and time are analyzed.

Awareness

Education basically consists of educating the attention, producing changes in the locus, in the focus, and in the structure of attention, and these changes can be increased through others, working in the awareness itself. The act of awareness is an internal individual activity which a student carries out but which is more easily achieved if the educational activity fosters it. Several strategies can favor this. For example, one strategy is that the teacher work with the awareness that the students have of mathematics instead of expressing his own awareness of mathematics. Another strategy is the development of an internal mathematical monitor which presents us with questions such as, "Why am I doing this particular operation?" "Is it supposedly more complicated?" and "Am I doing this wrong?" Developing a monitor which corrects errors is an important part of the metacognition involved in becoming an expert in mathematics.

Rationality/Reason

In this discipline, the mission of the human mind consists of rationally interpreting realities, facts, which are presented as given, as previous, to the best of its ability.

Mystery

The work of *mathematics* is necessarily an open activity, *inexhaustible*, in the sense that it can never be considered to be concluded; the mystery is linked to the fascination for new mathematical ideas and the perception of the infinite.

Relevant Themes

Finally, we should point out something which we have shown in this document, which is that in

the development of the discipline of Mathematics Education, there are different focuses. The conceptions of the knowledge of the world included in each of these focuses have repercussions in the education of the students and can become indirect ways of familiarizing them with different ways to see the world and to conceive objectivity and truth, and, as a consequence, to place the bases for their conception of moral responsibility.

Cross-References

- [Epistemology](#)
- [Mathematics and Religion](#)
- [Process Theology](#)
- [Statistics and Probability](#)
- [Virtue Ethics](#)

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Mathematics in Latin America, History

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The history of mathematics in Latin American countries is a very recent area of research D'Ambrosio & Selin (2001). Most of this research has been carried out since the 1960s and continues today with exceptional vigor. In general, it has been done by mathematicians who have a particular and deep interest in the history of the development of mathematics in their own countries. This activity has led to the creation of specialized journals in the region such as *Revista Latinoamericana de Historia de las Ciencias y las Técnicas*, *Mathesis*, and the *Revista Brasileira da História da Matemática*. Research results have been published in these journals as well as in other journals such as *Historia Mathematica*, *Llull*, and journals of national academies or mathematical societies. Some national and international associations have also appeared to organize and cement these activities. However, it is worthwhile to note that a technical report on the contribution of Latin America to world mathematics was made for UNESCO by the Science Corporation Office for Latin America in 1950 (Luis et al. 1951). The following historical periods have tentatively been proposed: pre-Hispanic D'Ambrosio (2006), the colony, the nineteenth-century-independent countries, first decades of the twentieth century, and the rest of the twentieth century.

First period: Pre-Hispanic period. The pre-Hispanic period goes up to the first decades following the discovery of the American continent. In this period, the counting practices and the underlying plane symmetries in the decoration of monuments, gold work, pottery, and textiles are studied as part of the mathematics developed by the pre-Hispanic American cultures.

Second period: Colony. The colonial period comprises the sixteenth, seventeenth, and eighteenth centuries. The teaching and use of mathematics (including astronomy, physics, and nautical sciences) at universities established at the different Viceroyalties and elsewhere are taking into account.

Third period: The nineteenth-century independent countries: This period goes from the 1810s up to the 1890 s, when the intellectual and political elite leaders of these new countries became aware of the importance of science and techniques in the economic and scientific development of these nations, since they would provide the means to construct a badly needed infrastructure (represented in roads, railroads, ports, and factories) and also the formation of able military officers to defend their new acquired sovereignty. Research and analysis in this period attempts to establish mathematics in military, university, and high school institutions, as a necessary premise for the social and economic development of Latin American countries.

Fourth period: First three decades of the twentieth century: The first decades of the twentieth century in math are historically void in most of the Latin American countries, except for the interest in the formation of teachers of mathematics for secondary and engineering schools. This period is characterized by a deep stagnation in the learning of advanced mathematics with the exception of Argentina (Ángel, 1995; da Silva, 1992; Sánchez Fernández Carlos & Valdés Castro Concepción, 2003).

Fifth period: The remaining decades of the twentieth century: This period correspond to the consolidation and development of modern mathematics in the region.

The history of mathematics in Latin America is part of the history of mathematics, the history of science, and the history of Latin America. In particular, it is interested both in the specific developments in mathematics and also in the social aspects about which the work was done.

As part of the history of mathematics, the history of mathematics in Latin America does not identify itself as a religion. Nonetheless, the works of Seidenberg (1961) on the ritual origin of

counting and geometry in primitive societies demonstrate deep relationships between mathematics and rituals. This awakens interest in these cultures' conception of the world, especially its creation. Nonetheless, it is noteworthy to remark that these relationships are actually used by some educators to teach mathematics to ethnic groups. This activity is called now ethnomathematics and began as such in Brazil with the works of Ubiratan D'Ambrosio (D'Ambrosio 2006).

The main primary sources for doing history of mathematics in Latin America are the archives related to national histories, in particular, the National Archives and those of Secretaries of War and Education, universities, and other academic institutions. The secondary sources are books and papers published by very respected and reliable mathematicians interested in the history of mathematics in their respective countries during the second half of the twentieth century. Some recognized journals are *Quipu*, *Llull*, *Mathesis*, *Revista Brasileira de História da Matemática*, and journals from the various Academies of Science. There are also some papers on the Web with relevant information on the history of mathematics in specific countries of Latin America.

The history of mathematics in Latin America, as part of the more general history of science and culture, must provide accurate knowledge about the development of mathematics and its impact in the region and the rest of the world. Mathematics serves to model the natural, economic, and social world. Its history in the region supplies information as how these aspects have been apprehended and used in Latin America. This, in turn, helps in designing appropriate strategies to improve the quality of education, especially in mathematics and in science, in order to cope with regional social and economic underdevelopment. Thus, the history of mathematical education is closely related to the history of mathematics.

Cross-References

- [Cultural Studies](#)
- [Education, Sociology of](#)
- [Historiography \(Classical\)](#)

- [Mathematics in Human Learning](#)
- [Mathematics, Modern](#)
- [Science and Scientific Knowledge, Sociology of](#)

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Mathematics, Ancient and Medieval

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Related Terms

[Logic](#); [Metaphysics](#)

After the boost given by the Greeks to mathematics, there was a long period in which creative

mathematical activity declined in Europe. During the Middle Ages (Folkerts 2003, 2006), especially outstanding were the research and discoveries regarding algebra carried out in the cultural environment of Islam.

Interactions Between Logic and Metaphysics in the Medieval Period

The Greeks introduced logical arguments in mathematics and metaphysics. Medieval Christian theologians combined Greek rationality with Christian metaphysical statements (Plantinga 1967). Among the medieval arguments about the existence of God, the ► [ontological argument](#) (Hintikka 1969) shows with particular clarity the problematic relation between mathematical logic and metaphysics.

The Ontological Argument

The ontological argument is a type of reasoning on the existence of God based on *metaphysical propositions* about the existence of a necessary being and *logical reasoning* (Leach 2010). The ontological argument stands out by its uniqueness among the argumentations which seek to show the existence of God a reasonable choice.

It is noticeable that some philosophers accept the ontological argument while others, even as accepting the existence of God reasonable, do not accept the ontological argument. *Thomas of Aquinas* (1225–1274) and *Kant* (1724–1804) reject the ontological argument, while other philosophers such as *Avicenna* (980–1037), *Anselm of Canterbury* (1033–1109), *Descartes* (1596–1650), *Leibniz* (1646–1716) and *Spinoza* (1632–1677), *Gödel* (1906–1978), etc., accept it.

Ontological Argument, Logic and Mathematics

There are several versions of the ontological argument, but in order to formalize them adequately, we need to use not only logical *formal signs* but also *metaphysical symbols* in all of them.

The Formal, the Real, and the Metaphysical in the Ontological Argument

The main difficulty posed by thinkers such as Thomas of Aquinas and Immanuel Kant as regards the ontological argument is that, from the mere analysis of the concept of existence, it is not possible to deduce the real existence of anything. Their difficulty is based on the fact that, in the ontological argument, a leap is made from the logical to the real, from the mental to what really exists.

The distinction between the propositions concerning formal existence in mathematics and real existence in the empirical sciences and in metaphysics helps us to reveal the confusion of opinions on the ontological argument.

Three Types of Propositions Concerning Existence

We can distinguish three types of propositions concerning existence: propositions of mathematics on formal existence, for example, there is a solution to the equation $x^2 = 4$; propositions of empirical sciences regarding real existence, for example, there are eight objects in the solar system with the category of planets; and metaphysical propositions on infinite and unconditioned existence, for example, God necessarily exists because God's essence is to exist (Baruch Spinoza, Part I of his *Ethics*).

Historical Formulations of the Ontological Argument

One of the first historical formulations usually cited regarding the ontological argument is that of the Muslim scientist and philosopher *Avicenna* (980–1037). In *The Book of Healing*, Avicenna distinguishes between the essence (*mahiat*) and the existence (*wujud*) of beings and postulates a being whose existence is necessary (*Wajib al-Wujud*).

After Avicenna, there have been other thinkers who have sought to show the rationality of the existence of God based on conceptual propositions and postulates concerning existence with no limitations and on logical reasoning. Outstanding among these was *Saint Anselm of Canterbury* (1033–1109) who based his argumentation on

the idea of God as the greatest being we can think of "... we believe that thou art a being than which nothing greater can be conceived ... And assuredly, that than which nothing greater can be conceived cannot exist in the understanding alone: then it can be conceived to exist in reality, which is greater." (A current version of the Works of Saint Anselm translated into English can be found at <http://www.sacred-texts.com/chr/ans/>.)

René Descartes (1596–1650), Gottfried Leibniz (1646–1716) and Baruch Spinoza (1632–1677) have different formulations of the ontological and of Anselm. Kurt Gödel (1906–1978) formalized the argument of Anselm in modal logic (Fitting 2002). (Modal logic is differentiated from classical logic by the fact that it admits propositions affected by modalities such as "possibly" or "necessarily.")

Although they are different as regards their formulation, all the ontological arguments have in common the fact that they are supported by propositions of metaphysical type concerning the concept of a being without limits (or, using the words of Anselm, refer to a being such that we cannot think of any greater being), and based on these propositions, they argue the reasonableness of the existence of God.

A simplified formalization of the ontological argument OA in predicate logic is as follows:

-
- (1) We cannot think of a being whose existence is more necessary than that of God
 - (2) If God does not exist necessarily in reality, then we can think of a being whose existence is more necessary than that of God
-
- ∴ Therefore God exists necessarily
-

Formalization of OA

We define:

-
- $M(x,y)$: We can think that the existence of x is more necessary than the existence of y
-
- $EN(x)$: x necessarily exists in reality
-
- d : God
-

Then OA:

-
- (1) $\neg \exists x M(x,d)$
-

(continued)

(2)	$\neg \text{EN}(d) \rightarrow \exists x \text{M}(x,d)$
$\therefore$	$\text{EN}(d)$

where we can read the premises (1) and (2) and the conclusion therefore as follows:

(1) $\neg \exists x \text{M}(x,d)$	There does not exist an element of our domain of discourse x such that we can think that the existence of x is more necessary than that of God
(2) $\neg \text{EN}(d) \rightarrow \exists x \text{M}(x,d)$	If God does not exist necessarily, then there is an element x whose existence we can think is more necessary than that of God
$\therefore \text{EN}(d)$	God exists necessarily

In the formalization of OA, we have used two different signs, the logical sign $\exists$ and the predicate EN, in order to denote the existence of the same element x . The use of the logical sign $\exists$ in formula (2) indicates the existence of an arbitrary element x of our domain of the discourse to which we attribute the predicate $\text{M}(x, d)$. The use of the predicate EN in the subformula $\neg \text{EN}(d)$ indicates the necessary nonexistence of d , whereas the formula $\text{EN}(d)$, the necessary existence of d .

It is easy to verify that, by applying the rules of deduction of classical logic to the formal propositions (1) and (2), the conclusion $\therefore$ follows.

We can construct a formally correct ontological argument and conclude that God exists, in the case that the two premises (1) and (2) are true. However, the problem stated by Thomas of Aquinas and by Kant regarding confusing formal existence in thought with real existence has not been solved because in premise (2) we are mixing the logical sign $\exists$ which refers to formal existence with the predicate EN which refers to necessary real existence. That is to say, we are mixing the real world with the mental world without adequately distinguishing these.

Empirical and Metaphysical Propositions

We know that, in the physical and empirical sciences, the propositions which include predicates which refer to real existence need to be confirmed by sense observations of reality.

For example, we know that a proposition of the geometry of Minkowski becomes a proposition of the theory of relativity if this is confirmed by observations of reality. Likewise, the propositions of a metaphysical type, which refer to unconditioned existence, also need to be confirmed by visions of a metaphysical type concerning necessary existence and, therefore, unconditioned existence.

For Anselm, Descartes, Avicenna, and many others, who have considered the ontological argument valid with several variants, the proposition $\neg \text{EN}(d) \rightarrow \exists x \text{M}(x, d)$ expresses a metaphysical vision of the reality. The metaphysical vision is not felt like the empirical experience and is not thought out like the mathematical and logical intuition; it has its own way of being thought and felt.

Saint Anselm and other defenders of the ontological argument reasoned correctly from a formal point of view. Their conclusion is valid in the case that the following metaphysical proposition is valid: “If God does not necessarily exist, then there is an object of our metaphysical intuition whose existence we can think as being more necessary than the existence of God.” But, the validity of this metaphysical proposition is not accepted by all thinkers.

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Mathematics, Early

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In the prehistory, before there were writing systems, we have archaeological evidence of representations of *geometrical figures* and of instruments used to make *numerical calculations* (Katz 1998). Before Greek civilization (D'Ambrosio and Selin 2001), there was an intuitive knowledge of mathematical relations and theorems which was first proved by the Greeks (Boyer 1991).

Infinite in Mathematics and in Religion

Apart from the mythical use of finite numbers in Egypt, Babylon, India, and other pre-Greek cultures (Katz 2007), the infinite is one of the first concepts relating mathematics and religion (Plotker 2009). The Yajur Veda, one of the four canonical texts of Hinduism, uses the concept *purna* and states that if we subtract *purna* from *purna* what remains is again *purna*.

The use of the concept *purna* in the Yajur Veda can be interpreted both religiously and mathematically. The word “infinite” is used in three different contexts, as a mathematical sign, as a sign representing a quality of the empirical reality, and as a metaphysical symbol. This can lead to confusion.

The Mathematical Infinite

As a *mathematical sign*, the infinite can have two distinct meanings: *potential infinite* and *actual infinite*. The potential infinite is a succession of objects which can be as big as we wish as it does not end. Otherwise, we can consider the actual infinite as a whole. For example, we can consider the natural numbers as a succession of numbers $N = 1, 2, 3, \dots$ that does not end or we can

consider all the numbers of N as a whole $N = \{1, 2, 3, \dots\}$ and call this whole actual infinite (Boyer 1991).

Cantor proved that the consideration of N as a set actually infinite leads us to consider other infinities which are “greater” than N , called *transfinite numbers*. The difficulty to understand transfinite numbers led some constructivist mathematicians to deny their existence (Morris 1990).

The Empirical Infinite

The infiniteness of time and space is a physical concept which refers to the real world and which is frequently confused with mathematical infiniteness. Different physical options concerning the infinitude of time and space in physical reality are based on different physical paradigms. It is impossible to take infinite small or infinite large measurements (Gardiner 2002).

The Metaphysical and Religious Infinite

Finally, the *infinite* is used as a *metaphysical symbol* representing the *transcendent*, *ultimate* and *definitive* existence, whereas the metaphysical symbol *finite* means the *nondefinitive* existence.

Frequently, religions state that God is infinite because we cannot define or delimit His names through human concepts. The religious and metaphysical understandings of infinite are symbolic and include a personal option accepting or rejecting the existence of an infinite, ultimate, and definitive reality.

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Mathematics, Formal and Contemporary

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Related Terms

Arithmetic

One feature that characterizes this epoch of mathematics is the *formalization of mathematical language*. The formalization had two important consequences, which influenced the global nature of mathematical and scientific knowledge.

The first consequence was the possibility to *study the mathematical language with mathematical methods* (Benacerraf and Putnam 1983). Just as mathematics proves theorems about numbers, straight lines, planes, geometrical figures, and other mathematical objects, in this last epoch, mathematics has been able to prove theorems about the very language of mathematics and its meaning.

The second consequence of the formalization of mathematical language was the ► *automation of mathematical proofs*. The automation of mathematics has brought the human mind next to the computer. Once formalized, the mathematical proofs can be translated into a programming language and be executed by computers.

Truth and Certainty in Formal Math

The formalization of mathematics brought about a new type of mathematical certainty based on formal methods (Leach 2010). The traditional

mathematical certainties were based on intuitions and proofs whose consistency was proved to be at times doubtful. The new formal methods made it possible to prevent paradoxes and have provided the capacity to prove mathematical consistency on some occasions.

The certain knowledge offered by mathematics in this new stage responds to an old metaphysical aspiration: the certain, consistent knowledge of truth. However, in order to achieve this certainty, it was necessary to pay a high price: the reduction of truth to the environment of the formal. The new formal certainty is the basis of interesting, complex relationships which were established between science and metaphysics throughout the twentieth century and at the beginning of the twenty-first century (Tymozco 1998).

We can divide this historic epoch in three phases:

1. First phase. The origin of formal mathematics

The appearance of non-Euclidean geometries showed that geometry did not depend on the traditional intuitions which supported it. *Nikolai Lobachevsky (1792–1856)* developed a new non-Euclidean geometry that relativized the value of the traditional geometric intuition and stressed the absence of contradiction in the deductions.

George Boole (1815–1864) published in 1854 *An Investigation into the Laws of Thought* in which he described with algebraic methods what today we call the logic of propositions. *Gottlob Frege (1848–1925)* completed the formalization of the mathematical language which Boole had begun. In 1879, Frege published *Begriffsschrift*, “Concept Notation,” with the subtitle, “a language of formulas for pure thought in the likeness of arithmetic.” *Georg Cantor (1845–1918)* defined a set as “a collection into a whole of definite and separate objects of our intuition or our thought.” The idea of collection helped Cantor to express what mathematical objects are in a uniform way: collections of elements. As a result of set theory, mathematics acquired standard semantics.

The formal results of Boole, Frege, Cantor, and others had prepared the terrain so that

David Hilbert (1862–1943) could put forward the study of mathematics with mathematical methods. This study is called metamathematics. The metamathematical program intends to prove that the mathematical theories are *consistent*, *complete*, and *semantically decidable* by metamathematical finite resources. A theory is consistent when we cannot deduce a contradiction within it. A theory is complete if any true formula in the system can be formally proved from certain axioms. And a theory is semantically decidable if we have a formal procedure for deciding whether a given formula is true in a given model or not.

2. Second phase. The incompleteness of arithmetic

Kurt Gödel (1906–1978) (Casti and DePauli 2001) proved that first-order logic was a complete system. However, later on, by using metamathematical methods, Gödel proved in 1931 that the formal system of arithmetic is incomplete (Smith 2007). The *incompleteness of arithmetic* proves that we cannot construct an axiomatic system from which we can deduce all the propositions valid in arithmetic.

Moreover, from the incompleteness of arithmetic, it is deduced that we cannot prove the consistency of arithmetic from within the arithmetic. That is to say, in order to prove the consistency of arithmetic, we need to be supported by another metatheory external to arithmetic, whose consistency we must also presuppose.

Pluralism in the conception of mathematics

When the program of Hilbert entered a crisis, the classical conception of mathematics also entered a crisis. There are other conceptions of mathematics such as the intuitionist/constructivist, which have a stricter attitude and only admit propositions effectively proved as valid (Hawking 2005). Outstanding among the constructivist mathematicians is the Dutch mathematician *L. E. J. Brouwer (1881–1966)*.

► **Pluralism** has been extended to the same conception concerning what the mathematical objects are. Set theory is not the only possible

description of the mathematical objects. The concept of category appeared as a basic description of mathematical objects; categories are not based on the concepts of sets and belonging but on the concepts of function and composition.

3. Third phase. The formalization of the processes

In his paper in 1936 (Turing 1936–1937), *Alan Turing (1912–1954)* presented his exact formalization of the concept of “effective method” called the *Turing machine*. *Alonzo Church (1903–1995)* (Church 1936) had presented another different formalization of the algorithms some months previous to Turing (Church 1936). The formalization of Church is called *the lambda calculus*. The formalization of the Turing machine and the lambda calculus turned out to be equivalent in the sense that both described the same set of algorithmic procedures or functions.

Once the mechanism of his machine was formally established, Turing obtained a surprising result which strengthened the theorem of incompleteness of Gödel (Turing 1936–1937). Turing proved that it is not possible to decide in all cases whether a given program will stop or not. Reasoning on the Turing machine, a version of the incompleteness theorem of Gödel can also be proved.

The ideas of Church and Turing are at the core of current theoretical computing (Davis 2000). Moreover, the applicability of computing has decisively affected the development of the applied dimension of the formal sciences. It has highlighted applied dimensions, unknown until now, of languages and formal models such as pragmatism, experimentation, implementability, and efficiency. This has led to the plurality of logics, suited to several finalities. The existence of a plurality of logics opens up new perspectives for scientific language as each of these reflects a partial dimension of reasoning.

The Risk of Committing Errors

The innovation brought about by the theorems of undecidability and incompleteness is that we are

faced with risk in the very environment of formal sciences, where we can exercise most control over our knowledge. Precisely because this risk of committing errors is based on the very nature of the formal processes, there is no formal explanation which tells us how we have to assume this risk.

Formal Sciences, Metaphysics, and Theology

Formal reasoning transcends all languages and all levels of human knowledge, including the metaphysical (Salmon 2005) and religious. The formal development of mathematics throughout the twentieth century proved that the results of mathematics cannot be complete, and therefore, they are open to several possibilities which cannot be predetermined in all cases.

Between formal sciences and metaphysics, there is a paradoxical link. On the one hand, formal sciences and metaphysics are two opposite dimensions of human knowledge with considerable differences between the two. On the other hand, there are some deeply rooted similarities between metaphysics and formal sciences.

Why the world is intelligible, why the world exists, and why goodness exists. These are metaphysical questions because they do not ask the reasons or causes behind how we understand the world, rather why these reasons and causes exist. Metaphysical statements answer these questions referring to views about the world as a whole.

Formal sciences are about a formally defined language. Empirical sciences are inevitably particular disciplines as they refer to an aspect of the world. Metaphysics is essentially transdisciplinary, as it refers to the reality as a whole.

Theological statements are metaphysical statements that express views about the world in relation to God from religious foundations. Religious communities use theological symbols to explain how God reveals himself to human beings. The revelation of God answers questions presented to man by metaphysics: the full

meaning of life, the creation and existence of God, and his revelation to the world. By reasoning about empirical experiences, we do not deduce statements about the revelation of God.

Religions present God as the ultimate foundation of reality. Theological reflection cannot avoid its relationship with metaphysical reflection as both ask about the ultimate questions of reality. Different ways of understanding theological reflection correspond to different metaphysical conceptions of reality.

Metaphysical and theological arguments need to be able to span different cultural communities. Formal reasoning can fully span communities, and it forms the basis for interdisciplinary, intercultural, and interreligious communication.

Cross-References

- [Automation](#)
- [Pluralism \(Religious\)](#)
- [Truth](#)

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Mathematics, Modern

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The third epoch of the historical evolution of mathematics began in the seventeenth century and extended to the end of the nineteenth century. In this epoch, there appeared a new relationship between mathematics and the empirical sciences when mathematics was used as a *language* to express the laws of nature (Heilbron 2003; Olby 1996). Mathematics was used in the first place as the language of physics and then as the language of other empirical sciences such as chemistry, biology, etc., and in the twentieth century, this was extended to sciences which included human conduct such as the economics, sociology, etc.

Mathematics as a Language of Science

Before the modern age, possibly the most well-known treatise for the study of natural phenomena was the *physics* (the text on the physics of Aristotle can be found at <http://classics.mit.edu/Aristotle/physics.html>) of Aristotle (Leach 2010). The works of Aristotle were translated from Greek and were known widely in Europe, to a large extent thanks to Islamic philosophers and mathematicians such as *Avicenna* (980–1037), *Avempace* (1080–1138), and *Averroes* (1126–1198).

Galileo Galilei (1564–1642) represents the change which took place in the world of science at the beginning of the modern age. The scientific work of Galileo was characterized by the use of instruments to observe nature and by the use of mathematical language.

The new physics brought about by Galileo differed from the physics of Aristotle in the use it made of quantitative measurements, expressible in mathematical language, and in the use of new

observation instruments, such as the telescope. Instead of quantitatively describing physical phenomena, the physics of Aristotle explains why these occur through speculation on their causes. In particular Aristotle distinguishes four types of causes: material, formal, efficient, and final (<http://classics.mit.edu/Aristotle/metaphysics.5.v.html>).

On using mathematics as language, the differences between the causes do not come from language but only from differences in the empirical observations on which the causal (Bunge 2008) study is based. For example, there are physical, biological, or social type causes because there are physical, biological, and social observations. However, within physics, biology, and the social sciences, the causes are expressed uniformly through mathematical laws.

In modern science both mathematical formulation and empirical observation are important. In fact, modern science arose from the ingenious combination of both. Quantitative observation is supported by two extremes in tension: observational experience and mathematical language.

The study of causes is a central component of scientific study. The expression of causes in mathematical language is at the root of the richness and the limitations of modern science. The distinction of four types of causes made by Aristotle is not based on the description of how things “behave” but on the interpretation of what Aristotle believed things “were.” This led Aristotle into committing serious errors in the description of the conduct of things. For example, Aristotle believed that if a body weighed more than another, it would fall more rapidly as he considered that the weight of the body was caused by the inclination of every body to tend to occupy the place corresponding to it by its very nature.

The Autonomy of Modern Science

The autonomy of modern science is a consequence of the quantitative observational method. The knowledge of the laws of nature no longer depends on the authority of a philosophical or religious theory but only on the methodical observation of nature and the mathematical formulation of the laws observed.

The autonomy of science as regards ► **meta-physics** and religion arose from the separation of mathematical language based on formal signs used to express the data observed and the metaphysical language based on symbols proper to metaphysics and religion. The basic components of the language of science are signs, which have formal, precise, and delimited meaning. However, metaphysics and religion make use of symbols which refer to the ultimate meaning of the totality of the world and to the transcendent and which cannot be reduced to quantitative signs.

Historically, the changes in the scientific view of the world have always affected the religious views of the world. Nevertheless, the change that occurred with the incorporation of modern science was especially important because modern science is by its own methodology independent of religious knowledge. Since the modern era, the autonomy of science has led to a new relationship between the scientific view of the world and the religious view being at times conflictive and at other times a factor for encounter and mutual interaction.

Mathematics and Metaphysics in the Modern Era

In the modern era, mathematics underwent a new internal development when it became the language of the empirical sciences. At the same time as this transformation of mathematics in the modern era, new basic metaphysical-type beliefs appeared. I will focus on three of these: *the principle of sufficient reason*, *causal determinism*, and *the rejection of* ► **metaphysics**.

The Principle of Sufficient Reason

The principle of *sufficient reason* (Pruss 2006) attributed to *Gottfried Wilhelm Leibniz* (1646–1716) established that no phenomenon occurs in nature which does not have a sufficient reason which explains it. The principle of sufficient reason is equivalent to the affirmation that a being that knows all the causes will be capable of explaining why all that is occurring occurs. Given that modern science understood a cause or reason to be

a mathematical reason, the principle of sufficient reason seemed to imply fatalist mathematical determinism.

The principle of sufficient reason supposed that any fact could be explained. This went against the possibility of free choice. In order to salvage the freedom of the human being, Leibniz distinguished between the limited knowledge of man which enables him to take decisions freely because he does not know all the causes of things and the unlimited knowledge of God who knows all the causes or reasons (G. W. Leibniz, *Discourse on Metaphysics*: <http://www.anselm.edu/homepage/dbanach/Leibniz-Discourse.htm>).

For Leibniz nothing in the world was indeterminate; everything followed a plan which was clear in the mind of God, and through this, God had created the best possible world. Leibniz believed that all the aspects of the world, both natural and supernatural, are related by links which can be discovered through rational methods. From this perspective, Leibniz thought that in order to discuss any problem with a man of “good will,” it was sufficient to formalize the problem, and both said “let us make the calculations” (*The Art of Discovery* 1685). These calculations had to be supported by some type of logic. However, although Islamic and scholastic philosophers had achieved some developments of the work of Aristotle, in the middle of the seventeenth century, formal logic was basically as it had been left by the Greeks.

Causal Determinism

Causal determinism is another consequence of the metaphysical belief that everything has a mathematical explanation. It is sufficient that everything has a mathematical explanation so that everything might have a cause or a *raison d’être*. Likewise we can say that if everything has a mathematical explanation, everything would be deducible from certain basic mathematical propositions. A characteristic representative of causal determinism was *Pierre-Simon Laplace* (1749–1827) (Laplace developed Newton’s mechanics; Laplace’s equations are important, as is his partial differential equation). Laplace believed in causal determinism. Laplace believed

that, just as Newton's laws could predict astronomical phenomena, all phenomena could be predicted using the location and momentum of the atoms making up matter. Laplace explained his determinist view by saying that if there were a demon that knew the position and momentum of all the atoms in the universe at any given moment, this demon would be able to predict all future events using Newton's equations.

The Rejection of Nonempirical and Nonmathematical Knowledge

The fact of denying the possibility of metaphysics is in itself an act which falls within metaphysical activity. Metaphysical activities refer to the knowledge of the essential, what finally matters, the definitive. Throughout all the cultural history of humanity, there has appeared the question regarding the possibility to know the essential in different ways. It is a question which is common to all cultures and to all religions.

Experimental observation, measured, quantified, and formulated with formal and methodical precision, is the center of modern science. Experimental knowledge of the facts and mathematical reasoning appear at the roots of scientific knowledge. Do our senses only perceive quantifiable experiences? Apart from scientific experience, is there also a metaphysical vision of the reality? Does quantifiable knowledge exhaust human knowledge? The negation of these questions is a metaphysical act in itself. The rejection of nonempirical and nonmathematical knowledge is a metaphysical act in itself.

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Matter

► [Physics](#)

Maya Religion

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Related Terms

[Mayan cosmovision](#); [Mayan religion](#); [Mayan spirituality](#)

Description

A summary of Maya religion must underscore the varied nature of the ideas and practices that make it up. This variation can be attributed to three causes: first, there is no overarching institutional structure; second, until recently, the religion has been based exclusively in an oral tradition; and third, the ritual specialist depends on his or her own observations and revelations in the elaboration of ritual and ceremony. In spite of its great variety, some common themes and practices emerge across the many regions where the Maya live and practice their traditions, namely, Mexico, Guatemala, Belize, El Salvador, and Honduras.

In recent decades, Maya religion has become an important facet of the "Maya Movement," sometimes referred to as the "pan-Maya movement" (Soto and Ricardo 1995; Molesky-Poz 2007). This movement is an attempt by indigenous scholars and activists to bring a greater cultural and political unity to Maya peoples. As an expression of identity and culture, Maya religion has come to play an increasingly public role. This is an especially significant change since during various times in history the ritual specialists of the Maya were forced to practice in secrecy and to clothe some of their most powerful symbols in

Christian imagery to avoid persecution by the colonial powers of church and state.

The Catholic Action movement of the 1950s and the Guatemalan Civil War (1960–1996) dealt significant blows to the Maya and their religion. The rapid growth of evangelical Protestantism throughout these same areas during the last few decades also marginalized Maya ritual practices. Whereas Catholicism and Maya religion forged an uneasy alliance for many centuries, Protestantism has been more exclusive in its demands that its adherents eschew all other ritual activity. That the religious practices of the Maya continue to flourish is an important statement in the face of 500 years of colonial pressures.

Self-identification

Science

The Maya have a number of traditions they consider to be specialized bodies of knowledge which could be labeled as sciences. Much traditional medicine would fall under this category, as would astronomical/astrological knowledge. But Maya religion is more of an intuitive set of practices and beliefs. Emotions and other forms of embodied cognition play a more central role in this tradition than do analytical and abstract rationality (Hart 2008; Molesky-Poz 2007; Tedlock 1992). That being said, a strong current of inductive logic seems ever present in Maya religion which has led to an especially rich set of divinatory and oracular techniques. Through careful observation of phenomena and association of past with present, Maya ritual specialists have developed elaborate associations between what they perceive to be related causes and effects.

Religion

In a sense, Maya ritual activity cannot be a religion as there is no word for religion in most Mayan languages. However, the ritual practices that the Maya utilize bear a “family resemblance” to activities performed by many cultures to mediate between themselves and the invisible forces that are thought to influence so much of human life. European ideas about

institutional religions and scholarly dichotomies that promote a division of the sacred and the profane or the natural and the supernatural do not fit well into Mayan worldviews.

Characteristics

The Maya often visit caves, mountain tops, and lakes to perform rituals. Crosses and orientation to the four cardinal directions are important in this tradition. Maya religion relies on an ecological worldview; the Maya envision themselves as embedded in an extended community which includes plants, animals, space, time, and numerous invisible forces such as the ancestors of their traditions. It is thought that certain places come to be imbued with special energies from previous use and from the presence of particular Nawales, spirits or energies that support existence. The 260-day ritual calendar known as the Cholq’ij is a combination of 20 Nawales (days) and 13 numbers (Rupflin-Alvarado 1995). This calendar plays a key role in many religious practices including the Ceremonia Maya (Fig. 1), a ritual (common in Guatemala) celebrated around a ceremonial fire that includes prayers, purification, and the invocation of all 260 days of the Cholq’ij. The Cholq’ij is also a basis of many divinatory practices. For the sake of clarity, Nawal means the name for the “day lords” that govern each of the twenty days of the Cholq’ij. But the term is also used as a more general term for the spiritual forces and energies of a place or of a being. It has been said that “everything has a Nawal.”

Relevance to Science and Religion

Maya religion has always shown a deep interest in natural phenomena and in such fundamental topics as space and time. The centrality of calendars and the careful observation of the heavens have always played a central role in Maya religion. These same topics end up as important ones in European scientific traditions; science (profane) and religion (sacred) were never

Maya Religion,**Fig. 1** Ceremonia Maya
(Photo by author 2008)

separated in Maya culture in the way that they were in European culture. The highly practical and the mythological have always been fused in Maya religion.

Sources of Authority

The chief authorities in Maya religion are the ritual specialists who conduct ceremonies and practice curing. The highland Maya of Guatemala typically use the term *Ajq'ij* for these specialists. This term can be translated as “day person” or “sun person” and refers to the specialist’s knowledge of the *Cholq'ij*. A less common term among these same groups is *Chuchqajaw*, which means “mother-father” and imbues the specialist with the authority of the ancestors. In certain places in the Guatemalan highlands, such as Momostenango, the *Chuchqajaw* serves as a higher authority than the *Ajq'ij* (Tedlock 1992). In the Yucatan peninsula, the ritual specialists are typically referred to as *J'meen*, translated as “doer” (Thompson 1970). There is also another ritual specialist called *J'k'iin* (“sun person”) in the Yucatan peninsula. This person is often considered to be of

higher authority than the *J'meen*. Among the highland Maya of Chiapas, the term *J'ilol* (“seer”) designates the ritual specialist.

Ritual specialists gain authority from esoteric knowledge, such as an extensive understanding of the meanings and prognostications of the *Cholq'ij*, from being born on special days, from unusual signs during their birth (such as being born with a caul), from revelations in dreams and oracles, through apprenticeship to a ritual specialist, and through the knowledge and capacity to heal using rituals and plant remedies.

An additional source of authority for Maya religion comes from the *Popol Vuh*, a text of the K'iche' Maya of Guatemala written down in the early eighteenth century from a corpus of much earlier oral accounts (Tedlock 1996). The *Popol Vuh* is composed of historical material, genealogies, and extensive mythological accounts including a creation story. Many contemporary prayers draw from this text.

Ethical Principles

Family unity is central to the ethical principles of this tradition. From family unity, an ethic of respect

and reciprocity ensues so that elaborate covenants and duties have come to exist between children and parents, humans and nature, individual and community, and the living and the dead. This background of reciprocity leads to complex notions of equilibrium and harmony between the elements that sustain life. Whatever is received must be reciprocated in some fashion; many of the rituals are based on this principle (Vogt 1993). If a person develops an illness, some fault or misstep is often inferred, and a “paying of one’s debts” to the gods and ancestors follows (Soto and Ricardo 1995). Similarly, if a person has a particular desire, he or she may present a ritual offering and expect some reciprocation from the same powers. A common supplication in the Ceremonia Maya is the giving of thanks for one’s life and livelihood with the understanding that this is always an ongoing debt that requires offerings and continual gratitude.

Key Values

Maya religion promotes family unity, community solidarity, responsibility, education, respect of elders and of the dead, ritual duties and commitments, marriage, work, and the respect of nature (Soto and Ricardo 1995). A strong reliance on and respect for the extended community informs all values for the Maya.

Conceptualization

Nature/World

Many nonhuman things or objects can be related to as sentient and alive in Maya religion (Watanabe 1992).

Human Being

Human life is sustained by a complex web of covenants between children and parents, humans and nature, individual and community, and the living and the dead.

Life and Death

According to the Popol Vuh, human beings were made from corn in order to offer thanks

and sustenance to the gods (Tedlock 1996). There is significant continuity between life and death in Maya religion. Sometimes, this is explained in terms of individual souls being present as guardians and intercessors for their descendants; otherwise, personal existence takes on more of an essentialized manifestation after death (one merges with the “ancestors”). The dead are regularly invoked and remembered during important events, especially in ritual activities.

Reality

In Maya religion, humans have access to reality through their senses and through intuition and conscience. But everything that participates in this reality is not visible. Important agents in the ritual ecology often communicate through extraordinary channels, such as through divinatory signs.

Knowledge

For the Maya, knowledge comes from tradition, from revelation, and from experience.

Truth

Truth is best arrived at through careful observation and long-term experience. For this reason, elders are thought to be key sources of reliable knowledge.

Perception

Maya religion emphasizes the importance of the five senses and also some additional channels of information such as intuition and conscience. Many nonhuman entities (plants, animals, the dead) are thought to use the same set of senses.

Time

Time plays a key role in Maya religion, and multiple calendars are kept with careful accuracy. The Cholq’ij plays an especially important role in Maya religion and delimits various aspects of personal and collective destiny.

Consciousness

The Maya value numerous states of consciousness. In addition to “normal, waking consciousness,” dream experience is thought to be especially

revelatory. Many of life's most important lessons come though dream experience.

Rationality/Reason

In Maya religion, rationality and reason play a role but are no more significant than intuition and sudden flashes of insight. Whereas rationality and reason are often exclusive and analytical, Maya religion tends to be more holistic and tolerates a great deal of ambiguity (Hart 2008). "Both/and" seems to be more central here than does "either/or."

Mystery

Mystery is a common theme in Maya religion, and legends abound in this tradition. Encantos (enchanted places, places where mysterious things occur and where magical beings often make an appearance; literally "enchanted place.") are thought to be especially mysterious; stories are often told about people disappearing into the centers of hollow mountains and living for years only to reappear with elaborate tales of their experiences in these other worlds (Hart 2008; Molesky-Poz 2007). Magical beings such as red dwarves or talking animals often appear in these legends (Tedlock 1992). Some people are also given Secretos by these beings or through their own dreams. These Secretos may allow them to breathe underwater, fly, or possess some other superhuman ability.

Relevant Themes

The Maya have consistently shown a deep respect for their ecology and for all the beings that compose it. This enduring interest and reliance on their supporting ecology has produced sophisticated knowledge of plants, animals, and other natural phenomena. Because there is little division between this world of nature and the invisible world of forces and energies, Maya religion has imported a uniquely ecological sense into its practices. Systematic observation, the use of inductive logic, and the amassing of data could apply equally well to many

forms of science and to Maya religion. Moreover, both attempt to provide people with some measure of understanding and control in an uncertain world.

Cross-References

- [Experience](#)
- [Revelation](#)
- [Ritual](#)
- [Time](#)
- [Worldview](#)

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Mayan Cosmovision

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Mayan Religion

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Meaning Theories

► [Meaning, the Concept of](#)

Meaning, the Concept of

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Related Terms

[Linguistic meaning](#); [Meaning theories](#); [Philosophy of language](#); [Theory of meaning](#)

Description

The concept of (linguistic) meaning has attracted an enormous amount of attention in contemporary philosophy. In order to clarify this concept, philosophers have proposed so-called theories of meaning. Theories of meaning can be understood as explanatory accounts of what has been variously described as “how meaning arises,” “wherein meaning consists,” “how meaning is determined,” and suchlike. The value of a correct theory of meaning has, by some theorists, been taken to consist simply in its contribution to an understanding of the workings of human language, but has, by other theorists, also been taken to consist in its potential for clarifying important philosophical problems, for example, by providing a means for distinguishing between words and sentences that have real or genuine meaning and words and sentences that do not have real or genuine meaning but are, in effect, nonsense.

Theorists of meaning typically propose one or several explanatory concepts intended to shed light on meaning. In what follows, we will survey some of the major proposals of such concepts, along with some of the consequences that these proposals have or have been taken to have. Our survey will focus primarily on proposals that have been developed within the tradition of analytic philosophy, where investigations into theories of meaning have been particularly intense.

Two Classical Approaches

The starting point of much modern theorizing about meaning has been traditional philosophy’s theorizing about meaning, and it is therefore appropriate to begin by taking a look at some traditional philosophical approaches to the subject. Two influential such approaches can be found in the writings of the classical philosophers Plato (429–347 B.C.) and Aristotle (384–322 B.C.).

In Plato’s writings, there is a clear tendency to understand the meanings of words – in particular, nouns and verbs – in terms of nonspatial, nontemporal, objective ideas (*eidos*), which are taken to exist in a suprasensible realm accessible to the mind but not to the senses. In line with this, to grasp the meaning of a word is regarded as amounting to a grasp of the nonspatial, nontemporal, objective idea with which the word is correlated. This way of understanding the meanings of words is usually referred to as “Platonism” or “concept realism.”

An alternative approach to meaning is found in Aristotle. In Aristotle’s *De Interpretatione*, for example, words – or at any rate, nouns and verbs – are said to have meanings in the sense that they function as symbols for “images” (*semeia*) “in the mind” (*en te psyche*) (1962, p. 114). These mental images, says Aristotle, are the same for the whole of mankind, whereas the words that symbolize them typically differ from language to language and are established by convention.

A major difference between Platonist and Aristotelian approaches to meaning is that whereas the former explains meaning via appeal to the mind’s apprehension of nonspatial,

nontemporal, objective ideas existing in a suprasensible realm, the latter explains meaning via appeal to mental images existing in the mind. A major advantage of the Platonist approach over against the Aristotelian approach is its capacity to account for the commonsensical belief that a word can have the same meaning for several distinct individuals (which would seem to require that meanings are in some sense independent of individual minds), whereas a major advantage of the Aristotelian approach is its capacity to account for the equally commonsensical belief that human beings can individually or collectively somehow come up with new meanings for words (which would seem to require that meanings are in some sense dependent upon human minds). A common feature of both Platonist and Aristotelian approaches to meaning, however, is the basic idea that language use is basically a matter of articulating meanings that are apprehended by the human mind.

The above basic idea dominated much of subsequent Western thinking about meaning and can be found in one form or another in the work of medieval scholastics such as Thomas Aquinas, in early modern philosophers such as René Descartes and John Locke, and in the work of early twentieth-century analytic philosophers such as Gottlob Frege (1848–1925) and Bertrand Russell (1872–1970). Thus, in Frege’s famous essay “Der Gedanke” (1918), we find a variant of a Platonist theory of meaning, and in Russell’s famous essay “The Philosophy of Logical Atomism” (1918), we find a variant of an Aristotelian theory of meaning. Frege holds that words and sentences are associated with meanings existing in a nonspatial, nontemporal dimension called “the third realm” (*das dritte Reich*) (1918, p. 69), whereas Russell holds that the meanings of words and sentences are “always more or less psychological” (1918, p. 506). Frege and Russell are in agreement, however, as to the correctness of the basic idea that language use is ultimately a matter of expressing the content of one’s thoughts in the garb of words and sentences.

The above basic idea was soon replaced by very different ideas about meaning in mainstream analytic philosophy, theories which take as their

explanatory concepts neither variants of Platonic ideas or Aristotelian images nor thought contents more generally, but instead, such concepts as “verification conditions,” “human behavior,” “speaker’s intentions,” “truth conditions,” and “rule following.” We turn now to survey some of these alternative accounts. These alternative accounts have often been motivated by an ambition to account for meaning without presupposing an underlying mind-body dualism of the sort that can be seen to figure in Platonist and Aristotelian approaches and, more generally, to provide an account of meaning that fits into an antimetaphysical and nonmentalistic view of the world.

Verification Conditions

According to some of the logical positivists of the 1930s and 1940s, the meanings of words can be explained via the meanings of the sentences in which the words occur, and the meanings of sentences – or at any rate declarative sentences – are said to consist in their *verification conditions*. Thus, Moritz Schlick (1882–1936), in his programmatic paper “Meaning and Verification” (1936), claims that “The meaning of a proposition is the method of its verification” (1936, p. 341). The verification conditions of a declarative sentence can be specified as those empirical observations that count as confirmation of the sentence.

The logical positivists often claimed that their theory of meaning accorded with science. Scientists were said to understand the meanings of scientific sentences in terms of verification conditions, and this was taken to provide a prototype for how declarative sentences in other contexts should be understood as well.

In more recent times, verificationist theories of meaning have gained renewed interest through the work of the Oxford philosopher-logician Michael Dummett. In various papers republished in *Truth and Other Enigmas* (1978), Dummett argues that the currently most defensible theory of meaning is a theory according to which “to know the meaning of a statement is... to be capable of recognising whatever counts as verifying the statement” (1978, p. 227).

Verificationist theories of meaning have often been taken to have radical consequences for traditional philosophical problems. The logical positivists, in particular, thought that this sort of theory gave them good reason to reject much of metaphysics and theology as nonsensical, inasmuch as the sentences of metaphysics and theology were taken to often lack verification conditions and therewith meaning.

There are several widely recognized problems with verificationist theories of meaning, however. One such problem is that for many declarative sentences, there are often various different sorts of empirical observations that count as confirming them, which would seem to require on verificationist premises that the sentences have various meanings corresponding to the different verification conditions. This seems wrong, however: a sentence such as “the Earth is not flat” can be confirmed in numerous ways, but it would seem wrong to conclude from this that it has correspondingly many meanings. For these and other reasons, many philosophers have considered verificationist theories of meaning unconvincing.

Human Behavior

A different theory invokes *human behavior* to explain meaning. A main philosophical representative of this approach is W.V.O. Quine (1908–2000). In *Word and Object* (1960), Quine proposes that the meaning of a declarative sentence should ultimately be understood on the basis of “men’s dispositions to respond overtly to socially observable stimulations” (1960, p. xi). Like the verificationist theory of meaning, the present theory has been taken to draw support from science. In Quine’s view, science has developed steadily toward a naturalistic worldview, and a naturalistic worldview fits ill with the recognition of seemingly nonmaterial phenomena such as ideas, meanings (construed as mental entities), and suchlike. The proper scientific thing to do, from a naturalistic point of view, is to do away with these spurious entities and instead seek to explain meaningful sentences in terms of responses to empirical input in line with the behaviorist stimulus-response schema.

An interesting consequence of the present behaviorist theory of meaning is that there will always be an element of indeterminacy as to whether two speakers use the same orthographically or phonetically identified word in the exact same sense, for sameness of sense must here amount to something like consistency of behavior, and there is always more than one way in which one person’s behavior can be consistent with another person’s behavior. A similar result holds also with regard to the translation of a word from one language into a word from another language: there is always an element of indeterminacy as to whether a translation is fully adequate or not, for the behavior associated with a word in one language will always be consistent with the behavior associated with a variety of different words in another language. This result is sometimes referred to as the indeterminacy of translation thesis.

Behaviorist theories of meaning of the present sort face some well-known difficulties. One pressing difficulty, pointed out by various cognitive scientists, derives from children’s language learning. Behaviorist theories of meaning would seem to require that children learn language via meticulous observation and copying of the behavior of other humans in response to verbal input, in line with the behaviorist stimulus-response schema. This does not appear to be the case, however. Children typically learn language by casual observation of the language usage of others and, moreover, quickly acquire an ability to freely and creatively construct and express sentences that they have not previously learned from anyone or have not observed others respond behaviorally to, but which nevertheless are perfectly meaningful. These circumstances have been regarded by many to be unaccountable for along behaviorist lines and have accordingly led many to reject behaviorist theories of meaning as untenable.

Truth Conditions

A further theory has been put forth by Donald Davidson (1917–2003) in his programmatic paper “Meaning and Truth” (1967) and makes use of the notion of *truth conditions*.

Like behaviorist theories such as Quine's, Davidson's theory makes no use of spurious nonmaterial entities such as ideas, meanings (construed as mental entities), propositions, and suchlike. But contrary to Quine, Davidson does not invoke behavior as an ultimate explanatory concept in the theory of meaning. Instead, he invokes the concept of truth or truth conditions.

One of Davidson's starting points is the claim that the concept of truth is among the clearest concepts we have. We typically know, without prior philosophical theorizing, what it would mean for such-and-such a sentence to be true, that is, what the sentence's truth conditions are. Given this, Davidson proposes that we use the concept of truth to explain the meaning of a declarative sentence: the meaning of a declarative sentence *s* is said to be "given by" the conditions that must be obtained for *s* to be true. Thus, Davidson suggests the following schema as a means for giving the meaning of any declarative sentence *s*: "'*s*' is true if and only if *p*," where *p* represents the occurrence of *s* without quotation marks and is taken to yield the truth condition of *s* (1967, p. 309). The typical example is: the meaning of the sentence "Grass is green" is given by the phrase "'Grass is green' is true if and only if grass is green."

Among the advantages of the above method of explanation, as Davidson sees it, is that it explains meaning without invoking obscure mental entities of any kind. Another advantage is that it replaces the equally obscure "means that" locution in meaning-explanations by the much clearer logical biconditional "if and only if."

Davidson's theory of meaning has spurred a lot of discussion, both sympathetic and critical. One interesting criticism of the theory is that by "giving" the meaning of a declarative sentence by specifying its truth conditions, the theory is not really explaining how meaning arises or wherein it consists or how it is determined. We are told *what* the meaning of a given declarative sentence is but not how the sentence has come to have that meaning in the first place. Provided that theories of meaning are to tell us not merely what meanings sentences have but also how they come to

have these meanings or wherein the meanings consist or how the meanings are determined, this criticism might amount to a major blow to Davidson's theory. Apart from this, however, the theory will have to be worked out so as to provide some way of explaining also the meaningfulness of parts of language to which the truth predicate does not obviously apply, such as commands, questions, and so on. Many have pointed out that it is not obvious how this is to be done.

Speakers' Intentions

We turn next to a theory that fastens on the notion of *speakers' intentions* (or just *intentions*). The prototypical theory of meaning of this sort is due to Paul Grice (1913–1988) and is put forth in his programmatic paper "Meaning" (1957). In what follows, we will take Grice's paper as representative of theories of meaning of the present sort.

Grice starts by distinguishing between "natural meaning" (as in "Those spots mean measles") and "nonnatural meaning" (as in "The remark 'Smith couldn't get on without trouble' means that Smith finds his wife indispensable") and makes it clear that his theory of meaning seeks to account for the latter sort of meaning (which he indicates by inserting the index "_{NN}" after "means," as in "means_{NN}"). Grice's basic proposal is to take a locution such as "A meant_{NN} something by *x*" – where "A" stands for a speaker and *x* for some expression – as roughly equivalent to "A intended the utterance of *x* to produce some effect in an audience by means of the recognition of this intention" (1957, p. 384). This proposal equates "means_{NN}" with "intends" and understands meaning or intention as a sort of relation between a speaker and an audience.

Intention-based theories of meaning of the present sort naturally lead to a rather liberal view of language usage. If a speaker intends to use a word or sentence to produce some effect on an audience by the recognition of this intention, then that is what the word or sentence means, plain and simple.

An initial problem with the above sort of intention-based meaning theory is that it seems to ignore that words and sentences can be meaningfully uttered even in the absence of an

audience, for example, in solitary discourse. Grice seeks to solve this problem by introducing the notion of a *possible audience*: an expression x means_{NN} something if it is at least intended to produce some effect *had there been* an audience present.

A more serious problem with the present theory is that it seems to ignore that words and sentences can mean things entirely different from the effect they are intended to have on audiences by means of the recognition of this intention. A famous counterexample goes like this: an American soldier taken captive by the Italians in World War II utters the German phrase “Kennst du das Land, wo die Zitronen blühen?” intending hereby to effect the Italians to believe that “I am a German officer.” Irrespective of the American soldier’s intentions, however, the utterance does not mean “I am a German soldier” but (in English translation) “Knowest thou the land where the lemon trees blossom?”

Various attempts have been made to overcome the above and similar problems while preserving the notion of intention as a key explanatory concept in the theory of meaning. Far from all, philosophers have found these attempts convincing, however, and many have concluded that intentions ought to be assigned some less central role in the theory of meaning, for example, serving the function of selecting between possible alternative meanings in cases of linguistic ambiguity.

Rule Following

An explanatory concept associated with the work of the later Ludwig Wittgenstein is that of *rule following*. Behind the idea of rule following lies the idea that the meaning of a word can in most cases be said to consist in its *use*. As Wittgenstein says in a famous passage in the *Philosophical Investigations*, “For a *large* class of cases – though not for all – in which we employ the word ‘meaning’ it can be defined thus: the meaning of a word is its use in the language” (1953, §43). This idea does not entail that words can be used in whatever arbitrary way one chooses, however, for words, or at any rate meaningful words, are used in accordance with what

Wittgenstein calls “rules,” “techniques,” or “customs” (1953, §199). To learn the meanings of the words of a language is to learn the rules, techniques, or customs associated with the uses of the words. This is roughly what is meant by “rule following.”

There are numerous rules at work in a language. New rules are constantly being added, and old rules are constantly falling out of use. There are rules associated with such things as the application of color words such as “green” and “brown,” rules associated with the use of sentential connectives such as “or” and “not,” rules associated with mathematical and scientific terms such as “plus” and “mass,” rules associated with religious terms such as “God” and “sin,” and so on and so forth. Wittgenstein characterizes the various practices in which different rules are at play as different “language-games” (1953, §7) or “forms of life” (1953, §23). There is no meaningful use of words, he holds, that is not rooted in some sort of language-game or form of life.

Philosophers sympathetic to Wittgenstein’s approach to language often claim that Wittgenstein did not seek to develop any theory of meaning, but simply sought to remind us of things about our language usage that we already in some sense know and take for granted. Even if this claim is correct, it is nevertheless the case that Wittgenstein’s approach, if correct, entails that various philosophical accounts of meaning are mistaken.

Wittgenstein’s approach to meaning has attracted both enthusiastic support and thorough criticism. Some critics of the approach have argued that the approach’s underlying idea, that the meaning of a word consists in its use, cannot be right, for the use of a word requires an antecedent understanding of the sense in which it is to be so used, in which case, sense would seem to precede use. Another line of criticism of the same underlying idea is that whereas uses of words can be popular, unpopular, and suchlike, the senses of words are not the sort of things that are capable of being popular, unpopular, and suchlike, in which case the sense or meaning of a word must be something very different from its use.

Deep Structures

Several of the meaning theories surveyed in the last few sections have largely been developed in an antimetaphysical and nonmentalistic spirit. From roughly the 1960s and onward, there has been a growing conviction among some influential theorists that these sorts of accounts are inadequate, however, and that some more substantial metaphysical and/or mentalistic premises are needed in order to account for meaning. One well-known such theorist is Noam Chomsky.

Although some of Chomsky's basic ideas on meaning can be found already in traditional approaches to meaning of a Platonistic or Aristotelian sort, Chomsky has chosen to characterize his approach as "Cartesian" on account of the stress he lays on the notion of "innate abilities," a stress familiar from the work of Descartes and other rationalist epistemologists.

One of Chomsky's basic ideas is that human beings have an innate ability to acquire and use language, much like birds have innate abilities to learn particular classes of songs, beavers have innate abilities to build dams, bees have innate abilities to integrate their behavior into the intricacies of a hive, and so on. Language use, on Chomsky's theory, is a matter of realizing this innate ability. Moreover, since the ability of human beings to acquire and use language is regarded as innate, it is also regarded as universal to mankind and, hence, not culture specific.

But how is this universalism to be reconciled with the fact that different peoples use different languages which differ not only in vocabulary but also in grammatical structure? Chomsky's answer to this question consists in positing what he calls a "deep structure" underlying the "surface structures" of the various contingent languages of the world. It is on the level of the deep structure of cognition that thought has its natural habitat and meanings are apprehended by the mind. However, in order to express meanings, speakers must ascend to the surface level of cognition, where the various contingent and acquired grammars of natural languages are to be found, and then clothe their thoughts in the

garbs of the words and sentences of that level. This all happens more or less unconsciously (see, e.g., Chomsky 1966, pp. 31–59.).

The chief strategy employed in arguing for the present theory consists in appealing to the rapidness and ease by which children pick up languages. This rapidness and ease is taken by Chomsky and others to be simply inexplicable in the absence of some sort of inborn and innate abilities on the part of human beings to acquire and use language.

An often-heard criticism of Chomsky's theory is that a satisfactory account of the "deep structure" allegedly underlying the surface grammars of natural languages has not yet been provided, in which case, the theory really only explains one unknown by another unknown and hence fails to explain anything.

Illocutionary Act Potential

Another recent theorist who has not sought to account for meaning along antimetaphysical or nonmentalistic lines is William P. Alston (1921–2009). Alston's theory seeks to explain meaning by identifying sentence meaning with *illocutionary act potential*. The theory makes heavy use of some ideas that go back to Oxford philosopher John L. Austin.

In *How to Do Things with Words* (1962), Austin distinguishes between locutionary acts, illocutionary acts, and perlocutionary acts. A "locutionary act," says Austin, is a use of a sentence whereby we "say something"; an "illocutionary act" is a kind of locutionary act whereby we perform some act "*in* saying something"; and a "perlocutionary act" is a kind of locutionary act whereby we produce some effect on ourselves or others in saying something (1962, pp. 99–101). The most important of these acts for present purposes are illocutionary acts, examples of which are urging, advising, ordering, protesting, stating, questioning, and suchlike.

Alston's initial idea is to identify the meaning of a sentence with its potential to figure in certain illocutionary acts: "What it is for a sentence to have a certain meaning is for it to be usable to perform illocutionary acts of a certain type"

(1987, p. 151). This does not mean that the contents of the illocutionary acts are identifiable as the meanings of the sentences used to make them, however. Rather, the contents of the illocutionary acts are *propositional contents* or *propositions* – the contents of thoughts – distinct from the meanings of the sentences by means of which these propositions are expressed. The sentence “The gate is open,” for example, has the potential of figuring in the illocutionary act of commanding someone to close a certain gate; this potential will count as the sentence’s meaning, but the content of the illocutionary act will be the propositional content of the command in view.

A problem with this initial statement of the idea – which Alston points out – is that one and the same sentence can often figure in a variety of different illocutionary acts, each of which has distinct propositional content. The sentence “The gate is open” can be used not only to command someone to close the gate, but also to inform someone that one’s garden gate is open, to proclaim that the gate of salvation is open, and numerous other things as well. Each of these illocutionary acts has distinct propositional content and makes different uses of the sentence “The gate is open.” The present theory would seem to require that this sentence has multiple meanings, each corresponding to one of the various illocutionary acts that can be performed by means of it.

Alston has a way of avoiding this problem, however. The problem is avoided by distinguishing between an illocutionary act *token*, that is, a particular occurrence of an illocutionary performance, and an illocutionary act *type*, that is, a type of illocutionary performance defined by its use of a given sentence to perform an illocutionary act. To every sentence – says Alston – there corresponds an illocutionary act type, which type can be used to make various different illocutionary acts, acts which in turn are typically differentiated from each other by features in the contexts in which the acts occur. The meaning of a sentence, says Alston, is to be identified not with any illocutionary act token but with the illocutionary act type by means of which

the various tokens are made. In line with this, Alston proposes the following more refined statement of the basic idea of the present meaning theory: “What it is for a sentence to have a certain meaning is for it to be usable to perform illocutionary acts of the matching type (that is, to have the matching illocutionary act potential)” (1987, p. 158).

Perhaps, one of the main difficulties with the above theory concerns how meaning-bearing illocutionary act types are to be identified and demarcated from the nonmeaning-bearing illocutionary act tokens with which they are matched. Take, for example, the sentence “the gate is open.” This sentence can be used in various illocutionary act tokens. But how is one to go about in seeking to determine objectively and nonarbitrarily what the meaning-bearing illocutionary act type is by means of which these illocutionary act tokens are made? If it is granted that the meanings of sentences are objectively determinable, the tenability of the present theory will seem to depend on the possibility of providing a satisfactory answer to this question.

Meaning and Metaphysics

Although much twentieth-century theorizing about meaning has, as we have seen, been pursued in an unequivocally antimetaphysical and nonmentalistic spirit, we have also seen that these sorts of approaches have been questioned in more recent years. The revival of metaphysics in contemporary Anglo-American analytic philosophy is likely to bring with it an increasingly strong interest in basically Platonistic or Aristotelian types of meaning theories in the years to come. Whether the traditional metaphysical or mentalistic theories of meaning will regain their former roles as central explanatory paradigms in the theory of meaning remains as yet to be seen. But in either case, it is clear that modern analytic philosophy’s widely endorsed ambition to account for meaning along antimetaphysical and nonmentalistic lines has proved to be much more difficult to realize than what was originally thought to be the case. Meaning, it seems, remains as difficult to account for as ever.

Cross-References

- [Philosophy of Language](#)
- [Semantics](#)

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concerns, etc.) that are undergoing change in the process of conversion (or spiritual transformation).

Mechanico-materialism

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A general term used in the history of ideas to describe the view of the universe, including even life forms and social behavior that emerged from Newtonian physics in the late seventeenth century. Mechanico-materialism stresses the law-like regularity and “clockwork” precision in the operation of the identifiable components of physical reality. The metaphor of billiard balls zooming about a pool table is often used to capture the sense of what Newtonians characterized as a cosmos consisting of “matter in motions.”

Mechanics

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Related Terms

[Classical mechanics](#)

Meaning-System Analysis

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Refers to the analysis of interactive set of person’s cognitive, affective, behavioral, and motivational elements (self-perception and identity, life purposes, attitudes and values, concepts, attributes, goals, sensitivities, ultimate

Description

Mechanics is an area of physics that studies the motions of material objects. *Classical mechanics* is the part of mechanics that does not deal with theory of relativity and quantum theory. Although classical mechanics does not describe reality adequately for very large speeds or very small distances, it is an active area of physics, with important recent developments and

innumerable practical applications. Moreover, ideas that were first introduced within the framework of classical mechanics turned out to be very fruitful in many other areas of physics and in mathematics. The next sections will focus on the discussion of some of the important concepts of classical mechanics, presenting them in the chronological order of their historical introduction. A detailed account of the history of classical mechanics until the 1950s could be found in the monograph (Dugas 1955).

Pre-Newtonian Physics

The roots of classical mechanics are in antiquity. It flourished in ancient Greece, in particular, in the works of Aristotle (384–322 BC). Aristotelian scientific doctrines had profound influence on the scientific thought until the times of Galileo and Newton. Ancient scientists discovered some simple mechanical laws (e.g., the law of buoyancy), realized that the Earth had a spherical shape and were able to measure its radius.

The modern development of classical mechanics started in the 1400s and is usually associated with the name of Nicolaus Copernicus (1473–1543), who challenged the geocentric planetary system of Aristotle and Ptolemy (Claudius Ptolemaeus, c. 90–c. 168 AD). Free of the stifling influence of Aristotelian ideas, observational astronomy developed quickly, culminating in the experimental discovery of the three laws of planetary motion of Johannes Kepler (1571–1630). In the works of Galileo Galilei (1564–1642), René Descartes (1596–1650), and Christiaan Huygens (1629–1695), reliance on observational or experimental evidence were emphasized rather than pure reasoning.

Quantitative Period of Classical Mechanics

The foundations of our present understanding of classical mechanics were laid by Isaac Newton (1643–1727) in his magisterial treatise

Philosophiae Naturalis Principia Mathematica (“Mathematical Principles of Natural Philosophy”), originally published in 1686; see the annotated edition (Chandrasekhar 1995). Using the three laws of mechanics formulated in *Principia* together with his *law of gravitation*, Newton was able to derive the laws of Kepler.

To describe the rate of change of physical quantities, Newton developed differential and integral calculus (at the same time as, and independently of, Gottfried Leibniz (1646–1716)) – a mathematical theory of enormous importance. In Newtonian mechanics, the motion of an object is governed by ordinary differential equations that express its acceleration (the rate of change of its velocity) in terms of the mass of the object and the forces acting on it. The entire subsequent development of classical mechanics is based on the understanding of the mathematical structures behind Newton’s theory and its relation with other areas of mathematics and physics.

At the very foundation of Newton’s theory of mechanics are such fundamental concepts as *space*, *time*, *force*, *matter*, and *mass*. As it is not possible to discuss here these notions in depth, we only direct the reader to (Borchert 2006) and proceed to the post-Newtonian development of classical mechanics.

Variational Principles and First Steps toward Geometrization of Mechanics

Pierre de Fermat (1601–1665) showed that Snell’s law of refraction of light can be derived from the postulate that, when traveling from one point to another, a light ray follows the path that minimizes the travel time. Pierre-Louis de Maupertuis (1698–1759) suggested that in the realm of mechanical phenomena the situation is similar – namely, there exists certain quantity, called *action*, that is minimized in mechanical processes. He interpreted this as a manifestation of the wisdom of God, who does everything in the most efficient way. The vague (and mathematically incorrect) ideas of Maupertuis were put on a firm mathematical

ground by Leonard Euler (1707–1783), Joseph-Louis Lagrange (1736–1813), William Hamilton (1805–1865), and Carl Jacobi (1804–1851). Given the initial and the final configurations of the mechanical system (i.e., the initial and final positions and velocities of all particles constituting the system), the *variational principle* states that the evolution of the system between the initial and the final moments of time is such that the action of the system is extremal (i.e., minimal or maximal). The action is expressed through a function of time and of the positions and velocities of the particles which is called the *Lagrangian* of the system. From the fact that the evolution of the system is an extremum of the action, one can derive ordinary differential equations, called the *Euler-Lagrange equations*, governing the temporal evolution of the system. If one starts with the Lagrangian of a physical system, the corresponding Euler-Lagrange equations are the Newton's equations of motion of the system.

Lagrange's description of a physical system has several advantages over the description of Newton. For a physicist, writing down the Lagrangian is usually easier than writing down Newton's equations. The symmetries of the system (see below) are more clearly visible from the Lagrangian of the system rather than from Newton's equations. Most importantly, Lagrange's approach relies heavily on the geometry of the space of coordinates and velocities of the system.

Lagrange's formalism is especially useful if the system is constrained. A simple example of a constrained system is two point particles connected by a rod of constant length; the whole system is free to move in three-dimensional space. Since each particle has three coordinates, in the absence of the rod, the position of the system would be described by the total of six functions of time (giving all the coordinates of the particles at each moment of time). The rod, however, imposes the constraint that the distance between the particles should be the same at each moment. Because of this constraint, the position of the particles is described by only five functions of time.

Hamilton's Equations and Symplectic Geometry

Another big step in the interpretations of the laws of classical mechanics was their reformulation as the so-called *canonical equations* of Hamilton. Besides their inherent importance for solving concrete physical problems, these equations provided a completely new way of thinking about the geometry behind the dynamics of the system. In this formalism, the space where the evolution of a mechanical system takes place is the so-called *phase space* – a space of even dimension where half of the dimensions give the position and the other half give the corresponding *momenta* of the particles (in high school physics, the momentum of a point object is the product of its mass and its velocity, but the general definition of momentum is more complicated). Hamilton's canonical equations then imply that the phase space of a physical system is a *symplectic manifold*, that is, an even-dimensional space endowed with a special geometric structure called a *symplectic form*. The state of the physical system at a given moment of time corresponds to a point in this space, and the temporal evolution of the system is described by the motion of this point. A *phase space trajectory* is a curve in the phase space of a physical system that describes the evolution of the system with time (from a mathematical point of view, a phase space trajectory is a solution of Hamilton's canonical equations). For each point in the phase space, there is only one phase space trajectory passing through it. This geometric description flourished in the nineteenth and twentieth centuries, and is the theoretical foundation of contemporary classical mechanics. For more details and references, the reader could consult the modern overview (Arnold et al. 2006) and the growing body of online information provided in the *Scholarpedia*.

Symmetries and Conservation Laws

One of the most important ideas in mechanics (and in physics in general) is the connection of the symmetries of the system with the existence

of *conserved quantities* or *invariants*, that is, quantities that do not change in time (Borchert 2006). For example, from the plausible assumption that time is homogeneous (i.e., that the evolution of a physical system from certain initial conditions does not depend on the initial moment when we let the system evolve), one can derive the law of conservation of energy. These ideas were generalized in early twentieth century by Emmy Noether (1882–1935) who formulated a general mathematical theorem relating symmetries and conservation laws. Together with the modern geometric methods of mechanics (especially taking into account the symplectic geometry behind Hamilton's equations) and an area of mathematics called “group theory,” these ideas provide a method for reduction of physical systems with symmetry. The reduction procedure eliminates the redundant coordinates from the original phase space of the system and replaces the original phase space with a phase space with smaller dimension which describes the evolution of the system in the most efficient way (see Arnold et al. 2006, Chap. 3).

Theory of Dynamical Systems: A Neo-Qualitative Period of Classical Mechanics

A radically new point of view on classical mechanics was developed in the studies of Henri Poincaré (1854–1912) culminating in his 3-volume magnum opus *Les méthodes nouvelles de la mécanique céleste* (“New Methods of Celestial Mechanics”), published in the last decade of the nineteenth century. Instead of concentrating on one particular phase space trajectory, Poincaré proposed to study the behavior of all possible phase space trajectories of the physical system, that is, all possible evolutions of the system starting with all allowed initial conditions. The family of all phase space trajectories in the phase space of the system is called the *phase portrait* of the system. Within this framework, key questions of interest are “Does the system have periodic solutions?” or “Are the velocities of the particles bounded?” or “If the

system is perturbed slightly, does the behavior of its solutions differ significantly from the behavior of the solutions of the original system?” Poincaré realized the importance of such qualitative questions and understood that the answer to such questions is intimately related to the global geometric properties of the phase space of the system. These new ideas were advanced significantly in the 1920s by George Birkhoff (1884–1944).

Poincaré and Birkhoff enriched mechanics by defining new goals and by providing new tools; the area of physics and mathematics created in their works was called *theory of dynamical systems*. This theory emphasized the importance of the qualitative theory of differential equations – a field of mathematics that was virtually nonexistent before their work. Instead of solving the equations explicitly, the theory of dynamical systems is interested in the behavior of whole sets of trajectories in the phase space and in particular in their stability. In connection with this, it studies the *bifurcations* of the system, that is, the abrupt changes in the phase portrait caused by changes of the values of the parameters of the system. The qualitative features of the phase portrait of the system are closely related to the existence of certain geometric objects in the phase space, for example, *invariant manifolds*. An invariant manifold is a surface in the phase space of the system such that each phase space trajectory starting from a point on this surface stays on the same surface forever. Clearly, the presence of an invariant manifold is an obstruction to the possible qualitative behavior of the system because phase space trajectories are not allowed to cross an invariant manifold.

Another fundamental innovation in the theory of dynamical systems is that, since it studies the behavior of whole sets of phase space trajectories, it has to employ probabilistic concepts in dealing with the physical system. This makes a connection with *statistical mechanics* – an area of physics that studies the properties of systems consisting of a very large number of particles so that the particles cannot be described individually (two examples of such systems are gas in a container or a crystal). Poincaré and

Birkhoff were among the creators of a new field of physics and mathematics called *ergodic theory*, whose main object of interest is the evolution of the probabilities related to the description of the system. The probabilistic approach is also related to *information theory* which studies the quantification of information and is of great importance for modern communication systems.

Further Developments in the Theory of Dynamical Systems

Initially created by Poincaré within the framework of celestial mechanics, the theory of dynamical systems evolved quickly, often stimulated by the rapid development of science and technology in the twentieth century. For a riveting popular history of dynamical systems, see (Gleick 1987), and a scholarly analysis can be found in (Aubin and Dahan Dalmedico 2002).

In the early days of radio engineering, Balthasar van der Pol (1889–1959) noticed strange irregular noises in experiments with radio circuits, which motivated mathematical studies by Mary Cartwright (1900–1998), John Littlewood (1885–1977), and Norman Levinson (1912–1975) in the 1940s. These studies culminated in the discovery by Stephen Smale (b. 1930) in the mid-1960s of a structure that is at the heart of modern theory of dynamical systems, which is now called the *Smale horseshoe*. If a dynamical system has a Smale horseshoe, then it exhibits complicated behavior (“chaos”).

A fundamental mathematical result on the behavior of Hamiltonian dynamical systems (i.e., dynamical systems described by Hamilton’s canonical equations) is the celebrated *KAM theorem* named after Andrey Kolmogorov (1903–1987), Vladimir Arnold (1937–2010), and Jürgen Moser (1928–1999), who proved it in the 1960s. It is concerned with the persistence of certain types of motions in a completely integrable Hamiltonian system under small perturbations. The behavior of the phase space trajectories in a completely integrable Hamiltonian system is very orderly – each phase space trajectory belongs to a torus (a particular kind of

a surface) in the phase space of the system. The KAM theorem states roughly that, under suitable assumptions, most of these invariant tori survive (and are only slightly deformed) when the system is slightly perturbed; hence, the “order” in an integrable system is not destroyed completely by small perturbations, but instead the “disorder” occurs in the system gradually as the perturbation becomes stronger.

The advent of modern computing devices influenced deeply the development of modern physics. One of the first computers, MANIAC I, was used in the early 1950s by Enrico Fermi (1901–1954), John Pasta (1918–1984), and Stanislaw Ulam (1909–1984), who studied numerically a one-dimensional chain of particles linked by springs (where the springs behaved slightly nonlinearly) – a one-dimensional analogue of atoms in a crystal. The results of their numerical simulations were strikingly different from what the scientists expected, thus showing that some very foundational ideas in physics (related to ergodic theory) had to be reconsidered.

Another remarkable discovery came from meteorology in 1963, with the publication of the famous paper “Deterministic Nonperiodic Flow” of Edward Lorenz (1917–2008). Lorenz modeled on a computer the phenomena in the atmosphere when it is heated from below by the Earth surface. He used a system of three nonlinear differential equations that have the feature that, due to the dissipation in the system (i.e., the loss of energy due to the viscosity of the air), as time passes, a three-dimensional domain tends with time to a set of lower dimension called an *attractor*. From the numerical studies of the attractor in the Lorenz system, it looked like it is a set with a complicated geometric structure. The dimension of the attractor seemed to be a non-integer number; such objects were called *strange attractors* (the word “strange” is sometimes used in this context with a different meaning). The concept of objects of noninteger dimension was studied in pure mathematics since the early twentieth century, notably by Felix Hausdorff (1868–1942). The presence of an attractor in the Lorenz system of differential equations made it clear that objects of fractional dimensions are not

only a mathematical curiosity but occur naturally in physical systems. Usually, such objects coming from physics reveal *self-similarity*, that is, a portion of the object looks approximately like the whole object under appropriate magnification. The ubiquity of such object in natural phenomena was brought to mainstream mathematics and physics by Benoît Mandelbrot (1924–2010), who named them *fractals*. Today, fractals are commonplace in natural sciences and engineering, and there are many concepts of dimension that are useful in different contexts.

It turned out that the Lorenz attractor has also the property that the distance between two nearby points on the attractor grows exponentially fast with time or, in technical terms, exhibits *sensitive dependence on initial conditions*. This sensitive dependence – metaphorically called the *butterfly effect* by Lorenz – gives an idea why there are fundamental difficulties in long-term weather prediction.

The attractor observed numerically by Lorenz turned out to resist rigorous mathematical analysis, so John Guckenheimer (b. 1945) and Robert Williams (b. 1928) introduced a “geometric model” for the Lorenz equations – a system that exhibits the same features as the ones observed numerically for the Lorenz equations but is simpler and hence amenable to rigorous analysis. The existence of an attractor in such geometric models was proved rigorously, and its properties were studied extensively. However, the question whether the attractor in the original Lorenz equations indeed exists remained open. In 1997, Smale posed this question as one of the 18 “Mathematical Problems for the Next Century.” The question was answered positively the very next year by Warwick Tucker (b. 1970), who also proved rigorously that the attractor is robust, that is, it is not destroyed by small changes in the coefficients in the Lorenz system. Tucker’s proof was *computer-assisted*, that is, it used a computer for numerical computations but – unlike in the traditional way computers are used – kept track of all possible numerical errors, which made his proof mathematically rigorous. This episode provides an interesting example of the interactions of modern mathematics and computing.

Determinism in Classical Mechanics

Newton’s laws are evolution equations, that is, if one knows the masses, positions, and velocities of all objects at some moment, as well as the forces of interaction between the objects, the whole subsequent motion of the bodies is completely determined (i.e., can be calculated with arbitrary accuracy). The uniqueness of the evolution in classical mechanics is the basis of the determinism of Pierre-Simon Laplace (1749–1827). If the world is governed by the laws of classical mechanics, then Laplace’s determinism holds, and there is no free will. There are, however, some situations when the equations of classical mechanics admit nonunique solutions, for example, when the force is proportional to the square root of the velocity (see the example of Hutchinson in the article of Bishop in (Borchert 2006)). The new developments in the theory of dynamical systems – in particular, the sensitive dependence on initial conditions, the probabilistic description of the behavior of a physical system, and the connections with statistical mechanics – pose a host of new problems related to determinism.

Classical Mechanics and Experiment: Connections with Other Branches of Science

Since mechanics is a natural science, the experiment is the ultimate test for correctness of its basic principles. One of its early triumphs is the prediction of the existence and location of the planet Neptune by John Adams (1819–1892) and Urbain Le Verrier (1811–1877) from the observed irregularities in the motion of Uranus caused by Neptune. Classical mechanics is the theory behind the functioning of any mechanical device, from a bicycle to an airplane.

A recent spectacular success of the theory of classical mechanics was the rescue of a Japanese lunar mission in 1991. The spacecraft Hiten was orbiting the Earth with only about 10% of the fuel necessary for it to go to an orbit around the Moon in the “standard” way. Using the subtle

gravitational interactions between the Earth and the Moon, Edward Belbruno (b. 1951) succeeded in changing the trajectory of Hiten to send it to an orbit around the Moon, thus salvaging the mission.

Classical mechanics is the oldest area of physics, and its ideas and methods have influenced deeply all other areas of modern physics. The variational principles and the ideas of symmetries and conservation laws developed for the needs of classical mechanics but have been used extensively in all areas of modern physics and have often been the main guiding principles in deriving new equations or rethinking the old ones. The equations of mechanics of Hamilton and Hamilton-Jacobi were used in developing the theory of quantum mechanics and optics (► [Quantum Theory](#)). The principle of relativity of Galileo was one of the main ideas in theory of relativity (► [Relativity](#)).

Many developments in mathematics have been motivated by the needs of mechanics. The classical example is Newton's invention of calculus. Topology (originally named "analysis situs") is a large branch of modern mathematics that was first developed by Poincaré in his work on celestial mechanics. Modern theory of differential equations was revitalized in the twentieth century thanks to the problems posed by the theory of dynamical systems. Modern mechanics is also intimately related to geometry, group theory, and other mathematical disciplines. As mentioned above, theory of dynamical systems provides connections with statistical mechanics, ergodic theory, information theory, dimension theory, etc.

The theory of dynamical systems expanded the goals of classical mechanics in new directions. While, before, the main problem was to solve the equations governing the temporal evolution of the system for any particular choice of initial conditions, theory of dynamical systems tries to understand the mechanism responsible for the behavior of the physical system, that is, to understand *why* the system is behaving in a certain way. To this end, theory of dynamical systems often employs simple *models* that have similar behavior as a complicated system and analyzes in detail the

model – the geometric models for the Lorenz equations mentioned above are an example of this approach. Another such example is the suggestion of the biologist Robert May (b. 1936) in the mid-1970s to use simple equations to model complicated ecological phenomena since, despite their simplicity, the solutions of these equations can exhibit a complicated behavior. Around the same time, Mitchell Feigenbaum (b. 1944) studied numerically the so-called *period-doubling bifurcations* of one-dimensional functions and noticed that certain quantities are *universal*, that is, that functions can be divided into classes such that these quantities have the same value. Feigenbaum proposed an ingenious explanation of his observations that was based on *renormalization* – an idea borrowed from the arsenal of statistical physics. Namely, he interpreted his numerical results as a manifestation of some phenomena that occur in the *space of functions* – the space where the functions "live" – which is infinitely-dimensional! This suggestion spurred an unprecedented surge of activity and has been employed – with appropriate modifications – to many complicated physical phenomena, deepening our understanding of nature.

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Cross-References

- [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)
- [Quantum Theory](#)
- [Relativity](#)

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Mechanization

► [Automation, Electronic](#)

Media Studies

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Media studies as a discipline draws upon roots in early twentieth century social theory and literary criticism. At that time, scholars in the USA and the UK were concerned with social problems arising in relation to industrialization. Scholars such as Robert E. Park, W.I. Thomas, George Herbert Mead, and Florian Znaniecki in what is known as the Chicago school of sociology questioned how well new immigrant communities were adjusting to urban life which led John Dewey to ponder whether the then new medium of newspapers would assist in securing a greater sense of community and led Herbert Blumer to oversee the first empirical studies of the impact of films on children and young adults. At the same time, literary critics in the UK, Frank R. and Queenie R. Leavis, were concerned that industrialization would destroy the cultural continuity of English language and literature. Unlike the New Critics of the USA at the time, Frank R. Leavis

was concerned that fiction and poetry could not be understood apart from their cultural contexts. This centering of culture in understanding textual artifacts became key to the work of Leavis' student Raymond Williams, who, along with Richard Hoggart and E.P. Thompson, were influential leaders in what came to be known as the **British cultural studies** tradition that is widely influential in today's field of media studies.

Media studies addresses questions related to media texts, processes of **media production**, and media audiences. This interdisciplinary field continues to draw upon social and literary theory as well as art history, aesthetics, political economy, psychology, rhetoric, and philosophy as it grapples with questions of media influence in society and in the lives of individuals. The US tradition of media studies was largely informed by **positivist** empirical inquiry until the 1970s, when the British cultural studies tradition and its Marxist orientation became more influential in conjunction with the rise of feminist thought, ethnic studies, and other critical traditions that questioned the assumptions upon which empirical research had been founded in the past. Also influential was what became known as the ► [Frankfurt School](#), as German Jewish expatriates Theodor Adorno, Herbert Marcuse, and Walter Benjamin struggled to understand the influence of media in Hitler's regime and the failure of a working class revolution in Europe. This led to a greater interest in the role of media in consolidating support for powerful regimes through the securing of what Italian social theorist Antonio Gramsci had termed ► [hegemony](#).

With developments in understandings of the social constructed nature of reality in the 1970s and the growing influence of British scholars, media studies scholars in the USA similarly began questioning the assumption that news media transparently conveyed "facts" to audiences that then unproblematically understood the news as "truth." Herbert Gans, Gaye Tuchman, and Todd Gitlin each wrote influential critiques of the US news industries, exploring the pressures and cultures of newsrooms as well as the assumptions and biases that tended to frame the reporting of the women's and student antiwar

movements. Media studies scholars then began pointing out that, whereas media systems were not intentional in creating or maintaining certain viewpoints, their drive to retain profits from the widest possible audience placed them in a societal role of maintaining certain perspectives while delegitimizing others.

These debates over the role of the media in legitimizing and delegitimizing truth claims have become of central importance in the debates about science in contemporary culture. In the past few decades, competing explanations for scientific understandings have captured media attention. This has happened as groups such as the Discovery Institute and its Center for Science and Culture have effectively inserted “intelligent design” into public discussion, which has happened as they have presented their view as a challenge, or “the other side of the story,” in contrast to evolution. Thus they have appealed to the reporting practices that aim for telling “both” sides of the story in order to illuminate truth. Once the media frame the debate as evolution versus “intelligent design,” the latter is granted legitimacy as a theory of equal standing to evolution. In this sense, the media are implicated in the rise of popular support for claims that are scientifically inaccurate yet that appeal to people on an emotional level.

Popular culture, too, plays a role in relation to scientific understandings. Rather than providing legitimacy for certain viewpoints, however, popular culture just as frequently serves to delegitimize scientific truths, essentially flattening all truth claims to stories that may or may not be true. Moreover, popular culture can provide people with symbolic resources that help them to associate with certain cultural groups and distance themselves from others. As such, fan communities and ritualistic consumption of certain media become practices that bring coherence to those with common ideological commitments, thus enabling popular culture to function in a manner similar to a religion.

Essentially, popular and news media have come to play a significant role in the search for truth that has long been a central part of both science and religion. Media such as books,

television, the Internet, and popular films provide scientists, religious scholars, and lay people access to a vast set of resources for thinking about and evaluating truth claims according to a variety of differing criteria, including emotional as well as rational responses. As media become ever more tailored to personal interests, the ways in which diverse populations evaluate and act upon truth claims stands to become even more of a challenge to advancing scientific understanding.

Media studies scholars do not take an authoritative stance with regard to particular truth claims. Rather, they are interested in sorting out how truth claims are made, what societal consequences may have resulted from the legitimizing of such claims, and how various constituents in society – including professional media practitioners as well as audiences of media – have responsibility for increasing, rather than decreasing, the potential for both improved lives and for the maintenance of a safe environment. Today, the media are the stage upon which such issues are increasingly discussed, debated, and decided, and thus media studies has become an important conversation partner in the discussions about the relationship between science and religion.

Cross-References

- [Popular Culture and the Mass Media, Sociology of](#)

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Mediatic Societies, Theology in

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Related Terms

[Theology and media](#)

Description

“Theology *in* mediatic societies” is a rather recent field of enquiry which is interested in both today’s context in which theological thinking unfolds and how theology is done in this context. The increasing interest in this field expresses the growing awareness that theological language about God and about the relationship between God and his creation is (1) always already expressed in (linguistic) symbols and images and (2) it is always already shaped by the cultural context, that is, the culture, language,

images, and symbols of a specific time and place. The people who do theology as well as those who practice religion are part of a specific culture and share in a common symbolic understanding which transforms over time. Thus, any serious theological thinking has to consider the sociocultural, political, and economic matrix in which it finds itself. Today, this matrix is increasingly shaped by media (Deacy and Ortiz 2008, p. 3; Marsh 2007, p. 27 f; Campbell 2010, p. 2–6, 19–40).

In the past few decades, theology’s context, that is, the cultural-mediatic-religious sphere, has radically changed and transformed. Religious topics, symbols, and language have dispersed from the realm of traditional religious communities into the media sphere. Different media and media formats explicitly, implicitly, or very subtly pick up either religious topics and/or religious symbols, images, and language. In particular in the early 2000s, we could witness a rise in the number of books, TV series, films, comics in their Western forms and in their Japanese versions of manga and anime that featured religious figures, saviors, the eternal struggle of Good versus Evil, angels, demons, or religious topics such as sin, salvation, and redemption. Media can also contribute to a subversion or affirmation of (religiously informed) gender roles. Examples (that have also caused religious and theological controversies) range from print, such as esoteric, wellness, and fantasy publications, to commercials, TV series and films, various sci-fi productions, as well as web sites of Christian communities and new religious movements, podcasts, and streaming media.

The field of enquiry “theology *in* mediatic societies,” then, is interested in how these more and less subtle uses of and references to religious symbols and language in various contexts might contribute to a change in the understanding of theological concepts and terminology such as grace, salvation, incarnation, and ultimately the reconfiguration of what is understood as “religion,” religious practice, the self-understanding of humans as being created in the image of God and fundamentally oriented toward him.

Further, theology is interested in the media-user/recipient interaction ► [Popular Culture and the Mass Media, Sociology of](#), ► [Media studies](#). Today, people engage and interact with a variety of different media with different motivations and purposes in their quest for meaning. From the variety of offers available, they are able to choose whatever religious offer or offer for meaning making caters best to their individual needs. Further, as Hoover and Campbell point out, (the practice of) religion, media (practices), and practices of meaning making increasingly overlap and are often intertwined (Hoover 2006; Campbell 2010). These phenomena, in particular in Western societies, have been described with terms such as ► [religious or spiritual marketplace](#), religious seeking, or the ► [commodification of religion](#) (Roof 1993, 1999, pp. 8, 69, 77). Media play a fundamental role in these phenomena because they are the sites where elements of meaning are offered and discussed. Thus, theology is interested not only in the religious narratives and elements to build a religious identity from media offer, but how people interact with media and for what purposes, what media do with the people, and what notions of a “good life” and ideas of the human being are generated in this interrelated process.

Methodologically, there are several approaches to understand and frame the relationship between theology *and* its mediatic (and cultural) context. Each approach is shaped in part by the question of how and why theology should engage with and study media, by what seems to become an increasing gap between a liberal, conservative, and fundamentalist understanding of how theology and media (or popular culture) should interact, as well as the theological tradition, for example, Anglican, Catholic, Lutheran, Methodist, Orthodox, etc. One way to systematize the different approaches to the relationship between theology and its context is based on Richard Niebuhr’s classification presented in *Christ and Culture* (1951): (1) Christ against culture, (2) Christ of culture, (3) Christ above culture, (4) Christ and culture in paradox, and (5) Christ the transformer of culture. Lynch points out that this approach, while valuable, has some

limitations, for example, how a discourse between theology and popular culture might look like, and suggests the following differentiation: (1) the applicationist method, maintaining that core theological values should critically be applied to analyze tendencies and transformations in media culture; (2) the correlational method which is influenced by Tillich’s work and maintains that theology should offer answers to questions raised in a mediatic society or in popular culture; (3) the revised correlational method which understands theology and mediatic/popular culture to be in a mutual relationship in which both can inform and enrich each other; (4) the praxis model which he relates with liberation theology, that is, this approach is similar to the revised correlational method but focuses on how both theology and mediatic/popular culture can contribute to human liberation, freedom, and equality (Lynch 2005, pp. 101–105). While there is sometimes a tendency to try to associate each of these approaches with a particular denomination, it is important to point out that the lines for a denominational classification are increasingly blurry. One widely accepted approach, for example, is to understand the cultural matrix, including arts, theater, film, traditional, and new media, as a place where the (religious) subject can encounter the o/Other. This is not to instrumentalize the cultural matrix for religious or theological purposes, but rather it is an expression of the awareness that this matrix is an autonomous – yet theologically highly relevant – place where meaning is constructed and that offers a critical reflection on theological and sociocultural developments (Larcher 2005).

There are several disciplines that deal with aspects of today’s context of theology, for example, theology and literature, theology and film, theology and the arts. What is important in all these fields is that art, media, or media contents do not need to be explicitly religious (or Christian) to be theologically relevant, rather they can be understood as part of a broader aesthetic (or religious) undercurrent present in today’s society (Larcher 2005).

Finally, talking about religion/theology and media, one needs to be aware that the understanding and experience of “religion” is changing. That includes not only the media culture as the context of and for theology, but the ways and the contexts in which people encounter “religion” or “the religious”, or the way we/academics talk about and conceptualize “religion”. In *Film as Religion*, John Lyden (2003) analyzes the “religious functions” films can have and perform today. Enzo Pace (2011) argues that religion is a communication system that deals with ultimate meanings. Theology is a contextual discipline; incorporating or considering these different approaches to religion can therefore be a fruitful contribution to theological discourse.

Self-identification

Science

The question, if theology qualifies as “science” poses a terminological problem. Particularly in English, “science” usually means natural sciences. In German, for example, the term “Wissenschaft” is much broader denoting any academic discipline, including humanities, philosophy, and theology. Often, the term “<exakte> (exact) Wissenschaft” is used to refer to natural sciences. Thus, theology does not self-identity as “science” if the term is understood as natural sciences.

There has been a long-standing discussion within theology if, why, and under what circumstances it should self-identify as *Wissenschaft* or academic discipline considering (1) the transcendental “object” of reflection of theology, that is, the mystery of Christ, (2) its relation to a specific religious community or church, their religious practices and faith traditions, and (3) its relation to other academic disciplines and the technosciences. The general consensus, however, is to identify theology as academic discipline (or *Wissenschaft*).

The term “theology” is rooted in Greek philosophy and refers to a speaking about gods/God that is philosophically and critically reflected. In a Christian understanding, the

critical, responsible, and rational reflection on faith is not a surplus, but one of its fundamental characteristics. Throughout the history of Christian thinking, several theologians have expressed and supported this notion, for example, Anselm of Canterbury with his understanding of *fides quaerens intellectum* (“faith seeks understanding”). More recently, Pannenberg pointed out that theology can only be adequately understood as “Wissenschaft von Gott” (“science” or academic thinking about God) with God as ultimate reality as its object of reflection (Pannenberg 1977, p. 299). As such, it is concerned with an epistemological and philosophical discourse on the possibilities of knowledge (Honnefelder 1989), and the development of theories to describe the various aspects of the reality of human existence. The several theological disciplines do not share one single “theological” method, but different disciplines draw on different methodologies.

The field “theology in mediatic societies” is not a distinct discipline, rather it is an approach or field of enquiry within several theological disciplines (e.g., ► [Practical Theology](#), ► [Systematic Theology](#)) that study theology in today’s context. Particularly in the late twentieth century, several disciplines have emerged that explicitly deal with the media context from a variety of perspectives, for example, theology and film, theology and literature, theology and arts. They use a variety of methods and approaches, for example, hermeneutics (cf. Also ► [Hermeneutics, Theological](#)), close reading, reception theory, empirical social research, as well as other methods from literary, linguistic, cultural, film, media and communication studies, sociology, and religious studies. In particular, these fields are interested in formal and technical aspects, that is, the characteristics of a medium, how media content is made and staged, the processes of media power, and how the audience engages with media and tries to make sense of what is presented to them.

Religion

Theology understands itself as rational (and academic) speech of God that is guided by the

mandate of 1 Peter 3:15: “But sanctify the Lord in your hearts: and be ready always to give an answer to every man that asketh you a reason of the hope that is in you with meekness and fear.” “Reason” is to be understood not just as a confession of faith but as critical reflection of faith. Thus, theology itself is not a religion but is rooted in a religious tradition and reflects on the tradition it is rooted in and its religious practices; it is a rational reflection on faith and faith practices in their specific contexts. Today, the context in which faith is practiced, religion is lived and experienced, and religious content and symbols are encountered, is shaped by media; often, the religious is encountered *in* media.

Characteristics

The field “theology *in* mediatic societies” with its related disciplines is a rather recent field of interest. It is interdisciplinary in nature because it deals with sociocultural, media, and technological phenomena, is interested in a critical dialogue between its own tradition and present day’s media culture, and utilizes methods from a variety of academic fields, including the empirical sciences. Several theological disciplines have their own interest and motivation to venture into the media realm, for example, pastoral theology in its reflections on how media can contribute to pastoral care, or on a more fundamental level: how media change the ways pastoral care can and should be done or what the omnipresence of media and religious symbols in media means for the life of a religious community; the role of media in education in general and in religious pedagogy (*Religionspädagogik*) in particular; in liturgical studies if and how media practices, media rituals, and religious rituals portrayed and described in media change religious practices. The study of the mediatic context is important for ► [fundamental theology](#) (*Fundamentaltheologie*) as well as it understands itself as conducting basic research located at the points of intersection between theological tradition and sociocultural practices such as arts and media.

The challenge for thinking and doing theology in today’s mediatic context is – as Marsh points out with his differentiation between “theology of/from/through culture” – not to deduce theological insights from media presentations or evaluate media culture based on theological truths or dogmas but be aware of how religion and culture interact and to engage in a “critical dialog between film (or media culture) and Christian tradition” (Marsh 2007, p. 166 f.).

Relevance to Science and Religion

Theology (in particular Catholic theology) has had a long-standing but ambiguous relation toward the sciences. On the one hand it supported and encouraged scientific discovery, on the other hand it has often perceived scientific findings as conflicting with theological ideas. Often, the validity of scientific findings has been judged according to theological ideas or theological insights have been based on or referred to scientific findings.

The field of enquiry “theology *in* mediatic societies” is interested in the area of “Science and Religion” because media have become the place where scientific insights are presented, meaning is constructed, and fundamental questions of human existence are discussed. In particular, this concerns the vast amount of popular science publications. This, however, is problematic. Often, theological reflections (particularly in areas that seem to touch on theological questions, e.g., biology, physics) draw and rely on popular science. This is problematic because popular science itself is an ambivalent enterprise where the lines between scientific facts and hypotheses, speculation, and thoughts on ontology are blurring. Theology would do well to critically analyze speculative, ontological, and metaphysical endeavors by scientists, but not to rely on them for theological thinking as this – ultimately – would result in “bad” theology (Mutschler 2005, p. 224 f.).

Representations of the technosciences and their achievements or of the technoscientific future of humanity in literature, film, or TV

series, for example, *Battlestar Galactica* (2004–2009), have often been influenced by religious and theological thoughts or express religious and theological ideas. These representations, in turn, become a pool of symbols for popular sciences to draw on and connect scientific endeavors with topics such as human longing and aspirations, venturing beyond frontiers, and hopes and visions of what the human future might or should look like (Graham 2002).

Further, popular science publications and publications on artificial intelligence and robotics often feature strong religious language and terminology. Such publications often deal with the question of the meaning of the cosmos and of human life, they often blur the lines between findings in the natural sciences and the God question, or attach a notion of (paradisiacal) longing to technological developments. Another reason why popular science publications often resort to religious symbols and language is to back up their own authority (Geraci 2007).

With regard to the relation between science, religion, and theology these phenomena concern, for example, the atheism debate and its presence in media as well debates and publications on evolution, creationism, intelligent design, artificial intelligence, and robotics. The debates on atheism or evolution versus creationism are often publicly staged, that is, staged in and through various media and media formats. These phenomena can be witnessed in particular in the USA, but in the late twentieth and early twenty-first century, European voices from the political, religious, and theological sphere have fueled the debate. Examples are Richard Dawkins' (2006) bestseller *The God Delusion* or the 2008/09 "There is probably no God" ad campaign in the UK, Germany, and several other countries (the campaign is not related to Dawkins but draws on some of his arguments).

Sources of Authority

There are two relevant sources for this field: (a) the *symbolum*, the declaration of faith, and

the tradition the respective theology is rooted in and its (critically reflected) faith practices (cf. ► [Constructive Theology](#), ► [Fundamental Theology](#), ► [Systematic Theology](#)); (b) any media (e.g., literature, film, web sites), media content, and media arts that express an authentic longing, are open to discourse, meaning making, and the o/Other, and deal with fundamental questions of human existence. As such, media, their content, and how they are used reflect tendencies and developments in society, and express what a society or different generations are longing for. Media, such as film, also discuss theologically relevant and existential questions, for example, the meaning of life and death, and are involved in the various processes of (religious) identity formation.

Explicitly religious media or media content form just a small fraction of source material theology considers to be relevant when getting involved with its media context. More importantly – and often more fruitful – are profane or secular media, media content, and media art because they express contemporary experiences and deal with questions contemporary society is interested in and dealing with. This complex process is shaped by different interests and subjects and is further complicated by the reception process; why and how something is meaningful for one individual might not be relevant for another. Seen from this perspective, a whole range of nonreligious media material can be theologically relevant.

Ethical Principles

As with every academic discipline, researchers are expected to disclose the methods and sources used, cf. also the entries on ► [systematic theology](#), ► [practical theology](#), and ► [fundamental theology](#). Further, impartiality toward various media and media content, their ability to provoke the question of the o/Other, as well as respect toward the different processes of (religious) meaning making at work in the media-user interaction are required.

Key Values

The “thorn of alterity” and the encounter with the o/Other can be experienced in various mediatic and artistic settings addressing the whole human being making it necessary for theology to pay attention to a reception process that involves all human senses (Knauss 2008). Thus, any research in this area has to be guided by the basic assumption that today media are a fundamental part of human experience. Further, an openness and curiosity for the different phenomena at work, for modern (and authentic) media experiences, the complex and rich religious traditions, and new religious and spiritual experiences is vital. It is also important to be aware of and take seriously the tension between the respective religious tradition and media culture any theology finds itself in, to be open to self-criticism and to be open to be challenged by this encounter by media culture.

Theological engagement with media culture is not to be understood as one-way enterprise, that is, either draw on media as the sole source for theological reflection disregarding the respective faith tradition or impose theology’s views on media and their content. Rather, this engagement has to be understood as a two-way dialogue where both participants can inform and learn from each other. Robert Johnston summarizes the attitude with which theology should encounter media: “Personal evaluation, including theological dialogue, has its place as in any human encounter, but it must follow the act of first looking and listening” (Johnston 2006, p. 239).

Conceptualization

A – short – definition of the following terms is problematic because there is not one theology but a rich diversity of theological traditions, for example, Catholic, Lutheran, Anglican, and Orthodox. Each tradition would have a slightly different interest in these terms and there are often different approaches to understand a term and its impacts within a tradition.

Also, the theological understandings of most of these terms have had a long history, starting with Greek philosophy, their conceptualization in the Bible, and in discourse with philosophy. And neither is there agreement in the natural sciences about how to define these terms. Any attempt to define or conceptualize these terms would have to consider their conceptual history which would go beyond the scope of this entry. Therefore, all that is offered here is a very brief – and thus insufficient – sketch.

Nature/World

“Nature” can have several meanings. Nature can refer to creation and express the religious and theological understanding of the goodness of nature and creation. Nature can also refer to human nature and that what ultimately and indubitable characterizes being human and human existence, for example, the burning question of meaning of life, the relatedness with and orientation of human existence toward God (cf. ► [Constructive Theology](#)). Nature is also often understood in its relation with (or difference to) culture and/or the artificial, that is, what is produced by human intervention. Today, what is understood as nature or perceived as the world we live in (and ultimately the understanding of our own nature) is shaped by our encounters and interactions with media and media images and representations of nature.

Virtual worlds pose the question of their status and their relation to the “actual” or “real” world. There are several approaches to this question. One would understand the virtual world as fundamentally and ontologically different, another – and increasingly common – one understands the virtual world as part of the world we live in, where communication and meaning making happens.

Human Being

Theology understands the human being as being created in the image of God and as his representative and steward within creation. Humanity’s relatedness with God is not a surplus or choice but fundamental to the human being and his/her

existence. There is, however, a diversity in understandings of the implications of “the human nature” and developments in the late twentieth century in theology, for example, feminist theology *queer theology*, liberation theology (cf. the entries on ► [Theology of Liberation](#)), are calling for a reevaluation of several aspects of human existence, for example, the question of gender.

Contemporary approaches (e.g., Dirscherl 2006; Schobert 2006) have emphasized the contextual nature of humanity. Being human always, already means being in time and in space; thus, any definition or idea of the human being has to be understood as an expression in and of time, that is, the question of what it means to be human is always explored in a specific time and context, making a permanent theological reevaluation necessary. A theological anthropology that considers – or is based on – the mediatic and technological context as being fundamental to human self-understanding would be vital but only exists in rudimentary forms and has to be further developed. Such a reevaluation has to consider that ideas about human existence and the meaning of life are nowadays (re)negotiated in a media setting, often outside of traditional faith communities, and often drawing on a variety of religious building blocks.

Life and Death

Theology understands all life as God’s gift, that is, God is the source of all life – human and nonhuman alike. “Death” can have several meanings; with regard to human life, it refers to the end of earthly life, expresses its uniqueness, and a passageway to the life after death which is, however, qualitatively different from earthly life (cf. ► [Systematic Theology](#)).

A challenge for a theological concept of life (and death) will be any form of virtual existence or artificial intelligence, since this would not only raise questions about how life itself is understood, but personhood, the relation between mind, materiality, and soul, and if and how human life is distinct from any forms of artificial lives that might emerge.

Reality

Theology is speaking and reflecting about an ultimate reality. Everything that exists has its roots in this ultimate reality and is oriented toward it. In the monotheistic theologies, this ultimate reality has traditionally been referred to as YHWH, Allah, or God. The theological understanding of “reality” then is shaped by (1) the biblical understanding of reality which itself has changed over time and (2) the understanding of God as the ultimate reality, (3) creation as the reality that is given to us. God, however, is not only the ultimate reality, he is the reality *of* and *for* his people.

With developments in the media sphere, for example, the rapid spread of communication media and embedded computing and the emergence of virtual realities, what people understand their reality to be depends on, among others, people’s experiences, media representations of the world, and how people interact with the world and with others through media. Lived reality and religious experiences and realities are thus not separate realms but overlap in and through media. Similar to aesthetic experiences, theology understands religious experiences to refer to and to be rooted in something real, something that consists of both an objective part, that is, that which causes a religious experience, and a subjective part, that is, the religious meaning the subject constructs in this engagement.

With regard to “science and religion,” theology holds that sciences with their methods have only partial access to reality, that is, the part that is currently – or will be – available to scientific, empirical, physical, and mathematical methods. Theology, on the other hand, deals with God as the ultimate and all-encompassing reality.

Knowledge

The common definition of knowledge in philosophy and philosophical theology is usually knowledge as true persuasion, conviction, or belief. It is disputed however, if it also is justified conviction (Müller 2008, p. 22). The theological understanding of “knowledge” is rooted in Greek philosophy and has developed in philosophical-theological discourse up until today. While

“knowledge,” “faith,” and “believe” have a range of meanings, theology generally opposes a contradiction between knowledge (understood as true conviction) and faith but sees them to be related. To believe is a deliberate act of faith, but faith is always also reasonable faith. In particular, theology rejects any contradiction of knowledge (in the sense of scientific facts or hypotheses) and reasonable faith. A challenge for a philosophical-theological understanding of knowledge, however, are approaches in biotechnology that want to reduce the human being to his/her mere genes.

Today, media form a valuable (but often ambivalent) source of knowledge. Therefore, theology has to analyze what is understood as meaningful knowledge, how (and by whom) meaningful knowledge is generated and how it is used.

Truth

In Christian theology, God is understood to be truth in its fullest sense. Truth, or the truth of faith, is not understood as empirically measurable, but as truth that refers to an ultimate truth or reality. In this way, the truth of faith is different, though not completely separate, from historical truth because theology holds that truth (i.e., truth as referring to an ultimate reality) cannot contradict truth (i.e., what is generally understood or experienced as truth). The theological interpretation of “truth” is shaped by the Bible (both the First and Second Testament), which generally understands God’s word to be truth and thus authentic, reliable, and trustworthy.

In a media context, it is often difficult to validate what is portrayed as being true. Media and media art, however, can open or provide a space in which the encounter with God as the ultimate truth can happen.

Perception

Perception generally refers to being aware of or becoming aware of the world. In a theological context, perception is often understood as becoming aware or being aware of traces of God in different context, for example, in explicitly religious settings or in art and media. With regard

to the engagement of theology with media it is important to point out that perception, that is, media perception and media interaction, is a complex and multilayered process that is not only a cognitive process but one that involves all human senses (Knauss 2008; cf. ► [Fundamental Theology](#), ► [Constructive Theology](#)).

Time

Time and the experience of time are fundamental to human life. Thus, being human always means being *in* time. Time is not eternal but a fundamental feature of creation. God’s *Selbstmitteilung* (self-revelation, self-communication, and self-sharing) is not understood as something abstract, but as something concrete that happens in time; he experienced time himself through the incarnation of the *logos* at a specific time and space in history. Time is structured through the history of salvation, that is, the history of God with his people and God’s work of salvation in creation. As such, time, and thus human existence and all of creation, are shaped by the eschatological tension and hope of “already” and “not yet.”

In today’s mediatic society, the fundamental experience of time as well as the relation between time and space are fundamentally transformed. Thomas points out that while in former times religion used to structure days and years, today media have taken on this structuring role (Thomas 1998). Further, media change the understanding of contemporaneity, the relation of time and space, of past, and future.

Consciousness

The term “consciousness” refers to a variety of phenomena which have already been discussed in Greek philosophy. Generally, consciousness is understood to be the foundation of *Erkenntnis* (knowledge/cognition) and includes self-awareness; cf. ► [fundamental theology](#), ► [constructive theology](#), ► [systematic theology](#). Today, theology is interested in the discourse on consciousness in philosophy as well as in the context of the mind-body/matter discussion, for example, in neurobiology (cf. ► [Neuroscience](#)).

Of particular importance is the relation between media, self-awareness, and the understanding of the self. Self-awareness includes a sense of one's place in time and space, that is, the context the self unfolds into. Today, media have become a primary source for what we know about the socio-cultural contexts and networks we perceive as our time and our space. Further, theology is interested in how media interact with, are part of, and shape different forms of consciousness, for example, personal/individual, religious, social, national, or public consciousness.

Rationality/Reason

For theology (in particular for Catholic theology), there is no conflict between faith and reason, on the contrary it emphasizes the rationality of faith. The relation between faith and reason is twofold. On the one hand, for faith it is not enough to believe but it seeks reasons for its beliefs. Reason, on the other hand, does not necessarily lead to faith (because faith is always a deliberate act) but expresses an openness toward the o/Other in its longing to question, understand, and explore; cf. ► [fundamental theology](#), ► [constructive theology](#).

Mystery

In theology, "mystery" refers first and foremost to the fullness and inexhaustibility of the reality of God's existence. This does not mean that human beings cannot know God or his existence; rather, the mystery of God includes his relation to his creation and to all human beings. Thus, the mystery of God refers to God as ultimate reality as well as God's self-revelation and self-communication in and through history and ultimately in the incarnation of the *logos*.

Relevant Themes

Media have played an important role in the development of human culture ever since (e.g., the invention of script or of printing). Today, media are accessible and available for a majority of

(at least the western) population and have thus become a fundamental aspect of everyday life (it is important to point out that there still exists a digital divide not only between the west and other parts of the earth but also within the west). Media do not only facilitate communication, but change the way we do things, the way we communicate with each other and with our environment. This raises the question of how human self-understanding will change over time. Thus, it would be vital for theology to develop a theological media anthropology that considers the variety of concepts of what it means to be human that are present in today's media society, that is, the human being as networked being. Technosciences contribute to and inform these concepts that are then portrayed and discussed in media.

Further, communication is a central aspect of human agency because theology understands the human being always already as addressee of God's "yes" to creation and to each individual human being. As addressees of God's word, humans find themselves always already in a communicative relationship with God. Human existence cannot be thought without this relationship but it is up to the individual to decide whether or not to respond to God's "yes." A challenge for a theological media anthropology, then, is the question how being human in its fullest sense, that is, as lived communication with God, can be thought if the everyday experience of communication radically changes.

Cross-References

- [Constructive Theology](#)
- [Fundamental Theology](#)
- [Hermeneutics, Theological](#)
- [Media Studies](#)
- [Neuroscience](#)
- [Popular Culture and the Mass Media, Sociology of](#)
- [Practical Theology](#)
- [Systematic Theology](#)
- [Theology of Liberation](#)

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Medical Genetics

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Related Terms

[Clinical genetics](#); [European medical genetics](#); [Human genetics](#)

Description

Medical genetics is a discipline of human medicine which is specialized in the research, diagnosis, and management of congenital disorders. As such, medical genetics is part of human genetics. However, whereas human genetics studies and describes the inheritance in man in general, medical genetics is devoted to inherited human diseases. This implies peculiarities of the genetic information, the DNA, and the genetic text itself, as well as of epigenetic factors, which influence the effect of the genetic information on an individual. In addition, congenital disorders are not limited to inherited genetic peculiarities but may also be caused by exogenous factors such as infectious or toxic agents, which may exert an adverse effect on the child during embryonic or fetal development. Therefore, acquired congenital disorders are also in the focus of medical genetics. The term “genetic medicine” summarizes subspecialties of medical genetics, which aim at genetically based treatment and prevention strategies such as gene therapy, personalized medicine, and predictive genetic testing. Medical genetics is a classical interdisciplinary specialty and reaches far into every other medical specialty.

Throughout Europe, in medical institutions the terms “medical genetics,” “clinical genetics,” and “human genetics” are being used synonymously. Medical genetics was first a subspecialty mainly of pediatricians and

gynecologists, but became a discipline of its own in the second half of the twentieth century. Departments of Medical Genetics were established in the university hospitals, and medical genetics or human genetics practices were founded subsequently.

Self-identification

Science

Medical genetics is deeply anchored in the biology of man and the natural sciences. It is based on the biochemical and biological processes of reproduction and evolution. The British biologist William Bateson (1861–1926) coined the term “genetics” to denote studies of heredity and variation. He rediscovered the work of Gregor Mendel (1822–1884), who described the principles of inheritance which are nowadays known as Mendel’s laws of inheritance. The translation of genetics into medical genetics is strongly connected with Archibald Edward Garrod (1857–1936), who in 1902 initiated his studies of inborn errors of metabolism. These errors were mainly associated with certain constellations of symptoms so that medical geneticists started to study biochemical and physical phenotypes systematically and to develop hypotheses about their origin. The chromosome theory of heredity was first formulated by Walter Sutton (1877–1916) and Theodor Boveri (1862–1915). In medical genetics, their theory was confirmed in 1959, when Jérôme Lejeune, a pediatrician and geneticist, identified the gain of an extra chromosome in a patient with Down’s syndrome. The following cytogenetic era showed that distinct chromosome aberrations result in specific syndromal diseases. Chromosome investigations were introduced in the prenatal diagnosis of the genetic status of the fetus. The clarification of the structure of the DNA by Watson and Crick in 1953, the unraveling of the genetic code by Marshall Nirenberg and H. Gobind Khorana in 1966 together with the development of DNA sequencing by Fred Sanger in 1977 initiated the molecular genetic era of medical genetics. Chromosomal rearrangements were analyzed with respect to the

involved genes which led to the identification of the gene defects of classical inherited genetic disorders such as muscular dystrophy or retinoblastoma. The gene, which causes cystic fibrosis, was the first that was identified by using molecular genetic methods only in 1989 by Francis Collins and Lap-Chee Tsui. Molecular genetic methods enabled the detection of gene defects in so far healthy individuals so that the risk of the occurrence of the respective genetic disease could be predicted more precisely. The human genome project ended up with a complete DNA sequence after 13 years research in 2003. A high grade of variation between individual genomes was found, which is responsible for the individuality of the phenotype of an individual (Quinlan and Hall 2012). Recently developed DNA-sequencing techniques made the entire genome of an individual available within 1 day. This opened a new window for medical genetics in that the genome of each individual becomes available to estimate the personal risk for inherited diseases for itself and its offspring before any symptoms may appear.

In 1960, when Peter C. Nowell and David Hungerford detected a minute chromosome, the Philadelphia chromosome, in the bone marrow cells of a patient with chronic myeloid leukemia, they confirmed the genetic theory of the chromosomal basis of cancer, which had been formulated by Theodor Boveri already. The tumor cytogenetic era revealed that chromosomal abnormalities are present in almost all tumors and paved the way to the molecular genetic studies in cancers. Nowadays, it is widely accepted that cancer on cellular level is a genetic disease. The clarification of the genetic disease mechanisms in cancer has led to the development of drugs directed to the correction of the genetic defect (Tran et al. 2012).

Religion

Religion is a framework to direct our thinking and acting according to a superordinate concept and depends on our idea of man. Human genetics and medical genetics have much influenced the idea of man, as it became evident, that inherited factors contribute to our

phenotypical appearance as well as to our physical and intellectual abilities to a very high extent. At the beginning of the twentieth century, when the first mosaic stones of the genetic basis of evolution were found, the findings were catastrophically misinterpreted, and tremendously false conclusions were drawn with respect to a superordinate concept of evolution of the survival of the fittest which led to the concept of eugenics and the horror of the Holocaust. With further development of genetics, it became evident that propagation of variation is the most important principle of evolution because selection cannot take place without variation (Perlman 2011). Medical genetics does not self-identify as a religion but is aware that the nearness to the biochemical source of life and the major source of variation, the genome, puts a particular responsibility in how to communicate genetic findings to the public in order to prevent from misinterpretation and misuse for the development of inappropriate superordinate concepts.

Characteristics

Medical genetics is distinctive among other specialties of medicine because the genome is shared by relatives of the patient. The diagnosis of an inherited disease in an individual, therefore, may have an adverse effect on healthy family members by stigmatization which may have consequences on the social and professional life. Moreover, gene defects may show pleiotropic effects as well as variable penetrance and expressivity so that the typical pattern of a respective genetic disease may only be visible if one looks at the entire family. Relatives of the patient may have minor symptoms and, therefore, need to be investigated to make the diagnosis in some cases.

Relevance to Science and Religion

Medical genetics influenced our understanding of how life comes into being and takes its course. It changed our view on normality and disease, and taught us that variety and differentness are the

primary principles of our world. Thus, the development of different religions is within the scope of this evolutionary concept.

Sources of Authority

In medical genetics, the authorities used to be scientifically interested and passionate physicians. Victor A. McKusick (1921–2008) was one of the cofounders of medical genetics as a self-contained medical specialty. He founded the Department of Medical Genetics at the Johns Hopkins University in Baltimore in 1957. In 1960, Charles R. Scriver edited his textbook “The Metabolic Basis of Inherited Disease” which was continued as “The Online Metabolic and Molecular Bases of Inherited Diseases.” Arno Motulsky (1923–) introduced the field of pharmacogenetics in medical genetics, i.e., the role of genetic variation in response to drugs. Friedrich Vogel (1925–2006) was a close friend of Arno Motulsky. He reestablished medical genetics in Germany and contributed considerably to the rehabilitation of the specialty human genetics after the Nazi terrorism. Vogel and Motulsky in 1979 published the textbook “Human Genetics – Problems and Approaches.” Alan E.H. Emery, David L. Rimoïn, J. Michael Connor, Reed E. Peyritz, and Bruce R. Korf in 1983 published the most important and comprehensive textbook in the field – “Principles and Practice of Medical Genetics.”

The need to correlate the abundance of phenotypes with the growing amount of genetic data in research and clinical settings met luckily with the development of the computer and the Internet. In 1966, Victor McKusick published the first edition of the book “Mendelian Inheritance in Man,” in which he systematically collected the symptoms and genetic basis of inherited diseases and which now is publically available as “Online Mendelian Inheritance in Man.” Albert Schinzel (1944–) in 1983 started to collect the phenotypes of patients with chromosome aberrations in his book “Catalogue of Unbalanced Chromosome Aberrations in Man”, which has now been

included in the online database ECARUCA. Felix Mitelman (1944–) in 1983 started a collection of the chromosome defects in cancer in the “Catalog of Chromosome Aberrations in Cancer” which was continued in the online database “Mitelman Catalog of Chromosome Aberrations and Gene Fusions in Cancer.” In 1991, P.L. Pearson started the human genome database within the human genome project. The entire human genome sequence is available online and linked to the major databases containing genome-related information (Fujita et al. 2011). The connection of these scientific resources provides the basis for the disentanglement of the effects of the genetic variation on the physical as well as mental health and disease of an individual.

Ethical Principles

As for every medical subdiscipline, medical genetics is guided by the oath and law of the ancient Greek physician *Hippocrates* (born 460 B.C.) who is considered the so-called father of medicine. This “*Hippocratic Oath*” has been supplemented by the rules of the *Declaration of Helsinki* of 1971.

Key Values

The key value of medical genetics is alleviating human *sufferings*, which arise from inherited peculiarities and genetic disadvantages. This includes patients with inherited diseases as well as individuals who themselves or whose offspring are at increased risk for a genetic disease.

Conceptualization

Nature/World

Nature is conceptualized as the basic environment on our globe which provides the chemical and physical prerequisites for life. World is defined as the space where nature exists.

Human Being

The human being is considered as a biological being which evolved in the struggle with the animated and unanimated environment. Upright walking and the use of the thumb as an opponent of the second finger are considered the most important evolutionary advantages and prerequisites for the development of the brain, which enabled the development of unique functions including speech, abstract thinking, creativity, and the development of ethical categories such as morality and religion (Babbitt et al. 2011).

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body, it includes functioning of the different organelles, including the *reproductive system and the genome*. Death is considered the cessation of such physical functions and important part of evolution.

Reality

Reality is considered the physical world around us that humans can observe with their senses.

Knowledge

Knowledge is understood to have an *objective* dimension, such that it is the *wisdom* that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries. However, knowledge is also understood to have a *subjective* dimension, which is taken to be the amount of information a person can retrieve from *memory* voluntarily, or by being *cued*.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal which humans can grasp only partially.

Perception

Perception is the *conscious sensation* of the forces and influences the external physical

world exerts on living beings. Genetic peculiarities may influence the type and character of the perceptions due to inherited variations in the perception systems, for instance, color blindness or lack of bitter taste.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time *objectively* and perceive it owing to the changes observed in the surrounding environment. Circadian rhythms of human beings are genetically influenced so that time perceptions may vary between individuals.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of *alertness* ranging from drowsiness to full *alertness*, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally or in differentiated fashions.

Rationality/Reason

Rationality is a function of logical connections of empirical data which have been collected by the individual itself or been communicated from others. The interpretation of the connection of the data leads to conclusions which are expressed as reasons. Genetic factors may influence the process of the development of rationality on different levels and to different extent.

Mystery

Mystery relates to observations and experiences which may not or cannot be explained by objective criteria, cannot be influenced by us, and have a scaring character. Because we all have to rely on our genome as it is, and do not know exactly, in how far our fate is determined by it, the genome, i.e., in medical genetics, may have a mysterious character for those individuals who are susceptible to mysterious thinking.

Relevant Themes

The genome provides the connection between the unanimated and animated environment by providing the blueprint of our body. Therefore, our thinking and especially the development of religion depends on the structures which are provided by our genome. Thinking and the abstract world including religion, however, is formed by the communication with each other. The abstract world has developed since the beginning of mankind and is being stored in spoken and written language. During this time, the language has evolved like the genome, and it is evolving further (Cavalli-Sforza 2000). Thus, religion will also be evolving further.

Cross-References

- [Evolution](#)
- [Developmental Psychology](#)
- [Gene](#)

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Medical History

► History of Medicine

Medical Microbiology

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Related Terms

[Clinical microbiology](#)

Description

Medical microbiology, also known as clinical microbiology, is a subdiscipline of microbiology dealing with the study of microorganisms (parasites, fungi, bacteria, viruses, and prions) capable of infecting and causing diseases in humans (Baron et al. 2007; Isenberg 2003). As with other specialties in medicine, the evolution of medical microbiology is essentially a response to clinical needs. At its core is the study of the pathogenesis and epidemiology of these microorganisms, and its practical applications lie in the form of diagnostic and therapeutic guidance – intrinsically a supportive role in clinical practice (Baron et al. 2007). Today, virtually all tertiary hospitals worldwide will have an in-house microbiology laboratory to provide diagnostic services for infectious diseases (Isenberg 2003). Advances in interconnected disciplines such as immunology, genetics, and bioinformatics have led to the further expansion of this field, resulting in the development of vaccines as well as advanced genetic- and protein-based diagnostics (Isenberg 2003).

Self-Identification

Medical microbiology is a natural science derived from the development of the germ theory of disease. Germ theory challenged the ancient view that disease was spontaneously generated with the understanding that many diseases are caused by microbes that can reproduce. The scientific work of Louis Pasteur and Robert Koch in the nineteenth century was critical in advancing germ theory, and consequentially, medical microbiology and ► [Koch's postulates](#) are still currently rigorously applied to determine if a microbe causes a new disease (Winslow 1950).

Since the inception of medical microbiology, practitioners have recognized its tremendous significance in medicine and used scientific methods to expand knowledge in this field, including further understanding of how microbes cause disease and cataloging of different disease conditions caused by microbes (Isenberg 2003). The application of breakthroughs in other fields such as microscopy, genetics, chemistry, and epidemiology has resulted in a corresponding increase in the breadth and depth of scientific knowledge in medical microbiology. This has translated into both an increase in the number of subspecialties (such as medical virology, medical bacteriology, molecular epidemiology, etc.), as well as an increase in the number and complexity of practical applications in modern medicine (vaccines, microbial diagnostics, susceptibility testing, therapeutics design, etc.) (Baron et al. 2007; Isenberg 2003).

Characteristics

Medical microbiology is distinctive among other specialties in medicine in that it is virtually the only field where there is comparatively negligible emphasis on the scientific study of the human body and its processes, but yet its main focus – the study of microorganisms of medical importance – has resulted in advances in the treatment and prevention of diseases in humans (Baron et al. 2007; Isenberg 2003).

One of its most ubiquitous practical applications – susceptibility testing of microorganisms – is based on the principle that the behavior of microbes in vitro (i.e., in the laboratory on culture media) mirrors that of microbes in vivo (i.e., in the human body) where it pertains to their vulnerability to different drugs. Thus microbes that are inhibited or killed by an antibiotic in vitro will similarly be affected in vivo if the antibiotic was instilled into the diseased human at equivalent or higher concentrations. This application of medical microbiology has guided the use of antimicrobials in the treatment of infectious diseases since their development in the 1940s (Isenberg 2003). In contrast to other specialties in medicine, one unique and key driver for advances in medical microbiology is the propensity for the microorganisms to evolve. Thus microbes become resistant over time to the antimicrobial agents used to treat them, and there is a corresponding pressure to be able to quickly identify the resistance and susceptibility profiles of these microbes such that the correct drugs may be used against them.

Because of the understanding of the human host-microbe interface for disease development, medical microbiology is also distinctive for its preventive applications. Vaccine development has resulted in the dramatic decrease of childhood infectious diseases such as measles and rubella. The eradication of smallpox worldwide and hopes for a similar outcome for polio have arisen as a consequence of the scientific developments in medical microbiology (Winslow 1950). On a more mundane level, rapid identification and typing of microorganisms has helped direct infection control operations in hospitals and communities afflicted by epidemics and outbreaks.

Relevance to Science and Religion

Medical microbiology has, from its inception as a scientific discipline, steered clear of religion. On the fringes however, medical microbiology insights, along with other advances in medical and scientific knowledge, have been used by scholars to propose explanations for phenomena

described in religious texts. For example, schistosomiasis was advanced as a possible explanation for the abandonment of Jericho in the 1970s, and various other microbiological causes were put forth to explain some of the ten plagues in Egypt. Schistosomiasis is a parasitic disease prevalent in developing countries in the tropics. It is caused by several species of flukes (*Schistosoma* sp.), which are carried by freshwater snails. People swimming in infected water may acquire either the liver or urinary forms of the disease, depending on which types of flukes are acquired.

Sources of Authority

This has evolved over time. Initially, the authorities in medical microbiology were prominent scientists such as Pasteur, Koch, and Martinus Beijerinck, who in the late nineteenth century established the principles and techniques for microbiological work that are largely still applicable today (Winslow 1950). Pasteur also developed vaccines to deadly diseases such as anthrax and rabies while Koch introduced various staining techniques and discovered the causative agents of tuberculosis and cholera in addition to the development of his famed postulates. Beijerinck is credited with the discovery of viruses and the development of enrichment techniques for culture, although he never worked on human diseases (Winslow 1950).

In turn, these men inspired others who had worked with them to continue their groundbreaking work, and the institutes that they had established – including the Pasteur Institute (founded 1887) – became important sources of authority for the specialty. But this was the golden age of microbiology (approximately 1870–1930), where microbiological work spread to different continents, and where an ever-increasing number of diseases were found to have causative microorganisms. Original work published in scientific peer-reviewed journals increased in number and quality, and these became increasingly important.

The discovery and development of antimicrobial agents by first Ehrlich and then Fleming

(penicillin) and successive others in the twentieth century shifted a significant part of the focus of medical microbiology toward clinical institutes and hospitals (Isenberg 2003; Winslow 1950). Professional healthcare and government organizations such as American Society for Microbiology, Centers for Disease Control (USA), Clinical Laboratory Standards Institute (USA), and Health Protection Agency (UK) published diagnostic and interpretive guidelines on medical microbiology that were increasingly used by healthcare professionals. This coincided with the advent of the internet and online publishing in the late twentieth and early twenty-first centuries, resulting in a few centralized authoritative institutes amid original published research that incrementally advance the specialty.

Ethical Principles

Medical microbiology, as with other specialties in medicine, is guided by the World Medical Association's Declaration of Helsinki. This is currently in its fifth revision (2000). Other important ethical guides include the Geneva Convention Code of Medical Ethics, which was adopted by the World Medical Association in 1949.

Key Values

The key values of medical microbiology are rapid and accurate diagnosis of microbial diseases, as well as understanding of microbial pathogenesis in order to improve outcomes in infectious diseases or prevent their spread. To this end, practitioners are called to adopt and use evolving technologies, and to remain aware of constantly emerging and evolving microbial pathogens.

Conceptualization

Nature/World

Nature refers to the natural and physical world, of which microorganisms form the largest part.

Interactions between humans and nature, particularly in new or unexplored environments, therefore result in interactions between humans and new microorganisms that may potentially cause disease.

Human Being

The human being is a biological being – a eukaryote – that is colonized by a diverse microbial flora. In other words, a human being is an organism with a membrane-bound nucleus within each of its cells. Animals and plants are eukaryotes, whereas bacteria are prokaryotes. Fungi, some of which are medically important and studied in medical microbiology, are also eukaryotes. These microbes may occasionally cause disease when the host immunological barriers are breached or fail.

Life and Death

Medical microbiology does not conceptualize life and death any differently from other medical specialties. In humans and other organisms, life is the presence of growth through metabolism, adaptation to the environment, and reproduction. Death is the loss of these processes, including the loss of physical organ functions. In medicine, the relatively new terminology of “brain death” – where brain activity ceases but other organ functions are maintained – remains controversial.

Two particular microorganisms challenge the conventional definitions of life and death. These are viruses (essentially genetic particles incapable of replication outside host cells) and prions (infectious particles composed of proteins only).

Reality

Reality is the physical material world.

Knowledge

Medical microbiology does not define or conceptualize knowledge differently from other scientific and/or medical specialties. In essence, it is the theoretical and/or practical understanding of a subject matter.

Truth

Truth is defined as being in accordance with facts and/or reality – a logical truth. As with other

scientific disciplines and in accordance with the formal theory of logic, truth is dealt with in a subjective and not absolute sense.

Perception

Perception is the state of being or becoming aware, understanding, and interpreting through the senses.

Time

Time is a fundamental quality used to sequence and define other events. This may be measured objectively.

Consciousness

Consciousness reflects the responsiveness of organisms to physical stimulus. It is unclear at this point if microbes possess consciousness.

Rationality/Reason

Rationality is the state in humans of having sound judgment and good conduct. Infections by microbes, particularly of the human brain, may cause this to be impaired.

Mystery

Mystery is accepted in medical microbiology, as in other scientific disciplines, as a temporary phenomenon that may be elucidated following the directed scientific research.

Relevant Themes

The concept of evolution is relevant for medical microbiology as regards “Science and Religion” engagement. That microorganisms evolve constantly is undeniable – the development of anti-microbial resistance and genetic shift and drift seen in certain viruses are the clearest indicators of such phenomena occurring.

Cross-References

- [Bioinformatics, Computational](#)
- [Evolution](#)

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Medical Procedure

- [Surgery](#)

Medical Psychology

- [Behavioral Medicine and Health Psychology](#)

Medical Sociology

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Description

Medical sociology is one of the significant subdisciplines of general sociology. As a core social science sociology is concerned with the analysis of general principles and culturally varying processes of developing societal structures, institutions, and patterns of relationships among humans. Medical sociology (more recently often termed “health sociology”) applies the theories and methods of general sociology to the analysis of two main areas of inquiry: first, the social determinants of human health and health-related behavior, and second, the social organization of health care, health

professions, and their interaction with patients. The former area is termed “sociology *in* medicine,” due to its problem-oriented approach that integrates sociological and biomedical knowledge, whereas the latter area is termed “sociology *of* medicine” as it analyzes the health care system from a more distant perspective as part of a broader social system. Medical sociology evolved from general sociology in the first half of the twentieth century in the USA and in Europe, but received relevant input from sociological “founding fathers,” in particular Emile Durkheim (1858–1917) from France and Max Weber (1864–1920) from Germany. The former introduced macrosocial constructs to explain variations in suicide, and the latter developed a general theory of modernization of society, its institutions, and professions.

Self-identification

Science

Medical sociology has been, and continues to be, identified as a social science. As such, it meets the four essential principles of a scientific discipline: it disposes of a specific terminology to identify particular aspects of our reality (the social reality with relevance to health and health care), it applies established methods to collect empirical data, it accumulates descriptive knowledge on the defined aspects of reality, and it develops and applies theoretical concepts to explain and predict the phenomena under study.

As an empirical science, medical sociology uses quantitative and qualitative methodologies in collecting data and in testing research hypotheses. Distinct from natural sciences that are mainly concerned with general laws related to the natural world, sociology deals with a more flexible, man-made reality, the reality of culturally varying social systems, and therefore, its explanations are restricted to so-called middle-range theories with limited generalization.

Characteristics

Medical sociology is distinctive among other social and behavioral sciences in that it applies both macrosociological and microsociological approaches to the study of human health and health care. As an example of macrosociology, sociology *in* medicine explores the impact of socio-environmental and structural conditions on health, such as poverty, unemployment, or social disorganization. As an example of microsociology, it demonstrates how secure and gratifying social relationships in core areas of exchange, such as family or work, affect human health and disease, for example, via behavioral or brain-mediated (cognitive, emotional) processes.

As an example of macrosociology, sociology *of* medicine analyzes the process of professionalization of physicians in modern health care systems, whereas its microsociological study is concerned with the characteristics of the physician-patient relationship as a distinct type of social interaction. Distinct from psychology, this subdiscipline of sociology is essentially interested in the interaction between the opportunities and constraints provided by a societal structure to its members and the needs and motivations of individual members who are exposed to, but also actively shaping this structure.

Relevance to Science and Religion

At least three different topical links between science and religion are relevant to this discipline. First, health and illness, birth and death are existential experiences of human life, and these experiences are shaped by sociocultural norms and socioeconomic contexts. By analyzing this interplay medical sociology provides insights to religion, but also draws from religious experience, for example, in understanding human suffering and ways of coping with threat and anxiety. Second, religious experience was shown to have beneficial effects on health. Analyzing this link is an interesting and important scientific task for this discipline. For instance, research

demonstrated that balancing efforts with rewards in core human activities exerts favorable effects on health. Religion may provide rewards beyond the usual material or post-material values, or may enable people to become less self-centered in pursuing rewards. Third, health care provision and access to life-saving means is a scarce resource in most health care systems. Thus, fundamental ethical issues of distributional and procedural justice evolve in relation to issues of value of human life. The same holds true for advanced technologies and scientific progress in medicine. In all these instances, an intense dialogue between science and religion is needed.

Sources of Authority

As in most sciences, eminent personalities who developed substantial innovations in theory or in methodology are considered authorities, often forming specific traditions (“schools”) within the discipline. Established textbooks, peer-reviewed original scientific publications, standards of academic training, and regular public discourses (congresses, Internet, etc.) are essential prerequisites of a “sound” scientific development.

Ethical Principles

As in every science, this discipline is expected to observe the general ethical principles of searching and presenting the truth by using appropriate reliable and valid tools of analysis and of avoiding manipulation and all other sources of scientific misconduct. Moreover, research must avoid any noxious effects on humans involved.

Key Values

Most professionals of this discipline would agree that the most important value of this discipline is to contribute to a reduction of human suffering, in particular a reduction of social inequalities in health between and within populations. Scientific knowledge of this discipline is instrumental in

identifying, explaining, and reducing these inequalities. Equally, promoting health and well-being by means of identifying and strengthening protective socioeconomic and psychosocial conditions is considered a key value.

Conceptualization

Nature/World

This discipline assumes that knowledge about nature as derived from updated natural sciences can be taken for granted and integrated into sociological analysis where needed. Clearly, there are important unresolved questions about the origin and trajectory of the natural world and about the limitations of the human mind of dealing with nature. In contrast, “world” is considered by this discipline as a socially and cognitively constructed reality that is in constant flux and that to a large part can be dealt with in productive ways by human mind and action.

Human Being

Human beings are considered the result of an evolutionary process that resulted in a species characterized by several unique capabilities and behaviors that are closely related to the development of human brain and its coevolution with social structures. Yet, there exist many fundamental open questions about the specific qualities of human nature.

Life and Death

Valid knowledge about these fundamental processes comes from biosciences, chemistry, physics, etc., but sociology adds to this analysis a sociocultural dimension of meaning and practice rooted in belief systems and social norms. Again, fundamental questions about life and death remain unanswered by current science.

Reality

See “world” above: Reality is defined as the physical substrate of the world that is accessed by our sensory processes, our higher nervous system activity, and our actions. Importantly, by our thoughts and actions we are able to influence – and thus modify – the real world to a significant extent.

Knowledge

This discipline distinguishes two different types of knowledge: (1) Knowledge based on evidence or experience about real-world phenomena, either acquired via socialization and learning, or accessed via information media. This type of knowledge can be communicated between individuals via mutually shared signs, for example, language; (2) Knowledge as subjective experience or evidence of an individual accumulated over one's life trajectory. This knowledge is part of an individual's unique world and can only be accessed or communicated selectively and approximately. Sociology and its subdisciplines, including medical sociology, are particularly interested in the analysis of origins and consequences of unequal distribution of knowledge across society.

Truth

As in philosophy, this discipline distinguishes between logical and empirical truth. Logical truth relates to the conclusiveness of arguments derived from certain axiomatic statements. Empirical truth relates to the congruence of a statement with the fact it describes.

Perception

This discipline integrates the definition of perception provided by modern neuroscience, that is, sensory input from external and internal stimuli processed by the brain in part consciously, in part unconsciously.

Time

Time as ongoing change of everything in the real world has an objective duration that can be measured by physical instruments. It has also a subjective dimension related to the experiences and interpretations of individuals. In many instances a discrepancy exists between objective and subjective time evaluation.

Consciousness

As humans, we are able to perceive our world and ourselves and to be aware of these perceptions.

This higher nervous activity is absent during sleep or specific critical conditions of ill health, and is reduced in people with specific mental or neurological disorders.

Rationality

This discipline considers rationality as an evolutionary stable pattern of human thinking and acting that aims at understanding and solving problems in effective ways and at acting in accordance with consistent principles. Rational behavior anticipates the consequences of one's actions and, thus, involves the acting person's responsibility.

Mystery

In science, mystery is the area of the unknown, which eventually and gradually can be unraveled by scientific progress. However, there is a second meaning of "mystery" that delineates a particular type of experience, imagination, vision, etc., that seems to transcend any scientific, rational approach. In this latter sense, mystery is an important component of religious experience and practice.

Cross-References

- ▶ [Collective Behavior](#)
- ▶ [Emotion](#)
- ▶ [Ethics](#)
- ▶ [Medical Psychology](#)
- ▶ [Perception](#)
- ▶ [Self](#)
- ▶ [Statistics and Probability](#)

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Medicine in Islam

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Related Terms

[Arabian medicine](#); [History of Islamic medicine](#); [Islam and medicine](#); [Islamic medicine](#)

Description

Medicine in Islam includes, firstly, a study of the history of Islamic medicine, the medicine practiced during the Islamic era stretching between the Greco-Roman Alexandrian times and the era of European Renaissance. Related to this first field of study is a subdiscipline in Islamic philosophy that serves to describe and clarify in objective, contemporary terms the methodological and philosophical principles that have guided the cultivation of medicine and other sciences in Islamic civilization.

Secondly, the term “Islamic medicine” also designates the currently reemerging concept of medical sciences as influenced and regulated by the worldview and ethical principles of Islam. As stated by Setia (2007), this meaning pertains to the subject matter of a discipline that serves to reformulate the concept of Islamic medicine and other sciences as a long-term creative research program dedicated toward a systemic reapplication of Islamic cognitive and ethical values to medicine, science and technology in the contemporary world (Setia 2007). This will involve critical integration of the scientific endeavor into the conceptual framework of the Islamic worldview and the concomitant explication of the cognitive, methodological, and axiological implications of such integration for present and future scientific research.

This operative redefinition of Islamic science as well as Islamic medicine will render it into a new overarching “paradigm” or “research program” pregnant with novel methodological and empirical implications (and hence, novel discoveries) for remanifesting the Islamic worldview in everyday individual and societal life through the vision and practice of a new, authentically Islamic science and technology geared first and foremost toward identifying and solving the true problems and satisfying the real needs of humanity.

Many Western authorities on history of medicine have acknowledged and documented the close relation and integration of medicine and other natural science, with the religion of Islam. This relation stems from the unique nature of Islam and its underlying unity in all domains of knowledge based on the Qur’anic concept of *Tawhid*, Oneness of God, and the most fundamental principle of Islamic epistemology. Islam, as a religion is distinguished by being a way of life that goes beyond the mere performance of rituals. The Arabic word for religion “din” appears in Qur’an, Islam’s Holy Book, in contexts that place it outside the purely ritual. Din in essence describes an integrated code of behavior, which deals with personal hygiene, at one end of the spectrum to the relationship of mankind with the natural order at the other. It provides a holistic approach to existence, it does not differentiate between the sacred and the secular and neither does it place a distinction between the world of mankind and the world of nature. The motivation provided by Islam for the study of natural phenomenon and pursuit of empirical knowledge is, thus, tremendous. This explains the harmonious relationship between epistemological dimensions of science and the Islamic worldview, as well as between ethical and societal dimensions of science and Shari’ah (the Islamic Divine Law).

As detailed by Bakar (2003), the word Islam refers not only to its normative teachings that allow for fresh interpretations but also to its culture and civilization as these dimensions have been manifested throughout Muslim history. If Islam is understood in this sense, then it has to be inclusive of its past intellectual culture,

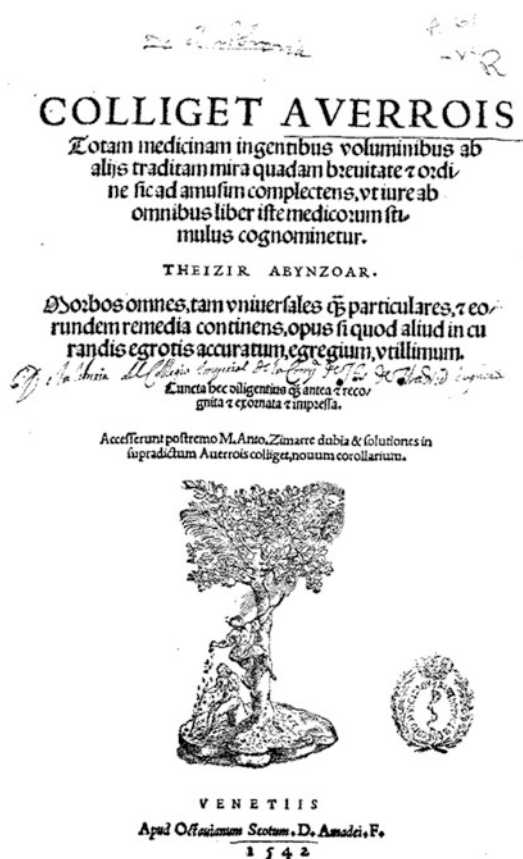
of which medicine and science used to be an integral part. It is a position that is informed by a solid knowledge of the history of Islam the religion and Islam the civilization. This civilizational approach to the Islam and science discourse which is sensitive to tradition is based on the conviction that past formulations of the relationship between religion and science have an intrinsic value that make them relevant to contemporary attempts to arrive at the same conceptual goal. On the other hand, a discussion of Islam and medicine in the background of definitions rooted in the post-Renaissance understanding of religion in the Western world will be unrepresentative (Bakar 2003).

Several recent studies in the history of medicine illustrate that Islam's contributions were richer, more profound, and more lasting than was previously thought. As recent research has shown, there is a continuum between Islamic medicine and modern medicine. Science in Islam is not just a forerunner, something strangely distinct and distant, from science today but an integral part of modern science.

Focusing on the history of our surgical specialty, urology, we performed several primary-source studies utilizing the already published original medical works of 11 Islamic medical scholars who lived and practiced between the ninth and the thirteenth centuries.

Our study critically evaluated their contributions to the progress of not only urology but also other surgical and medical subspecialties. Their original works were compared with those of their predecessors and with those who came after them. Their influence on Medieval Europe and European Renaissance was traced, evaluated, and documented. Furthermore, original translations into English were made of relevant excerpts of all the works studied. The Latinized works of all those Islamic scholars (Figs. 1, 2, and 3) were available in Europe as early as the twelfth century, with their influence lasting until the eighteenth century as documented by Sarton, Cumston, and several other Western scholars (Sarton 1927; Cumston 1926).

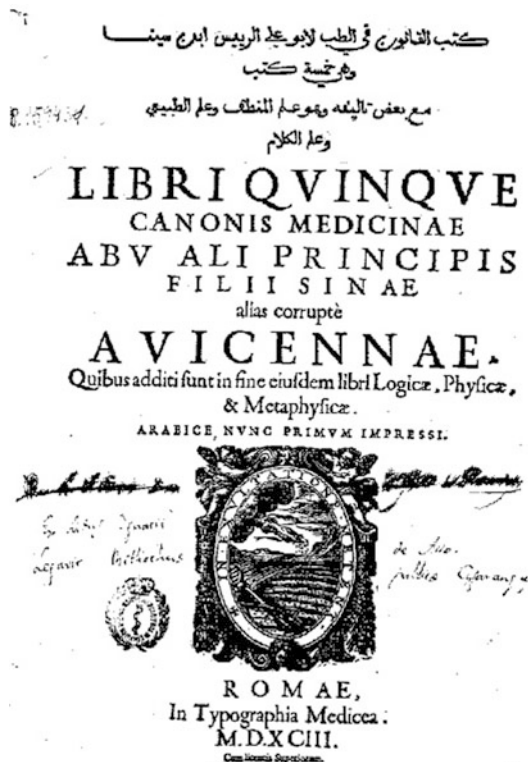
Out of this long-term study, several original contributions to the progress of urology by those



Medicine in Islam, Fig. 1 A Latin edition of the Kulleyyat of Ibn Rushd and the Taisir of Ibn Zuhri; the first-ever example of joint authorship of a medical textbook (Printed in Venice in the year 1542, courtesy of Biblioteca Histórica de la Universidad Complutense de Madrid)

scholars during the Medieval Islamic era have been documented (Abdel-Halim 2008). This includes contributions to the progress of anatomy, physiology, pathology, clinical urology, therapeutics, operative urology, and instrumentation.

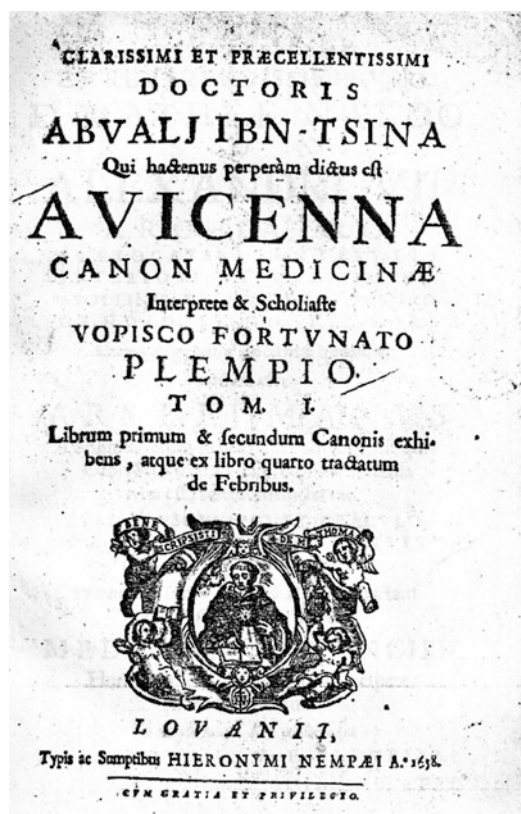
Our results also confirm that those scholars of the Islamic era were not mere compilers or sheer transmitters of Greco-Roman medical literature. On the contrary, they critically reviewed the translated heritage of previous civilizations rejecting what is superfluous and accepting only what proves to be true. They added original contributions to the progress of medicine and surgery and pioneered new fields of medical



Medicine in Islam, Fig. 2 A Latin edition of Ibn Sina's Canon of Medicine printed in Rome in 1593 (Courtesy of Biblioteca Histórica de la Universidad Complutense de Madrid)

knowledge and practice such as medical ethics, medical education, medical certification, health education, preventive medicine, social medicine, hospitals and hospital training, mobile hospitals, medical-practice quality control, clinical medicine, differential diagnosis (Fig. 4), experimental medicine, experimental surgery, beginnings of specialization, ophthalmology, pharmacology, and use of anesthetics.

Over the last three decades or more and coinciding with the beginning of the fifteenth Hejri century, an increasing interest in Islamic medicine has been noticed in different parts of the Islamic world as well as in few Western research centers. This scientific activity that seemed to be a product of the Islamic revival movements in various Muslim countries took the form of seminars, conferences, books, and other scientific publications organized and



Medicine in Islam, Fig. 3 Another Latin edition of Ibn Sina's Canon of Medicine printed in Louvain in 1658 (Courtesy of the Koraes collection, Koraes Central Library of Chios)

published through individual and organizational scholarly efforts.

This ongoing contemporary discourse on Islamic medicine, Islamic science, and Islamization of knowledge in general is enriched by the contributions of many scholars in different parts of the Muslim world as well as in the West. Among those who significantly contributed to the advance of this reemerging discipline are Al-Attas, Nasr, Bakar, Al-Faruqi, Golshami, Muzzafar, Setia, Kamali, Kazi, Sardar, Kalin, and many others. They all provided important background knowledge that helped in the construction and growing understanding of the concept of Islamic science including medicine. However, what remains and is essential for this Islam-science discourse to move forward is



Medicine in Islam, Fig. 4 The opening page of a manuscript of the first-ever book written on differential diagnosis: *Kitab Ma Al-Fariq, Kalamun Fi Al-Furuq Bain Al-Amrad* (A discourse on differential diagnosis) by Al-Razi (Rhazes)

the actual emergence of a scientific tradition based on the foundational principles of the study of nature anchored in the Qur'an and the Prophet's Tradition (Sunnah).

Several scholars formulated their viewpoints on how to implement the concept of Islamic science. According to Setia (2007), the true operative essence of Islamic science including Islamic medicine is that it has to be involved in an unapologetic, proactive construction of empirico-conceptual frameworks for interpreting and interacting with the world in a way that is self-consciously inspired by, and hence, in harmony with, the ethico-cognitive principles of Islam. For that purpose, Setia formulated a proposed Islamic Science Research Program (ISRP). It consists of an unchanging core metaphysical component underpinning the

program and a surrounding network of auxiliary explicative theories and hypotheses for relating the metaphysical abstract core to the concrete physical world. The role of the network of auxiliary theories is to provide directions for the conceptual clarifications and empirical investigations of various aspects of this permanent metaphysical core by relating them to corresponding aspects of the physical world. In other words, it is in this creative middle circle where the discursive reason (*fikr*) and contemplative intellect (*'aql*) mediate between the book of revelation and the book of creation (Setia 2007).

Setia, also, emphasized the role of the twin Qur'anic cognitive principles of *tabayyun* (investigation, scrutiny) and *burhan* (proof, evidence) in implementing the concept of scientific objectivity in the ISRP with respect to cultivating a critical attitude toward contemporary science. He stated that it will be irresponsible to take reports of promising new methods, discoveries, and techniques at face value without undertaking investigation (*tabayyun*) into the often hidden underlying context of these reports and ascertaining their empirical adequacy (*burhan*) and "epistemological autonomy" (*al-istiqlal al-'ilmi*) from powerful forces geared less toward global scientific enlightenment than narrow political economic enrichment (Setia 2007). Creative understanding and practice of *tabayyun* and *barhanah*, as practiced before by the Medieval Islamic scholars, will help Muslim scientists to separate the wheat from the chaff of Western science and incorporate it into the ISRP.

In this context, further help can be obtained by undertaking evidence-based medical research into the well-documented but largely neglected vast corpus of the very successful 1,000 years old Islamic cosmopolitan medical tradition.

Cognitive evaluation and ethical evaluation are both intrinsic to the scientific enterprise in Islam, as is quite evident in the studied scientific methodology of the Medieval Islamic medicine. The realization that scientific objectivity and methodological probity are not possible without concomitant ethico-moral integrity has been growing in the West and is now moving more

toward the Islamic position thus allowing room for mutual constructive engagement on this important metascientific issue.

Self-identification

Science

Islamic medicine self-identifies as a science. This is well documented by Western authorities on history of medicine who studied the medicine of the Islamic era between the eighth and the fifteenth century. As stated by Cumston, the majority of the orientalist who have studied the works of the Arabs admit that long before Roger Bacon, they were in possession of that method which later on led to so many discoveries. Speaking of the school of Baghdad, he quoted Sedillot (*Histoire des Arabes*, Paris, 1854) as saying *“what specially characterized the Baghdad school at its beginning was the truly scientific spirit which presided over all. To go from the known to the unknown, then from the effects to the causes, and only to admit as true what had been demonstrated by experimental work; such were the principles taught by the masters”* (Cumston 1926). Similarly, in his classic work on the intellectual development of Europe, John William Draper acknowledged Europe’s scientific obligations to Islam (Draper 1863).

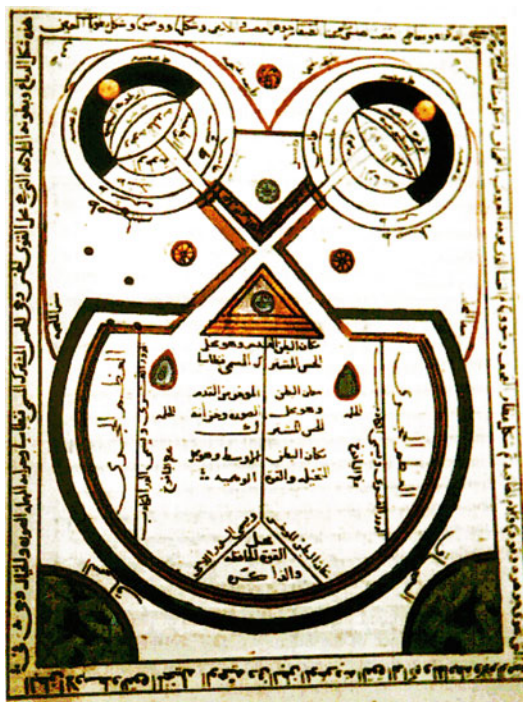
The Islamic system of medicine, well established as a discipline for over 800 years, was constructed in a logical, scientific, and regular manner, taking the consecutive steps of first translating all the works of the predecessors, followed by critical evaluation of those works, rejecting what is superfluous and accepting only what proves to be true. Then original contributions started and flourished.

From the days of Al-Razi (Rhazes; 865–925 AD) and onward, the medical scholars of the Islamic era were keen on direct observation and experimentation. Ibn Al-Nafis, the thirteenth-century Muslim scholar emphasized that *“as regard the function of organs, we rely only on what is dictated by investigative observations and accurate research; Not caring whether it*

conformed with, or differed from, the opinions of those who came before us.” Therefore, more than 600 years before the time of Vesalius (1514–1564), the interest and experience of the Muslim scholars in the study of anatomy led them to contribute to the advance of this important medical science by correcting many of Galen’s erroneous anatomical concepts. Ibn Al-Nafis, like his predecessors in the Islamic era, critically appraised the views of those who came before him in the light of his own experimentation and direct observations. Accordingly, in his book *Sharh Tashreeh Al-Qanun* (A Commentary on the anatomy of Ibn Sina’s Canon), we find the first correct description of the pulmonary circulation. He also laid the seeds of the proper understanding of the systemic greater blood circulation. Ibn Al-Nafis was also the first to describe the coronary vessels and the true concept of the blood supply of the heart. Those discoveries of Ibn Al-Nafis were translated from Arabic to Latin by the Padua-University-professor Andreas Alpagus; the translation was printed in Venice in 1547. Six years later, Ibn Al-Nafis’ description of the pulmonary circulation appeared in the *Christianismi Restitutio* of Servetus and, in 1555, in the second edition of the *De Fabrica Humani Corporis* of Vesalius. Similar descriptions were also given by Valverde in 1554, Columbus in 1559, Cesalpino in 1571 then, finally in 1628 by Harvey (Abdel-Halim 2008).

Furthermore, the presence of anatomical drawings within medical textbooks is a trend that started and flourished in the Islamic era reflecting the role of direct observations and experience. During the whole of the Islamic era, with the increase in practical experience, the illustration of anatomical findings continued to progress in quality and in fine details (Abdel-Halim 2008) (Figs. 5, 6).

Another example of the originality and sound scientific nature of the medieval Islamic medicine is the twelfth century Ibn Zuhri (Avenzoar)’s application, for the first time, of experimental methodology in evaluating new or controversial surgical procedures. He performed the operation of tracheotomy on



Medicine in Islam, Fig. 5 The drawing of the cross section of the brain and the eyes made by the thirteenth century Khalifa ibn Abi Al Mahasin Al Halaby (from Aleppo) in his book *Al Kafi Fi Al-Kuhl* (The Book of Sufficient Knowledge in Ophthalmology)

a goat in order to confirm the safety of the operation and disprove its condemnation by the Greco-Roman scholars. This unique experiment represents a further step in the development of the experimental school started by Al-Razi of Baghdad in the ninth century, who is known to have given monkeys doses of mercury to test it as a drug for human use. Ibn Zuhr's application of an experimental animal model to a clinical problem was the forerunner of the method by which many current surgical procedures were developed.

The investigative mind and reliance on experimentation in seeking evidence during the Islamic era is also represented by the post mortem examinations done on sheep by Ibn Zuhr in the course of his clinical and therapeutic research on ulcerating diseases of the lung.

Religion

Islamic medicine is the practical application of concepts of Islamic belief based on the Divine Revelation contained in Qur'an and explained in Sunnah. Both forms of revealed knowledge and their value system of Islam strongly support observation, inductive reasoning, and experimentation in the study of natural phenomenon. Search for truth is the method of Islam, and therefore, pursuit of scientific knowledge strengthens the faith of the believer. The quest of knowledge, creativity, and innovation has a sanction of the Holy Qur'an and is extolled by the Holy Prophet. It must, therefore, be pursued vigorously and with full commitment and dedication. One of the Prophet's main prayers was "O my Lord, increase me in knowledge." History is witness to the fact that Muslim philosophical thought and scientific knowledge of its golden period had essentially a moral and religious base.

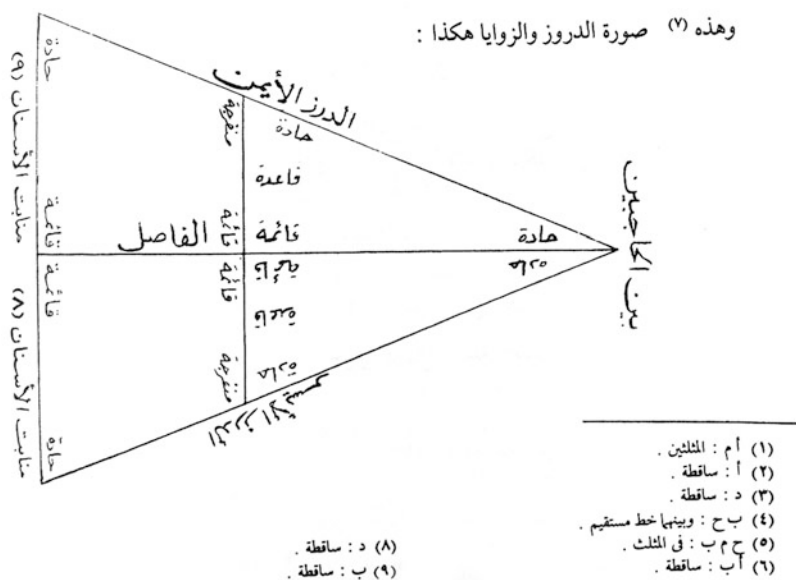
According to Sarton, Cumston, Sedillot, and other Western medical historians, with the spread of Islam in the seventh century AD, a great revival of the sciences took place in the Islamic empire; knowledge of medicine flourished and acquired a truly scientific spirit, and doctors were highly esteemed (Sarton 1927; Cumston 1926). As stated by Guthrie, the progress in medical knowledge during the Islamic era was motivated and inspired by Divine Revelation. In documentation for that statement, Guthrie cited the translation of an authentic prophetic tradition saying: "O servant of God, use medicine because God has not created a pain without a remedy for it" (Guthrie 1945). Islamic medicine was stimulated by the concepts of faith. Learning and practicing medicine is an act of worship. Wisdom is highly appreciated and always sought for. In most of the Muslim countries, up till very recently, before the spread of the modern word "doctor," the physician's commonly-used title was "Al-Hakim" meaning in Arabic "the man of wisdom."

According to Castiglioni, this historical period of Islamic medicine, which lasted more than seven centuries, coincided with the most flourishing period of Islam. Likewise,

Medicine in Islam,

Fig. 6 Anatomical drawing of the maxillary sutures in one of the original manuscripts of Ibn Al-Nafis' book Sharh Tashrih al-Qanun (a commentary on the anatomy of Ibn Sina's Canon)

مساوية للتي للمثلث^(٥) عند طرف المنخر في تلك الجهة وتلك حادة ، وكذلك هذه . فتكون التي في ذلك العظم عند طرف المنخر منفرجة لأنها مع السفلية مثل قائمتين .
والله ولي التوفيق^(٦)



emphasizing the religious context of medieval Islamic science, Sarton said: "How could we reach a correct understanding of Muslim science if we did not fully grasp its gravitation around the Qur'an?" Medieval theology, he noted, was the core of science as well as the prop of religion. Science is positive knowledge, but scholarly inquiry cannot be restricted to the modern Western definition of positiveness. Medieval scholars (both Muslim and Christian) regarded theology as positive knowledge (Sarton 1927).

In Islam, the human body is a source of appreciation, as it is created by Almighty Allah (the God). Hence, all activities contributing to the well-being and preservation of health as well as the relief of sufferings of individuals and societies are virtuous acts of worship and essential religious duties. Muslim physicians, therefore, came to look upon medicine as the science by which the dispositions of the human body could be discerned and to see its goal as the preservation of health and, if health should be lost, assistance in recovering it (Fig. 7).

The close integration and unity of knowledge between Islam and medicine is also evident in the development and spread of health education during the Islamic era. Health education has always been an integral element of Islamic teaching, and its spread was inextricably linked with the spread of Islam itself (Figs. 8, 9 and 10).

Another example of the unity of medical sciences with Islamic faith is the statement of Ibn Rushd (Averroes, 1125–1198): "Anyone who practices anatomy will increase his faith in Allah." This is of particular importance because he was, at the same time, the Grand Qadi (chief magistrate) of Cordova and a well-known authority on Islamic jurisprudence in the whole Muslim world then and up till now. Accordingly, contrary to several contemporary medical historians, the practice of dissection for medical teaching was not prohibited in the religion of Islam (Abdel-Halim 2008).

Furthermore, the chapter devoted for physiology in the encyclopedic book Al-Mukhtar Fi Al-Tibb authored by Muhadhdhabul Din



Medicine in Islam, Fig. 7 A page from an original manuscript of Al-Zahrawi's book Al-Tasrif showing the beginning of the first volume. It starts with a citation of Al-Razi's definition of medicine: "medicine is preserving health unto healthy individuals and returning it to the sick within the limits of human abilities"

Al-Baghdadi (1117–1213) was titled the Gained Benefits of the Wisdom of Creation, and likewise, the chapter on Embryology was titled the Creation of Human Being. This example shows how Islamic faith and medicine were closely integrated in the minds and hearts of the Medieval Islamic medical scholars (Abdel-Halim 2008). They had no conflict at all in



Medicine in Islam, Fig. 8 The cover page of an original manuscript of "kitab muntakhab min kitab al hawi" (Selections from the Continens), a compilation meant for the spread of health education to the public. As stated by the author, he was inspired to write this book because God said in the Holy Qur'an: "Whosoever saves a human life, saves the life of the whole mankind" and also because of the Prophet's saying: "The best among people is the most devoted to their benefit"

their minds between religion and science. Indeed many of them were, also, pioneers in religious sciences.

Characteristics

The following distinguishing features of Islamic medicine as practiced during the Islamic era are evident and well documented:

- Motivated and inspired by Divine Revelation.
- Ethically based on values from Divine Revelation.
- Exalted the soul, the mind and the body at the same time.
- Constructed on a regular scientific way.



Medicine in Islam, Fig. 9 A page from the manuscript of “kitab muntakhab min kitab al hawi” (Selections from the Continens) shown in Fig. 8. The text shown is the author’s statement enjoining a sick person to seek treatment and maintain the body in good health because it is his means for faith and knowledge being the abode for the honored self and revered soul and it is the way to obey the divine commandments, acquire courage, and achieve a good life here and hereafter

- Strongly opposed to magic and quackery. The Prophet stated that “*If anyone carries out medical treatment, yet previously he was not known as a medical man, then he takes the responsibility*” (Johnstone 1989).
- Also, derived from “the medicine of the Prophet” is the primary attention given to preservation of health and prevention of disease (Johnstone 1989).

Relevance to Science and Religion

A major factor in the misuse of modern science and technology for destructive ends is its supposed value-neutral framework. The renaissance of science and learning in Europe was accompanied by a separation of the religious and the



Medicine in Islam, Fig. 10 A page from an original manuscript of the thirteenth-century book “Pearls of Prophetic wisdom for guidance on rules of medicine.” The title shown on this page is “a section on what is narrated on enjoining people to study medicine and the command to seek treatment”

secular, due to the peculiar conditions then prevailing. Knowledge has increasingly come to perform a utilitarian function, whose ends are determined largely by the prevalent and dominant distribution of societal power. Modern science, mistakenly based on the separation of the secular from the religious, has cut off its moral mooring. The world needs to rethink the assumptions that led to the creation of this value-neutral framework.

According to Patricia Marshall, the current dissatisfaction with the limitations of the analytical philosophical utilitarian approach to bioethics has led recently to explorations of religion-based philosophies with increased attention to moral phenomenology and a recognition of the importance of social, cultural, and historical determinants that shape moral questioning (Marshall 1992).

The highly integrated and holistic framework of Islamic science including Islamic medicine provides an alternative model, which permitted the growth of science and learning as well as protected society from its misuse.

There are so many verses in the Holy Qur'an and many sayings of the Prophet that are highly relevant to contemporary controversies in medical ethics, bioethics, as well as ethics of modern science and technology.

Furthermore, as stated by Bakar, unlike the modern trend of easily falling into the pitfall of reductionism, the Muslim search for premises has usually been guided by more holistic views of reality and knowledge. The result is a more solid intellectual foundation for sciences which also embraces issues beyond the domain of applications to include other aspects of the societal dimension of knowledge (Bakar 2003).

There is, also, a great need to revise the way university science and medical students are educated so that they know how to integrate their scientific knowledge and expertise into the more fundamental and higher goals of human life and thus avoid the destructive pitfalls of scientism. True science is beneficial knowledge (al-"ilm al-nafi") that is geared toward serving rather than subverting these higher, human goals.

Furthermore, there is a lot to learn from the experience of the Islamic medical scholars who developed their own original school of knowledge and practice more than 1,000 years ago. The way they critically evaluated cultures and civilizations before and around them, in the light of their own experience, rejecting what is superfluous and accepting only what proves to be true, is a good example for scientists today to stop blind imitation and lead the way for originality, innovation, and new inventions.

The study of the history of Islamic medicine will be also rewarded by progress in the fields of bioethics, medical ethics, ethics of medical education, ethics of experimental research, philosophy of medicine, psychological and mental health, care of the terminally ill patients, social medicine, holistic medicine, care for the environment, nutrition and many other areas related to public health and health services.

Moreover, there is a lot to learn from medieval Islamic medicine in relation to its greater emphasis on the art of maintaining health and care to prevent illness. Another lesson is that the least we use drugs the better. The illness that can be remedied by regulating diet should not be treated by medicines, and what is relieved by a simple medicine should not be treated by a compound drug, whereas surgical intervention should always be kept as the last resort. Furthermore, the vast experience of the medieval Islamic scholars well recorded in hundreds of extant Arabic works on pharmacy constitutes a buried treasure of information and provides a range of topics for modern pharmacological research bound to enrich our present day pharmacopoeias with simple and safe herbal medicines.

Paying attention to spiritual as well as bodily health will, also, help us to minimize and control the high incidence of psychosomatic disease complicating the spiritual deprivation of our contemporary materialistic way of life.

Sources of Authority

With regard to the ethical and societal aspects of Islamic medicine, the sources of authority are the moral (akhlaq) and legal (ahkam) codes derived from Qur'an and Sunnah. Akhlaq refers to morals, the second part of the Islamic teachings (second to "aqaid, doctrines) relate to the commands and teachings relating to the spiritual and moral characteristics of human beings, such as, justice, God-fearing (taqwa), courage, chastity, wisdom, endurance, loyalty, truthfulness, trustworthiness, etc., and prescribe "how" a human being should be. Ahkam is the Law, the third part of the Islamic teachings (third to "aqaid, doctrines and akhlaq, morals). It comprises the issues relating to practice and the correct manner of performing acts. Within this metaphysical and ethical framework, it will be easy to accept, assimilate, integrate, and advance any subject matter the truth of which has been confirmed by critical evaluation, experience, and experimentation.

Ethical Principles

The moral part of Islamic teachings (akhlaq) constitutes the commands and teachings relating to the spiritual and moral characteristics of human beings, such as justice, God fearing (*taqwa*), courage, chastity, wisdom, endurance, loyalty, truthfulness, trustworthiness, etc., and prescribes how a human being should be.

In an Islamic context, the Qur'anic term *khuluq* is closest to the term "ethics." (The first independent work on medical ethics was authored by Al-Razi under the title of *Khuluq Al-Tabeeb* (The Physician's Good Manners). Ishaq ibn Ali al-Ruhawi who lived around 1200 AD used the title *Adab al-Tabib* for his famous book on medical ethics. The word "Adab" is closely related to "Kuluq"; hence, the title here also means the physician's good manners.) Also, some other terms referring to fundamental ethical principles referenced from Qur'an and describing the concept of good are *khayr* (goodness), *birr* (righteousness), *qist* (equity), and *'adl* (equilibrium and justice). The Islamic moral philosophy served as a basis for defining and suggesting solutions of the ethical and moral problems facing individuals in all various walks of life whether they are professionals, scientists, practitioners, businessmen, or workers.

Islamic medical ethics is integrated within the framework of *Ihsan* (good personal conduct), that aspect of Islamic creed, which is, described as the act of worshipping Allah as if you see Him, knowing that even if you do not see Him, He sees you. Consequently, the strict adherence to ethical principles becomes inspired and internally monitored by the love to do what is pleasing to Allah, who is ever present, ever watchful.

Key Values

- Islam emphasizes on the sanctity of human life and considers access to health care as a fundamental right of the individual.
- Islam emphasizes on the respect of a person's rights and dignity.

- Another main principle is the emphasis on seeking a cure. This is further emphasized by the fact that three of the goals of the Islamic Shari'ah are the protection and preservation of life, intellect, and progeny. The other two are the protection of property and religion.
- The physician is an instrument of God's mercy on earth. So are the scientist and every individual in his own career.
- Five key values govern Islamic ethics: unity, equilibrium, free will, responsibility, and benevolence.
- In the framework of *Ihsan*, the above-mentioned principles and values have lasting effect both on the personal, professional, and day-to-day activities of individuals.

Conceptualization

Nature/World

Nature/world has been created for a purpose and is blessed with a meaning. Man is entrusted by God to take good care of nature for himself and future generations, as well as for animals, plants, and environment.

Human Being

Human being is created by God and has a transcendental nature. Man is dignified. He is made the center of the Universe. He is not completely part of nature. Dignity and nobility are part of each human being's birthright.

Life and Death

Life is a divine gift from the Creator. The first leg of its journey starts in a womb then from the darkness of the womb to the light of this present world. With death, the soul, then, leaves the body, but life continues in a different form until the Day of Judgment when it will rejoin the recreated body and come out from the darkness of the grave to the light of the hereafter, the final eternal abode.

Reality

To accept the metaphysical dimension of reality is an integral aspect of the Islamic worldview,

and the Qur'an clearly demands that. In a similar vein, to acknowledge the reality of the human psyche and thought is just as natural as acknowledging his physical existence. This is bound to be ultimately a wholesome and a more meaningful approach to the understanding of reality and a sound foundation, therefore of a valid epistemology.

Knowledge

The Islamic concept of knowledge encompasses transcendental knowledge as well as knowledge that is based on sense perception, observation, experimental knowledge and rationality. Islam also lays emphasis on beneficial knowledge that advances human welfare and seeks to utilize the resources of the universe for sound and beneficial purposes.

Truth

The fundamental truth and essential message in life is so expressively placed before humanity in the Qur'an and Sunnah. It is the same message that had been revealed to all other Prophets during the long course of human history.

Perception

Human perception and knowledge are of two kinds: perception by the senses and knowledge through the contemplative intellect. It is important to have a philosophical framework through which to give meaning to the data of sense perception and a sense of coherence to our understanding of reality, science and religion. Islam's perception of knowledge is thus value-oriented and informed by ethical and theological concerns.

Time

Time is life. It goes on for a fixed term in the present world then continues to eternity in the hereafter.

Consciousness

Muslim religious consciousness is essentially the consciousness of the unity of God. The scientific spirit is not opposed to this religious consciousness, since it is an integral part of the latter.

Rationality/Reason

In Islam, the word "intellect" (reason) is used in its traditional sense, namely, as related to contemplation. The modern connotation of the words intellect and reason as logical analysis or discursive thinking is the result of the emptying of their metaphysical content. The attitude these words imply toward nature is the one that Goethe was to deplore as late as the early nineteenth century – that attitude that resolves, conquers, and dominates by force of concepts. It is, in short, essentially abstract, while contemplative knowledge is at bottom concrete.

Mystery

With regard to the origin, purpose, and end of life, the Divine Revelation in Qur'an and in Sunnah left no unsolved mysteries in the human mind. The Creator also provided humankind with the mental tool to discover, understand, and resolve mysteries of nature.

Relevant Themes

The major medieval scientific and medical treatises, usually quite lengthy, still await reliable translations and editions, and a great deal of potentially important material lies unexamined. Furthermore, the latest research and the last few years have seen revolutionary findings that pushed forward the date for the beginning of a decline in Islamic science well into the sixteenth century. Moreover, as documented by Saliba, in the field of astronomy, and many others in the field of medicine, it is becoming more and more apparent that the scientists who were responsible for the production of original scientific discoveries in Medieval Islamic science and Islamic medicine were mostly religious men at the same time and religious scholars in their own right (Savage-Smith 1988). Accordingly, works exploring the relationship between science and religion and between Arabic science and Western science have to be rewritten in light of these new findings.

Cross-References

- [Ethics](#)
- [History of Medicine](#)
- [Humanism in Islam](#)
- [Perception](#)
- [Philosophy in Islam](#)
- [Philosophy of Science](#)
- [Physics, Science in Islam](#)
- [Surgery](#)
- [Science in Islam, Transmission](#)

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Medieval Arabic

- [Mathematics in Islam General](#)

Medieval Arabic Music

- [Music in Islam](#)

Medieval Hebrew

- [Language and Literature, Hebrew](#)

Meditation

- [Meditation-Research](#)

Meditation-Research

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Related Terms

[Contemplative neuroscience](#); [Meditation](#); [Mindfulness research](#)

Description

Since its beginnings in the first decades of the nineteenth century, the scientific study of meditation had a strong focus on physiological changes in practitioners. After a couple of initial

electroencephalographic (EEG) studies of yogis and Zen monks conducted in India and Japan in the 1950s and 1960s, meditation research flourished in the 1970s with the popularity and spreading of Transcendental Meditation® in the West (a concise outline of major research strands can be found in the bibliography by Murphy et al. 1997). The observed calming effects on peripheral physiology – e.g., respiration and heart rate, blood pressure, muscle tone, skin conductance – and on the central nervous system supported the notion of meditation as a technique to evoke a “relaxation response” that could be employed in mundane and clinical settings to counteract stress. In addition, phenomenological analyses of subjective experiences during meditation and research on personality changes in practitioners underscored the potential of meditation to induce altered states of consciousness and foster self-development (for review, see West 1990).

Over the last 2 decades, the number of studies in the field of meditation research has sharply increased. To some degree, this upsurge is driven by the development of modern brain imaging techniques, in particular magnetic resonance imaging (MRI). The various meditation techniques that have been investigated with these techniques differ with respect to the object of focus, the width of attentional focus, and effortful self-control versus passive stance. Concordantly, EEG and functional MRI studies have reported a broad variety of findings providing a complex picture of effects and interpretations (for review, see Cahn and Polich 2006; Lutz et al. 2008).

Another reason for the sharp increase in the number of research studies on meditation over the last 2 decades is the increasing interest in mindfulness meditation. Standardized clinical programs that include training in mindfulness meditation like mindfulness-based stress reduction (MBSR) and derived interventions for numerous mental disorders have shown to be effective in ameliorating symptoms and promoting health (Fjorback et al. 2011). In this field of application and research, meditation exercises

are uncoupled from their traditional religious contexts and conceptualized as certain types of mental training that can be used to enhance distinct self-regulation skills – e.g., relaxation, concentration, and equanimity. The remainder of this entry focuses on mindfulness meditation and the mechanisms of action that have been described in the recent literature.

Mindfulness meditation, the practice of nonjudgmental awareness of experiences in the present moment, has been found to produce beneficial effects on a number of psychiatric, functional somatic, and stress-related symptoms and has therefore increasingly been incorporated into psychotherapeutic programs (Baer 2003; Grossman et al. 2004). Research has established that mindfulness meditation positively influences aspects of physical health, including improved immune function, reduced blood pressure and cortisol levels, and increased telomerase activity. Furthermore, a large body of research is beginning to document the efficacy of mindfulness-based therapeutic interventions in the treatment of a number of clinical disorders, including anxiety, depression, eating disorders, chronic pain, and substance abuse. Aside from investigating the effects of mindfulness practice on disorders, meditation research has also begun to investigate the positive effects of the practice on psychological well-being in healthy participants and its effects on cognitive functioning.

Along with the many reported positive implications of mindfulness arises the following questions: How does mindfulness work? What are its mechanisms? The existing body of research points to the fact that an array of distinct but interacting mechanisms might be at play in producing the benefits of mindfulness meditation practice. Recent theoretical frameworks have suggested that meditation might work through several mechanisms, including (1) attention regulation, (2) body awareness, (3) emotion regulation, and (4) change in perspective on the self (Hölzel et al. 2011). These components have been suggested to interact closely to constitute a process of enhanced self-regulation.

Attention Regulation. Illustrating the effects of repeated practice of focused attention during meditation practice, meditators report that they are able to focus their attention for an extended period of time. In accordance with such self-reports, a number of studies have empirically documented enhanced attentional performance in meditators (Lutz et al. 2008). The anterior cingulate cortex is the brain region that enables executive attention. In line with the behavioral findings of improved attention, several neuroscientific studies have reported the anterior cingulate cortex to show functional and structural changes following meditation training (Cahn and Polich 2006).

Body Awareness. Body sensations are a common object of attention during meditation, and practitioners often report improved capability for body awareness, but empirical studies testing that claim are mixed. Studies assessing performance on a heartbeat detection task found no evidence that meditators showed superior performance. Tactile acuity, however, has been shown to be superior in experienced Tai Chi practitioners and to be improved in experienced meditators. Findings from the mindfulness neuroscience literature point to changes in the function and structure of brain regions related to body awareness, such as the insula, which is involved in interoceptive awareness.

Emotion Regulation. A growing body of literature suggests that mindfulness practice results in improvements in emotion regulation. Studies from the field of meditation research have addressed improvements in emotion regulation through a variety of approaches, including experimental, self-report, peripheral physiological, and neuroimaging data. For example, it has been shown that mindfulness practice reduces interference from negative emotional images in solving a response task, suggesting that mindfulness meditation enables subjects to better regulate

their emotional responses. Several theories have suggested that the enhanced emotion regulation capacities seen in meditators are achieved through strengthening of positive reappraisal processes. Other theories have suggested that it might work akin to exposure therapy and facilitate extinction of maladaptive emotional responses. During emotion regulation, prefrontal control systems in the brain modulate emotion-generative limbic structures, such as the amygdala. Modification of this fronto-limbic network through meditation practice has been suggested by functional and structural MRI studies.

Change in Perspective on the Self. The essence of Buddhist psychology lies in the teaching that there is no such thing as a permanent, unchanging self. Rather, the perception of a self is a product of an ongoing mental process. The process of a repeatedly arising sense of self becomes observable to the meditator through development of meta-awareness. According to Buddhist philosophy, a change in perspective on the self is the key in the process to enduring forms of happiness. Whereas more advanced meditation practices are required to experience a dis-identification from the static sense of self, a de-identification from some parts of mental content is often experienced even in the earliest stages of meditation practice. Self-report studies have begun to document the experienced changes in perspective on the self following meditation. Those studies documented a more positive self-representation and higher acceptance of oneself, as well as the development of an observer perspective. Neuroimaging studies of mindfulness meditation have demonstrated that brain structures that support self-referential processing are structurally and functionally impacted by mindfulness meditation, including the medial prefrontal cortex and posterior cingulate cortex.

The above described components, attention regulation, body awareness, emotion regulation,

and change in perspective on the self, are presumably highly interrelated, constituting a process of enhanced self-regulation.

Cross-References

- [Attention](#)
- [Buddhist Meditation Practices](#)
- [Cognitive Neuroscience](#)
- [Emotion](#)
- [Mindfulness \(Buddhist\)](#)
- [Neuroimaging](#)
- [Self](#)

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Memory

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Description

Memory is a universal attribute of animals and is sometimes even used with reference to plants and machines. Consequently, memory is an important concept for many scientific disciplines from the neurosciences and psychology over physics to history and the humanities. In the context of animals (including human beings), it implies the storage of ontogenetically acquired information in neuronal structures so that it may be recalled in the future. Nowadays, memory is split into systems and processes. The systems are based on time and content. The most universal distinction is that between short-term and long-term memory. Contrary to its common use, the neurosciences limit short-term memory to seconds or minutes at most and to the acquisition of a very few bits of information (4–7). Long-term memory is then everything extending in time or bits of short-term memory and consequently includes lifelong memories as well. The content-based division of memory uses simple memory systems, relying on mechanical or motor-related acts (e.g., riding a bike, skiing, playing piano) (“procedural memory”), on the repetitive appearance of subconsciously acquired material (“priming”), on percepts (e.g., of an apple or a cherry) (“perceptual memory”), on our general knowledge (world knowledge, school knowledge) (“semantic memory”), and on autobiographical events or episodes which have a distinct time and place connotation, which are based on the conjunction of subjective time, the autonoetic consciousness (“self-awareness”), and the experiencing self (“episodic-autobiographical memory”). The processes imply a conscious (explicit) or an unconscious (implicit) acquisition

of information. The sketch illustrates the complexity of memory as seen at present (Fig. 1).

Self-identification

Memory is both viewed as a science and is subject to intensive, methodologically complex investigations and is seen as an everyday attribute of individuals – exemplified by expressions “to have a good (or to have a bad) memory” of certain events or episodes that happened in life. Both science and common sense see memory as most important for a successful interaction with the world. Ewald Hering, a physiologist, formulated roughly 140 years ago: *“Memory connects innumerable single phenomena into a whole, and just as the body would be scattered like dust in countless atoms if the attraction of matter did not hold it together so consciousness – without the connecting power of memory – would fall apart in as many fragments as it contains moments.”* So, Hering expressed in short words how dependent we are on our memories and how memory distinguished us from a world in which only the present exists – the world of animals. Large amounts of human memory are conscious (“autonoetic”), allow us to make mental time traveling, and make us humans to creatures that base their future on their past. Nevertheless, implicitly stored rudiments of time-based memories can be found in animals as well. In fact, it is quite obvious that memory evolved to increase the survival of individuals and species. Knowing that a plant or an animal is eatable or is toxic prolonged the life of an individual, and knowing that whether the smell of another individual or of an area in the environment indicates danger of being attacked or indicates the possibility of sexual intercourse increases the life of a species.

Memory is consequently a most important in the life sciences but also in culture. Not to repeat the errors of past generations evolves and strengthens humankind and therefore also leads to a better and more successful life of an individual. The possibility to find and define rules of memory and to identify false memories, memory distortions, and memory disturbances, in general,

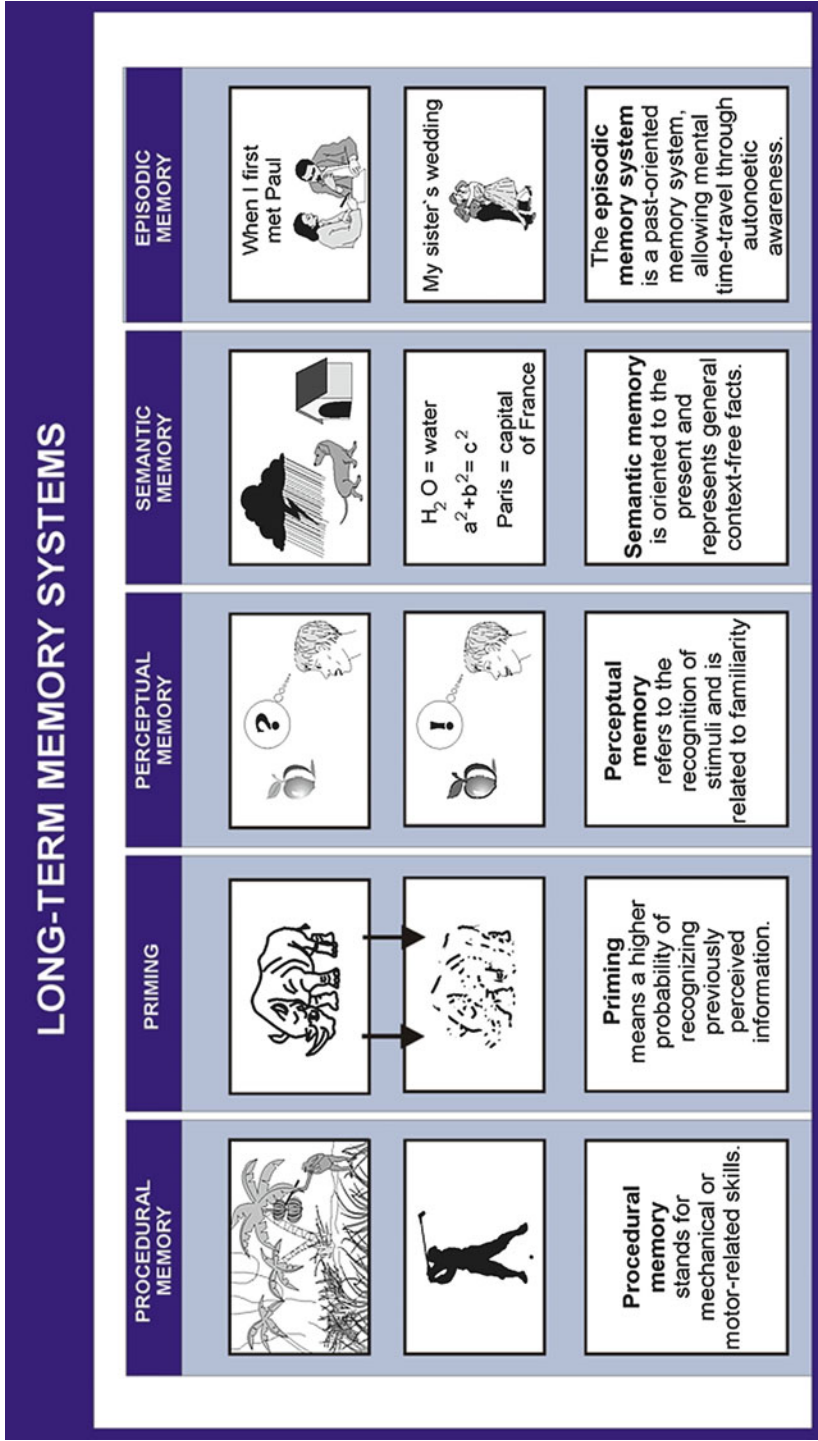
makes the investigation of memory one of the most important scientific disciplines. A more recent expansion of this field lies in the possibilities to trace memory performance to brain performance: To investigate and unravel the conditions of successful and of impaired memories has become a major endeavor of scientific enterprises. This is done both by studying subjects with brain damage and subsequent impairments as well as by applying modern functional brain imaging techniques which allow to view the acting neural networks engaged in particular memory processes such as successful or unsuccessful processes of encoding, consolidating, storing, or retrieving memories. By doing so, it also becomes possible to develop and suggest strategies and techniques for memory repair, for memory improvement, and for providing clues that prevent a deterioration of memory.

Characteristics

Memory is both a universal attribute of mankind and is seen as an everyday experience, and memory is special, as it provides the bases for an ontogenetic and phylogenetic development of individuals and societies and consequently also of culture and culture-based traditions, such as religion. Importantly, memory is a feature or concept that has strong affinities and interactions with other components of behavior, such as attention, concentration, emotion and affect, executive functions, and cognitive flexibility.

Relevance to Science and Religion

Mnemonics – the rules to improve and strengthen memories – are of interest to both individuals and societies. There is a tradition from the song lines of Australian aborigines over medieval memory culture up to oral history. Furthermore, memorizing pattern, such as repetition and colorization by rhythmic and musical recitations, has a strong tradition in various religions (Buddhist/Lamaist praying, Christian Gregorian songs, Judaic psalm prayers) for memorizing and deeply encoding



Memory, Fig. 1 Sketch of the five content-based long-term memory systems used presently. The systems develop phylo- and ontogenetically from left to right. The first two (procedural memory, priming) are considered to be anoetic (i.e., do not require conscious reflection for being retrieved), perceptual memory and semantic memory are considered to be noetic systems, requiring awareness and reflection, and the episodic memory system requires autoeotic consciousness, that is the ability to reflect upon oneself and to distinguish oneself from the social and biological environment.

texts regarded as crucial. Here especially the implicit (sometimes trancelike) memorization is seen as fundamental for a proper immersing in religious patterns.

Sources of Authority

The investigation of memory and its disorders has been prominent since the writing of Greek philosophers and even before. Especially religious rules were treated with great care, and special instructions were established for proper memorizing. In the last two centuries, memory research flourished in numerous disciplines from neurology and psychiatry to the behavioral sciences. In 1885, Hermann Ebbinghaus wrote his well-cited book *Über das Gedächtnis* (On memory). In the same year, August Forel in Zurich published on “Memory and its abnormal states” (*Das Gedächtnis und seine Abnormitäten*). And from Ewald Hering’s short book “On memory as a general function of organized matter” (*Ueber das Gedächtnis als eine allgemeine Funktion der organisierten Materie*), published in 1870, a citation was already given above. Only a few years later, Pierre Janet wrote in France on “The mental state of hysterics” and emphasized that amnesia may be caused by adverse environmental stimulation. Similarly, in Prague, Anton Pick in 1886 wrote *Zur Pathologie des Gedächtnisses* (On the pathology of memory), and Theodore Ribot published in 1881 “*Les maladies de la mémoire*” (The disturbances of memory). Charcot and, even more so, his pupil Sigmund Freud provoked many debates by emphasizing the importance of the unconsciousness and of implicit memories. Some Russian scientists such as Korsakoff and von Bechterew established relations between brain damage and amnesia while others, in particular Ivan Pavlov established classical conditioning. The behaviorists followed in North America with rules for operant conditioning, with Burns F. Skinner becoming the most prominent among them. Much of the last half of the last century was then devoted to finding interactions between

brain and memory, starting in 1957 with the publication of William Beecher Scoville and Brenda Milner on the case H.M. H.M. received (already in 1953) a bilateral resection of his medial temporal lobes and became severely (anterogradely) amnesic from this time onward. Nowadays, names such as that of Endel Tulving from Toronto University are most well known. Tulving wrote in 1983 a most influential book entitled “Elements of episodic memory.” Later, he engaged himself in functional imaging studies on memory, a subject which thereafter became the topic of numerous other investigations. Other researchers attempted to establish relations between brain changes after stress-induced autobiographic amnesias.

Ethical Principles

As far as memory research is based on human beings and in particular on patients, the ethical principles of all medical disciplines apply (Declaration of Helsinki, 1971).

Key Values

Insofar as memory research is a clinical discipline, it focuses on methods and techniques intended to help patients to improve their memory or to prevent its deterioration.

Conceptualization

Human Being

Most, but not all, memory scientists see episodic-autobiographical memory as a unique capacity of human beings, while they consider all other forms of memory as shared with non-human beings.

Life and Death

There is at best an indirect relation insofar as cultural memory is considered to last over generations. Similarly, facts and traditions are transferred via memory over generations.

Reality

Memory, in particular autobiographical memory, is considered a dynamic process, which is dependent on numerous concomitant variables (mood, attention, experience, etc.) and therefore may lack all features of reality. In its more extreme variations, false memories or memory distortions may occur which lack a background of reality.

Knowledge

In modern memory research, there is a distinction between remembering and knowing. Knowledge is considered to deal with facts (*knowledge system or semantic memory*), remembering with autobiographical events.

Truth

As episodic memory is considered to be dynamic, it may vary on a gradient of truthfulness.

Perception

Memory depends on the perception of information. Perception itself is seen as the subjective conceptualization of sensations.

Time

Memory is embedded in time and changes with time. The dimension of time is fundamental to memory, though time is not chronometric but subjective with respect to memory. For example, in older age, subjective time may shrink.

Consciousness

The various memory systems rely on different degrees of consciousness with procedural memory being least dependent on consciousness and episodic-autobiographic memory most.

Relevant Themes

There are two critical issues, first the subjectivity of memories which is at present also noted in history and, secondly, the possibility of indoctrination via various forms of information transfer, for example, via subliminally presented messages.

Cross-References

- ▶ [Amnesia](#)
- ▶ [Anatomy of the Brain](#)
- ▶ [Biological Psychology](#)
- ▶ [Cognitive Psychology](#)
- ▶ [Conditioning and Learning](#)
- ▶ [Consciousness, the Problem of](#)
- ▶ [Learning](#)
- ▶ [Neuropsychology](#)
- ▶ [Self](#)

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Memory Loss

- ▶ [Amnesia](#)

Memory, Types of

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Long-term memory is the permanent storehouse of memory that can be recovered by demand for remembering. There are several different types of long term-memory, including episodic memory and semantic memory, habits and emotional memories, and more. *Short-term memory* takes care of the information that is held internally for a brief period without thought or rehearsal. The size of short-term memory differs depending on the type of information and how memory is

tested. *Semantic memory* organizes knowledge abstracted from many experiences with overlapping stimuli and events, free of the sequences of events that compose individual experiences. *Working memory* refers to the information that can be held in mind actively and manipulated for an indefinite period. *Declarative memory* is defined in terms of our ability to bring what has been learned to consciousness. Conversely, nondeclarative memory is defined as learning that occurs and can be expressed without conscious awareness of specific learning events. *Nondeclarative (implicit) memories* are memories that are retrieved in ways other than conscious recollection, such as memories for reflexes or automatic abilities. It is the type of memory that results from unconscious learning and can be expressed unconsciously, including procedural learning and the acquisition of attachments or aversions to otherwise neutral stimuli. *Episodic memory* comprises memories of specific events in which one participated; they are organized as sequences of events that compose particular experiences. *Procedural memory* takes care of the habits formed as a result of classical or instrumental conditioning; it can occur and be expressed in terms of behavioral performance in the absence of conscious recollection of the learning experience.

Mensuration

- [Geometry in Islam](#)

Mental Ability

- [Intelligence](#)

Mental Culture

- [Buddhist Meditation Practices](#)

Mental Disease/Disorder Treatment

- [Clinical Psychology](#)

Mental Disorder

- [Schizophrenia](#)

Mental Events

- [Externalism and Internalism](#)

Mental Health

- [Counseling Psychology USA/Europe](#)

Mental Process

- [Magic](#)

Mental Representations

- [Attachment: Theory and Patterns](#)
- [Externalism and Internalism](#)

Mental Simulation Theory

- [Simulation Theory](#)

Mental States

- [Functionalism](#)

Mentalizing

► [Theory of Mind](#)

Mesmerism

► [Hypnosis](#)

Messiah

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Related Terms

[Jewish](#); [Messianism](#)

Messiah

From the Hebrew *mashiach* (“anointed”). Developed from the words of the biblical prophets, messianism expresses a popular hope for the liberation of the people, the return from exile, and an era of peace. In his classic essay on *The Messianic Idea In Judaism* (1959), Gershom Scholem emphasized the catastrophic visions of doom preceding the coming of the Messiah which are present in much Jewish messianic speculation. The actual word Messiah in the sense of an ideal future King does not appear in the Hebrew Bible, although the germ of the idea is certainly there. Jewish messianism has developed through movements which have followed charismatic individuals even more than through literary speculations. The Dead Sea Scrolls present a picture of two Messiahs at the end of days, the future King and the future Priest. The recently discovered ancient inscription known as the “Gabriel Revelation” presents a notion of catastrophic messianism, a war leader who will be

killed, a messiah of suffering and death from the tribe of Ephraim. Messianism played a part in the Jewish revolt against Rome of 66–70 CE, a war in which there were rival leaders from different Jewish sects. A key figure in the history of Jewish messianism is Shimon Bar Kokhba, a rebel leader who led troops against the Romans (132–135 CE). Rabbi Akiva is said to have accepted him as the Messiah. The total defeat of Bar Kokhba’s army led to fierce Roman persecutions and an immediate end to messianic hopes as expressed in rabbinic thought, although such hope remained an important part of the daily worship. The central prayer known as the *Amidah*, a Jewish prayer recited thrice daily consisting of nineteen benedictions, contains a prayer for redemption, one for the ingathering of the exiles, and one for the restoration of David’s kingdom, “the blossoming of the light of salvation.” The Babylonian Talmud (edited 500 - 600) has one long speculative passage about the Messiah (*Sanhedrin* 97a - 99a). It advises against trying to calculate when he will come, since God will only send the Messiah to a suitably repentant and worthy generation which is strict about keeping the Sabbath. The Talmud teaches that the advent of the Messiah will be preceded by the return of the prophet Elijah, and that the Messiah will be a direct descendant of King David. In medieval Jewish thought, the philosophers Nachmanides and Maimonides disagreed about messianism, with the former arguing that it was not central to Jewish thought and the latter making the coming of the Messiah a principle of the faith. Messianic debate surfaced more recently with movements who saw the Messiah more as a spiritual leader than a war leader- those who followed Shabbetai Zevi in the 1660 s and Rabbi Menachem Mendel Schneerson, leader of Chabad-Lubavitch in the 1990s. Chabad-Lubavitch began 250 years ago, but today’s worldwide movement began in the 1940s. Other modernists have promoted messianism without the personal messiah. In the first half of the twentieth century, some saw socialism as a secularized form of Jewish messianism. All these spiritual and secular examples show the power of popular thinking to outrun the theorists

and reshape the doctrine to fit a new age or a new leader. Although the coming of the Messiah remains a popular Jewish belief, there are those who believe redemption is at hand, and others who feel that the real practical application is an optimistic outlook for the world's future. The first group shares with science the goal of saving humanity from impending catastrophe, while the second group would accept the notion of scientific progress. However, messianism differs from a scientific approach in being ever changing and rooted in popular culture.

Cross-References

- [Bible as Literature](#)
- [Eschatology](#)
- [Faith and Belief](#)
- [Happiness](#)
- [Judaism: An Overview](#)
- [Practical Theology](#)
- [Revelation in Judaism](#)

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Messianic

- [Messianic Judaism](#)

Messianic Age

- [Messianic Judaism](#)

Messianic Judaism

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Related Terms

[Christianity](#); [Hebrew Christianity](#); [Jew](#); [Jewish Christianity](#); [Jewish-Christian relations](#); [Judaism](#); [Messianic](#); [Messianic age](#)

Description

Messianic Judaism is the religion of Jewish people who believe in Jesus (Yeshua) as the promised Messiah. It is a Jewish form of Christianity and a Christian form of Judaism, challenging the boundaries and beliefs of both (Boyarin 2004). The Messianic Jewish Movement refers to the contemporary movement, a renewed expression of the Jewish Christianity of the early church. Messianic Jews construct a new social and religious identity that they express communally in Messianic Jewish Congregations and Synagogues, and in their individual beliefs and practices. Since the early 1970s, significant numbers of Jewish people now believe in Jesus and identify as Messianic Jews. Their beliefs and practices raise important questions and challenge traditional understandings of Judaism and Christianity (Cohn-Sherbok 2000).

There are some 150,000 Messianic Jews worldwide, according to conservative estimates.

More than 100,000 are in the USA, approximately 12,000 in Israel, the remainder being found throughout the 13.4 million world Jewish population (2010, North American Jewish Databank). There are over 200 Messianic groups in the USA, 120 in Israel, and many others around the world (Kjær-Hansen and Skjøtt 1999). While they are not uniform in their beliefs and expression, the majority adhere to orthodox Christian beliefs on the uniqueness and deity of Christ, the Trinity, and the authority of scripture. They express these beliefs in a Jewish cultural and religious context while affirming the continuing election of Israel (the Jewish people) with which they identify.

To varying degrees, Messianic Jews observe the Sabbath, keep the kosher food laws, circumcise their sons, and celebrate the Jewish festivals. They celebrate Passover showing how Yeshua came as the Passover Lamb, and practice baptism, linking it to the Jewish *mikveh*. They worship with their own liturgies, based on the Synagogue service, reading from the Torah and the New Testament. Their hermeneutic of scripture repudiates the tradition of Christian Anti-Judaism that “the Jews killed Christ” and the metanarrative of supersessionism that the Church replaces Israel as the “new Israel.” They argue for continued Torah observance, identifying themselves as Jewish members of the Church, and as a believing “remnant” in the midst of Israel. Their eschatology is generally, but not entirely, Premillennial, seeing the return of the Jewish people to the Land of Israel as a fulfillment of prophecy (Cohn-Sherbok 2001).

Self-identification

Science

Messianic Judaism does not identify itself directly as a science. Messianic Jewish theology sees itself as a scientific field of enquiry concerning God, Torah and Israel. It is based on the twin epistemic foundations of the uniqueness of Yeshua as divine-human Messiah, and the ongoing election of Israel (the Jewish people).

Religion

Messianic Judaism identifies as a religious and cultural identity that situates itself within the primary social space of Jewish life and peoplehood.

Characteristics

Messianic Judaism is distinctive among Judaism and Christianity as an inseparable part of both, the “missing link” between the two traditions, that combines Christian affirmation of the uniqueness of the Messiah Yeshua (Jesus) as divinely incarnate Son of God with God’s ongoing election of Israel (the Jewish people).

Relevance to Science and Religion

Messianic Judaism is relevant to and interested in questions of cosmology (creation, evolution), psychology (free will, determinism), social psychology (social identity theory), social anthropology (anthropology of religion, conversion.), ethics (sanctity of life, personal and social morality), political science (peacemaking and conflict resolution in the Israeli-Palestinian conflict), theology.

Sources of Authority

The primary sources of authority are the Scriptures of the Old and New Testament, interpreted through Jewish and Christian history and religious tradition. Jewish tradition (Mishnah, Talmud, Midrashim, Codes, Responsa, Contemporary Jewish thought) strongly influences Messianic Jewish teaching and practice. Messianic Judaism, emerging from the Hebrew Christianity, was took birth in nineteenth-century Evangelical Protestantism (Kjær-Hansen 1995) but also relates to Orthodox and Roman Catholic traditions. The writings and work of nineteenth and early twentieth-century leaders of Hebrew Christianity (e.g., Joseph Rabinowitz, Sir Leon Levison, Hugh Schonfield) offer guidance to the

Movement. Within the different streams of the movement, the contemporary leaders (Daniel Juster, Mark Kinzer, David Stern) have varying levels of authority (Juster 1986; Kinzer 2005; Stern 1988). Harvey's survey provides a generally accepted statement of key theological issues and identifies 8 theological streams within the movement (Harvey 2009).

Ethical Principles

The Judaeo-Christian tradition, encourages love for God and neighbor, in the context of the transformation of the values and practice of the Torah through the death and resurrection of Yeshua (Jesus), the Messiah. These principles include justice, equality before the law, loving-kindness, social welfare, and the ideals of peace and political freedom.

Key Values

Messianic Jews focus on Torah as the guide for life, as exemplified by the life, teaching and ministry of Yeshua (Jesus). Respect for God, humanity, and practical holiness (*kedushah*) in everyday life.

Conceptualization

Nature/World

The world is created by God and reflects God's beauty, order, and creativity. It is marred by the effects of humanity's sin, but through the election of Israel to be God's people in God's land, and the atoning and salvific life and ministry of Yeshua, the nations will be engrafted into a renewed Israel, and the creation will be renewed and restored.

Human Being

All humanity is created in the image of God but is marred by the effects of the fall. Israel is elected to be a means of blessing to the nations and humanity will be redeemed through the death and resurrection of the Messiah and restored to

enjoy relationship with God in restored humanity. The individual is to be understood aspectively as comprising body, soul, and spirit, and corporately as belonging to family, people, and ethnicity (social identity). The dyadic relationship of Israel and the nations is an ecclesiological given that proleptically anticipates an eschatological unity within the differentiated order of a new humanity (Soulen 1996).

Life and Death

Life is the gift of God, beginning physically at the moment of conception. Physical death is the forerunner to judgment, resurrection, and a corporate eternal state.

Reality

Messianic Jews are influenced by Michael Polyani's *Critical Realism*. The writings of Thomas Torrance, Michael, Edith Wyschogrod, and Emmanuel Levinas influence their ontology.

Knowledge

Special revelation of God is through the Scriptures, the Incarnation of Yeshua, and the proclamation and practice of the community of the faithful. General revelation is through sense-experience of the everyday world, moral consciousness, and the order of creation.

Truth

Truth is both propositionally revealed and personally appropriated, mediated through reason, tradition (both Jewish and Christian), and the Scriptures.

Perception

Messianic Jews follow externalism and critical realism, but the term is not defined explicitly within this tradition.

Time

Messianic Jews see time as both linear (but not evolutionary positivist), and also cyclical. There are different understandings on the qualitative nature of the boundary between the "now" of the present age (*olam Hazzeh*) and the "not yet" of the world to come (*olam haba'ah*) which result

in several different eschatological systems of Amillennialism, Dispensationalist, and Historic Pre-Millennialism.

Consciousness

Messianic Jews see individual consciousness as a property of the human mind/soul, which continues ends in death and is restored in resurrection. Religious experience may be the result of altered states of consciousness.

Rationality/Reason

The exercise of reason and the systems of rationality found in different societies reflect the created order and the rational character of the Creator God. Human reason follows principles of argument and logic, but rationality in complex social systems reflects cultural and worldview assumptions that are often not made explicit. Messianic Jews situate themselves within the Christian and Jewish worldviews, where “rational arguments” on topics of controversy are problematic.

Mystery

Mystery is truth beyond the comprehension of human reason unless revealed by illumination of the consciousness through the agency of the Holy Spirit. The existence of God, the Messiahship of Yeshua, the realities of sin, judgment, and eternal life are all mysteries that require revelation.

Relevant Themes

1. Cosmology – creation and scientific accounts of the origin of the world.
2. Compatibilism, Freedom and Determinism – human free will and the foreknowledge of God.
3. The being and activity of God in and beyond time and space – His triune nature and involvement in the created order. The divine-human nature of Yeshua (Jesus) – How can this be expressed?
4. Life after death – What is the nature of resurrection, both personal and corporate?
5. Social identity and ethnicity – who is Israel?

Cross-References

- [Bioethics in Judaism](#)
- [Christianity](#)
- [Eschatology](#)
- [Global Christianity](#)
- [Judaic Studies](#)
- [Judaism: An Overview](#)
- [Messiah](#)
- [Redemption in Judaism](#)
- [Revelation in Judaism](#)
- [Systematic Theology](#)

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Messianism

- [Messiah](#)

Mestizaje

► [Latino Studies](#)

Meta-heuristics

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Meta-heuristics is the most recent development in approximate search methods for solving complex optimization problems that arise in business, commerce, engineering, industry, and many other areas. A meta-heuristic guides a subordinate heuristic using concepts derived from artificial intelligence, biological, mathematical, natural, and physical sciences to improve their performance. Notable examples of meta-heuristics include genetic/evolutionary algorithms, Tabu search, simulated annealing, variable neighborhood search, GRASP, and ant colony optimization, among many others (see *Meta-heuristics: theory and applications*, I. H. Osman and J. P. Kelly ed. Kluwer Academic Publishers, 1996).

Metaphysical Theology

► [Natural Theology](#)

Metaphysics

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The science of “first principles” or “first causes” as laid out by Aristotle in his book *Metaphysics*.

Much of the development of modern physics has proceeded from an empirical refinement through mathematical modeling or empirical investigation of theoretical propositions that can be defined as “metaphysical.” Aristotle regarded metaphysics in much the same way as modern philosophy of science regards the practice of science. The philosophy of science studies and analyzes the theoretical premises and procedures as well as the general ground plan of knowledge that enter into the pursuit of science as an empirical discipline. Today metaphysics is a separate branch of philosophy that no longer enjoys the prestige it possessed in its heyday up until the early nineteenth century. The philosopher Immanuel Kant redefined metaphysics as an inquiry into the foundations of how knowledge as a whole is gained, making it an appendage of *epistemology*, the theory of knowledge. In this view, the “first principles” of philosophy can no longer count as basic elements of the universe itself, but as rules or assumptions for how we can come to know the universe in a reliable fashion.

Cross-References

- [Mathematics, Ancient and Medieval](#)
- [New Age Religions](#)
- [Ontology](#)

Metaphysics, Darwinian

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Related Terms

[Darwinism](#); [Universal](#)

Description

“Darwinian metaphysics” may be seen as a compound of two antonyms, since Darwinism

has often been treated as a scientific theory opposing religious and philosophical kinds of metaphysics. Correspondingly, the use of such term may appear provocative, almost as if one were using “Darwinian religion” to designate a general Darwinian approach. The approach and the term itself, therefore, are bound to elicit criticism from positivistic as well as metaphysical positions. Nevertheless, “Darwinian metaphysics” appears to be a suitable term for all historic or recent approaches claiming that Darwinian processes essentially offer a universal account of biology, culture, and our very being. Although Charles Darwin did indeed mainly concentrate on biology, he speculated that his theory would at least “give zest [...] to whole metaphysics” (Notebook B, p. 228). Before we discuss Darwinian metaphysics in the narrow sense, based on a radicalization of Darwinism, we will briefly discuss the proposition that in fact several quite different approaches may be interpreted as Darwinian metaphysics.

Darwinian metaphysics in a *broad sense* is difficult to characterize, since throughout intellectual history “Darwinism” has been presented in different forms and has been used to build syntheses with many other ideas. For instance, Darwinism, even if defined as a biological theory of natural selection, has had an influence on quite different kinds of social Darwinism, from *laissez-faire* capitalism to racism to anarchism. Likewise, historians have linked Darwinism to many philosophical systems – for instance, to that of Herbert Spencer, Ernst Haeckel, William James, and Charles Sanders Peirce. Furthermore, although Darwinism sometimes seems to be linked to progress (at least in the sense of adaptation), Darwinism allows for *local* adaptation only and hence is generally considered to preclude the possibility of genuine progress (see, e.g., Gould 2002) – not least because the process underlying evolution is interpreted to remain essentially static (see, e.g., von Sydow 2012). Likewise, since apparent purpose seems actually to be based on a blind mechanism, Darwinism has sometimes been interpreted as a nihilist doctrine. Darwinism, with the central concept of struggle for life, particularly among

conspecifics, appears to emphasize conflict over cooperation. Moreover, Darwinism at least probabilistically seems to have been correlated with materialism and atheism. Yet one should also note that from the very formulation of Darwinism there have been attempts to interpret natural selection in the opposite direction, linking natural selection to God’s invisible hand. Historically, the relationship between science and religion has been more volatile and intricate than today’s actual conflict between a radicalized Darwinism and a radicalized religious fundamentalism would suggest. Darwin himself not only studied theology at the University of Cambridge, but he in fact seems to have aimed at retaining some aspects of William Paley’s natural theology in his elaboration of the theory of natural selection (even though the theory indeed contributed later both to Darwin’s own increasing agnosticism and a quick decline in the estimation of Paleyan natural theology; see von Sydow 2005).

It is important to distinguish Darwinism from evolutionary theory as such (evolution was advocated in different schools in France and Germany before the publication of *The Origin of Species*). Furthermore, some philosophers (such as Teilhard de Chardin, Henri Bergson, and Alfred North Whitehead) made interesting proposals for a “metaphysics of evolution” that must be seen in contrast to any “Darwinian metaphysics.” On the whole, the relevance of biological Darwinism to ethical or religious issues is highly controversial. There was reaction against the influence of Darwin in the fields of philosophy as well as theology, as well as objection on the part of several authors to the asserted direct relevance of biological theories to ethics (e.g., G. E. Moore) or revealed religion (e.g., K. Barth). Whether one can postulate an epistemic autonomy of these disciplines, however, seems to depend on one’s preexisting logical, epistemic, ontological positions, and also on the details of one’s biological account. Correspondingly, different sub-paradigms of Darwinism displayed different views on the autonomy of culture or ethics. Theories that can be characterized (at least partly) as Darwinian, such as Darwin’s first formulation of Darwinism, Weismann’s neo-Darwinism, the

early evolutionary synthesis, the late evolutionary synthesis, gene-Darwinian sociobiology, and multilevel-Darwinism, held different positions with respect to reductionism and the autonomy of sociology and ethics (see, e.g., von Sydow 2012). Overall, the heterogeneity of thought on Darwinian metaphysics has two main reasons: first, the variation of underlying biological theories and second, the fact that “auxiliary hypotheses” needed to link Darwinism to metaphysics sprang from various traditions.

Darwinian metaphysics in a more *narrow sense* is based on a “purer” Darwinism and (less pluralistic) understanding of the theory. K. R. Popper, D. Campbell, R. Dawkins, D. C. Dennett, and (arguably) D. Hull may be cited as main proponents of this Darwinian metaphysics – of which two types need to be distinguished: gene-Darwinism and (universal) process-Darwinism.

The first type, *gene-Darwinism*, is a radical interpretation of Darwinism that became popular in the 1970s. Its basic ideas have been popularized, particularly by R. Dawkins and G. C. Williams. Pure gene-Darwinism reduces living entities and processes in the biological and social worlds to single selfish genes in Darwinian processes struggling for survival (for a critical survey, see von Sydow 2012). Phenotypes as well as products of organisms, such as beavers’ dams or human habitation structures (so-called extended phenotypes) are interpreted as mere ephemeral vehicles of potentially immortal selfish genes (Hull and colleagues deviates on the issue of vehicles and sees them as interactors, Hull et al. 2001). In the words of R. Dawkins, just as “Chicago gangsters, our genes have survived, in some cases for millions of years, in a highly competitive world. This entitles us to expect certain qualities in our genes. I shall argue that a predominant quality to be expected in a successful gene is ruthless selfishness. This gene selfishness will usually give rise to selfishness in individual behaviour.” (*The Selfish Gene*, 1976, p. 2; cf. Dawkins 1983). One reason to regard gene-Darwinism as a purification or radicalization of Darwinism is that one defining aspect of traditional Darwinism (at least Darwin’s

Darwinism) is a reductionist stance in the units of selection debate by a primary focus on individuals (which, according to Gould 2002, is one of three defining aspects of Darwinism). The focus on selfish genes (gene-reductionism) thus radicalizes the reductive tendency inherent in traditional Darwinism as well. Moreover, like Darwin’s Darwinism has been contrasted to earlier romantic accounts, which stressed the “evolution” or “unfolding” of nature and the role of form and structure, gene-Darwinism in a second sense radicalizes Darwinism in this respect as well, by degrading phenotypes to puppets or mere vehicles of genes (germ-line reductionism). Finally, whereas paradigms that were perceived as Darwinian (such as Darwin’s Darwinism and the evolutionary synthesis in its later phase) remained to advocate a limited process-pluralism, gene-Darwinism reduces all evolutionary processes to the only truly Darwinian process of natural selection (process reductionism). For example, sexual selection from the perspective of single genes cannot be seen as a mechanism in its own right (referring to a special kind of what one may call auto-selection); rather, the process becomes identical to natural selection (both equally referring to hetero-selection). It may even be argued that the entity “gene” – or, more abstractly, the entity of an atomic “replicator” (see Dawkins 1983) – directly corresponds to or is equivalent to a Darwinian process of replication, blind variation, and external selection (von Sydow 2012). However that may be, according to gene-Darwinism there is essentially only one entity – the selfish gene – and only one evolutionary process – a Darwinian process. God, according to universal Darwinism at best is a blind watchmaker. The question of whether Dawkins and Dennett’s prominent critiques of religious thought are directly linked to this position may remain open (*The God Delusion*, 2006; *Breaking the Spell*, 2006). Nevertheless, if one advocates a pure gene-Darwinian position and takes up the sociobiological battle cry to “biologize” social sciences and ethics (E. O. Wilson), one ought not be surprised when several gene-Darwinian authors (despite R. Dawkins’ more cautious

Metaphysics, Darwinian, Table 1 Process-Darwinism and specific Darwinian processes in selected disciplines

Discipline	Object of evolution	Darwinian processes	Authors
Biology	Genes	Blind mutation and natural selection	G. C. Williams, R. Dawkins
Psychology	Operants, acts, associations	Trial and error	B. F. Skinner, D. T. Campbell
Philosophy of science	Theories	Conjectures and refutations	K. R. Popper, S. Tolmin
Economics	Firms, products, routines	Innovation and market selection	M. Friedman

position on ethics) consider maximization of gene-replication as the only ultimate biological categorical “imperative.”

The second type of Darwinian metaphysics is *process-Darwinism*, with roots going back to A. Weismann and C. S. Peirce. Whereas at first Weismann advocated the omnipotence (“Allmacht”) of the one basic process of natural selection, later he postulated several levels of what are now referred to as Darwinian processes. During the course of the twentieth century, the main contributions to process-Darwinism were made by R. Campbell, D. C. Dennett, D. Hull, H. C. Plotkin, K. R. Popper, and R. Dawkins. Process-Darwinism need not be committed to gene-reductionism, and yet it retains as defining characteristic Darwinian process reductionism. Whereas gene-Darwinism allows for natural selection on the single level of selfish genes alone, process-Darwinism claims that these processes exist on several levels, and in fact constitute the only remaining processes of adaptation. D. Campbell (1960), in an early main contribution, advocated that Darwinian processes were the only processes of “knowledge acquisition.” Darwinian processes represented the algorithmic structure of natural selection (in a broad sense) as defined by the two-step process of blind-variation-and-selective-retention (Campbell 1960). The last of the two subprocesses may likewise be called “external selection” or “environmental selection,” since it generalizes natural selection (in the narrow sense). Finally, Darwinian processes are normally assumed to lead to a gradual evolution.

What are the main levels (or domains) in which a process-Darwinian account has been elaborated? Even within biology, the revived

multilevel approach in evolutionary biology, criticizing pure gene-Darwinism (Gould 2002; Wilson and Wilson 2007), assumes (at least in some of its proposals) the central role of Darwinian processes (for instance, on the level of species; cf. the work of M. T. Ghinselin and D. Hull). However this may be, the term “process-Darwinism” is preferably to be used in accounts where Darwinian processes have been advocated outside of evolutionary biology as well. Proposals have been discussed in a number of domains, from immunology, neurology, and language-development to its three main areas: philosophy of science, psychology of trial-and-error learning and creativity, and economics (see Table 1 for an overview).

First, falsificationism, founded by Sir K. R. Popper, had a strong impact in philosophy of science, but was first advocated without explicitly linking it to Darwinism. Popper’s original position is usually introduced based on an asymmetry between verification/confirmation and falsification – a theory taken as a universal statement can never be fully verified by observations but may be falsified by a single one. On this basis, Popper opposed any form of inductive confirmation and argued that scientific theories can be falsified only. Yet in his book, *Objective Knowledge – an Evolutionary Approach* (1972), Popper in fact closely linked his postulated theory of conjecture-and-refutations to Darwinian evolution. Correspondingly, for Popper the development of ideas was irrational and analogous to chance mutation. Likewise, R. Dawkins (1976; cf. 1983) advocated that ideas evolved by a Darwinian process. He coined the term “meme” as analogous to “gene” for atomic replicating and mutating elements of thought that

were the units of selection. Whereas Dawkins assumed a radically reductionist stance within biology, for the meme-level as a whole he appeared to advocate a degree of autonomy. Although the consistency of such a position has been criticized, nevertheless it represents an interesting attempt at reviving the idea of a cultural level, here by replacing with Darwinian processes such traditional notions as “logos,” “spirit,” or “Geist.”

Second, trial-and-error learning (or “operant conditioning”) has been central in psychology to the behaviorist concept of learning. Although one may interpret the rigid research program of behaviorism partly as a bulwark against biology, paradoxically B. Skinner actually postulated that he is introducing a Darwinian process at a second level. The analogy of trial-and-error learning with mutation and selection (or, more correctly, with blind-variation-and-selective-retention) has been explicitly elaborated (Campbell 1960; Hull et al. 2001). Likewise, psychological creativity has been interpreted as a Darwinian process (by D. Campbell and D. K. Simonton; cf. Campbell 1960 and Gabora 2005).

Finally, analogies between neoclassical economics and neo-Darwinian biology have been discussed. Some have treated Popper’s philosophy as founding a philosophy of radical capitalism (although in *The Open Society* he actually allowed for some degree of state intervention). Similarly, the work of M. Friedman, who backed the neoliberal policies of the last decades of the previous century, was partly inspired by Darwinian ideas. Moreover, several proposals in economics have been made that directly refer to the concept of universal Darwinism, where companies or routines have been interpreted as evolving by Darwinian processes, with innovations corresponding to mutations and given consumer preferences to the natural selection by the invisible hand of the market (confer, e.g., Hodgson 2002).

With respect to these Darwinian processes, it is debatable whether their postulated combination (in a process-Darwinian account) in fact yields – implications that are quite non-Darwinian (e.g., non-blind variation at some

level) and; also whether this leads to inconsistencies, thus transcending strict process-Darwinism (von Sydow 2012). Likewise, although process-Darwinism normally continues to stress competition (the struggle for life) over cooperation (both in biology and economics), it should be noted that process-Darwinism allows for the argument that our thoughts, ideas, and theories die instead of us (P. Munz), mitigating a nature red in tooth and claw. Finally, although advocates of process-Darwinism usually subscribe to a naturalistic research program, the emphasis on the algorithmic level of natural selection (cf. works of D. C. Dennett or P. Munch) may be interpreted to go beyond this commitment, basing the theory on a mathematical structure, a form or a principle, rather than on matter or observations.

Let us return, however, to the question of whether it is appropriate to treat these Darwinian theories as metaphysical systems. Depending on one’s understanding of metaphysics, such labeling may either be too high an honor for these sometimes philosophically naïve Darwinian theories – traditionally the highest discipline of philosophy – or else it is too severe a discredit to them to be assigned to a philosophical discipline that from a positivistic viewpoint concerns itself with “meaningless” questions. Many authors today, however, use the term “metaphysics” in a more liberal way, neither necessarily referring to an all-embracing philosophical system set up a priori by a single author, nor accusing metaphysics of being a vacuous system of tautological claims. The term “metaphysics” is not restricted to continental philosophy, but rather has come into use as well in what may still be broadly called “analytical philosophy.” Yet what would be an appropriate reply, if one nevertheless argued that these Darwinian theories were results of plain empirical induction, with no metaphysics involved?

First, historically, Darwin’s great synthesis was clearly not only a great *empirical* synthesis, but a *theoretical* one as well, formulated while ordering the evidence gathered during his journey with the HMS Beagle in the light of available theories of his day (being strongly influenced,

for instance, by Malthus, Paley, Lyell, Grant, etc.). Interestingly, these influences extended to theological approaches (Rev. Malthus and Rev. Paley). Darwin himself acknowledged the influence of William Paley's natural theology, and conceded that everyone with such metaphysical preconceptions would have exaggerated the belief in adaptation and "naturally extend[ed] too far the action of natural selection [...]" (Darwin, *Descent of Man* 1877; cf. von Sydow 2005, p. 154). This is the case, although Darwin's theory of natural selection seems to have dealt a death blow to natural theology as well as to Darwin's own belief. However, Darwin's Darwinism in its initial formulation was even by Darwin's own claims not based on "plain empirical induction" but rather was influenced by theoretical and even theological considerations. Even were this not so, one could still question a presupposed strictly rationalist understanding of metaphysics. Notably, today one hears the term "empirical metaphysics" as well.

Second, gene-Darwinism and process-Darwinism are not generally advocated in the context of a single specific discipline, but rather are universally advocated for all living entities. Attempts have been made to apply gene-Darwinism to "biologize" sociology and ethics. Process-Darwinism has developed for instance in biology, psychology, the history of ideas, and economics. Hence the term "universal Darwinism," introduced by Dawkins (1983), seems appropriate. If generality of the intended field of application is taken as a criterion for a theory's being termed a metaphysical approach, and if another criterion is the abstractness and simplicity of the basic explanatory concepts (for both types of Darwinian metaphysics: Darwinian processes), then we are clearly concerned with metaphysical systems.

Finally, and foremost, the claimed generality of Darwinian processes is to be classified as a metaphysical approach even if one adopts a rationalist understanding of metaphysics based on self-evident principles or a priori truth. In fact, major authors of Darwinian metaphysics (Popper, Campbell, Dawkins, and Dennett) present their approach based on principles or

theoretical arguments, which in a way constitutes a "fundamentalist" position. Paradoxically, Darwinian metaphysics, often depicted as empirical generalization or a positivist "success story," actually seems to revive the rationalist project of an ultimate theoretical justification of a metaphysical position based on first principles. It may suffice here simply to mention Popper and Dawkins. Popper did not argue inductively in favor of a high generality of Darwinian processes, but instead advocated their universality in principle. His argument is in fact based on logical considerations – the above-mentioned logical asymmetry of falsification and verification – and is linked to the fundamental problem of induction that is often attributed to the philosopher David Hume (see below). It is only on this basis that Popper could argue in such a general way that the "growth of our knowledge is the result of a process closely resembling what Darwin called 'natural selection'; that is, the natural selection of hypotheses: our knowledge consists, at every moment, of those surviving so far in their struggle for existence; a competitive struggle which eliminates those hypotheses which are unfit. [...] The theory of knowledge which I wish to propose is a largely Darwinian theory of the "growth of knowledge. From the amoeba to Einstein, the growth of knowledge is always the same [...]" (Popper 1972, p. 261). Dawkins as well seems to be committed to a rationalist foundation of universal Darwinism, making it a truly metaphysical account (1983). He claimed that Darwinism is not only empirically, but also theoretically "probably the only theory that *can* adequately account for phenomena that we associate with life" [italics added]. Other explanations were "in principle incapable of [...] explaining the evolution of organized, adaptive complexity" (pp. 403, 404). Dawkins has argued against any form of instructivism: "Even if acquired characters are inherited on some planet, evolution there will still rely on a Darwinian guide for its adaptive direction" (p. 409).

In this last section, two theoretical reasons will briefly be considered for assuming a Darwinian metaphysics. First, a main "metaphysical" argument favoring Darwinian metaphysics is linked

to the fundamental problem of induction often attributed to David Hume in the eighteenth century. This problem may have had an even longer history: For in scholastic philosophy, first formulations of the problem were paradoxically used to support religious or rationalist positions against empirical ones. Hume, however, with the goal of justifying empirical induction, showed that one cannot “prove that those instances, of which we have had no experience, resemble those, of which we have had experience” (*A Treatise of Human Nature*, 1739/1740, Book I, Part III, sec. VI). Nature may change its course and our inductions rendered false. This in fact implies that all our knowledge, including such a simple and apparently well supported claim as “the sun will rise tomorrow,” may be fallacious. Popper concluded that no confirmation of a theory will ever make a theory “truer” or only more “probable” than a less supported alternative (provided the alternative has not already been falsified). Accordingly, there are no true or probable theories – only theories that have or have not been falsified. Such a “negative solution” to the problem of induction in Popper’s logic of discovery asserts that scientists in fact make blind conjectures and that they should rather aim solely at refutations (falsifications). This, moreover, supports a universal justification for Darwinian processes of blind conjectures and environmental refutations.

The fundamental problem of induction is a highly intricate and hotly disputed issue in philosophy and cannot be treated in any further detail here. Yet it must be noted that Popper’s position is highly controversial in philosophy of science (starting with early criticism by W. V. O. Quine, H. Putnam, and I. Lakatos). Several authors, for instance, have argued that the postulated asymmetry of confirmation and disconfirmation does not hold with regard to complex or compound theories (where it is not clear which aspect of a theory is to be falsified), nor with respect to probabilistic relationships (as they cannot be falsified by single disconfirmations). Moreover, one may object to the link between the problem of induction and falsificationism: Although plain falsification of a formerly

“valid” rule deductively proves that the rule does not hold overall, a falsification applied to the past rule does not logically prove that the rule may not hold in the future. If one assumes that prediction is essential to organisms as well as to scientists, the problem of induction seems to apply equally to falsifications. Although the problem of induction remains fundamental, it may therefore be argued that this problem does not necessary favor a falsificationist approach over a confirmatory one. Furthermore, in recent years there has been a revival of Bayesian approaches, both in philosophy of science (e.g., C. Howson and P. Urbach) and in psychology (e.g., M. Oaksford and N. Chater); that is, it is argued that people, when testing logical hypotheses, search for data in a rational, informed, and more active way than would follow on the basis of Darwinian processes alone.

The second way, Darwinian metaphysics may have gained plausibility (at least in popular writings) may be linked to the unclear meaning of the phrase “survival of the fittest.” Darwin borrowed this expression from H. Spencer in 1869 as a synonym for “natural selection.” Yet, although it appears on the surface to be both testable and plausible, it may be also be interpreted as a tautology: That is, if fitness is interpreted in terms of survival, this results in the phrase of the “survival of the survivor.” More refined definitions are of course possible and have been proposed. For instance, “fitness” is often defined in terms of reproduction, but this does not in fact resolve the problem, since one would then be obliged to measure the term “survival” in terms of reproduction as well (in order to avoid a formulation that is plainly false). Similarly, one may consider a probabilistic formulation of fitness. Once again one would need to look at both sides of the phrase which once again would produce a truism: “those organisms probably survive which probably survive.” The possible problems arising from these “improved” reformulations may in fact question whether “survival of the fittest” is always being used in testable way. It is of course beyond reasonable doubt that evolution and the Darwinian evolutionary theory provide a plethora of testable and

very well tested theories. Nonetheless, it seems plausible that at times it is only more specific theories that are tested, leaving the “survival of the fittest” as an explanatory framework rather than as a testable theory. Nonetheless, it is not claimed here that “survival of the fittest” is always and necessarily used in a tautological way. Actually, there seem to be ways to define “survival of the fittest” falsifiably, but the tautological meaning, broadly applied, may well have played a role in immunising Darwinism and popular versions of universal Darwinism in particular (von Sydow 2012). As such this seems connected to the observation of biologists Gould and Lewontin that adaptive explanations are sometimes be nothing but ad hoc “just-so-stories.” Interestingly, moreover, it was Popper, among others, who pointed out that a “considerable part of Darwinism is not of the nature of an empirical theory, but is a logical truism” (1972, p. 69). Even though he modified his views on this issue later, this is particularly noteworthy, since he modeled his own approach on an analogy to Darwinism.

Outlined here are only a few possible discussions of the metaphysical arguments, with no claim at providing a definitive result. Significantly, the apparently positivist approach of a universal Darwinism appears to revive the philosophical disputes on metaphysical issues in a way that seems relevant to several scientific domains. Other interesting topics in Darwinian metaphysics (particularly for process-Darwinism) concern conceptual and empirical issues. Are mutations, trials, conjectures, innovations, and new ideas actually strictly blind? Is selection strictly external or environmental? Is variation supplemented by synthesis? Could combinations of Darwinian processes result in irreducibly non-Darwinian processes? Is there top-down causation of emerging entities and processes? These are controversial matters, partly raised concurrently in varying domains of process-Darwinism (e.g., Gabora 2005; Hodgson 2002; von Sydow 2012). This, however, brings us back to the earlier point made about tautological definitions. That is, it may depend on our definition whether we define Darwinian processes so widely that Darwinian metaphysics

become almost a truism, or whether we define them as rigidly as possible, with the result that they become false almost by definition. Within metaphysics, one generally preaches to the converted if one argues that – besides factual issues – definitional issues often decide over the truth or falsity of theories or even of metaphysical systems of theories. However, in Darwinian metaphysics it seems clear that a greater awareness of definitional practices and implications may be helpful.

Cross-References

- [Biology](#)
- [Conditioning and Learning](#)
- [Divine Creativity](#)
- [Epistemology, Evolutionary](#)
- [Evolutionary Theology](#)
- [Natural Selection](#)
- [Natural Theology](#)
- [Reductionism](#)
- [Scientism](#)

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Method

- ▶ [Naturalism, Ontological and Methodological](#)
- ▶ [Personhood and Scientific Methodology](#)

Methodology in Psychology

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Related Terms

[Research design](#); [Research methods](#)

Description

Methodology in psychology refers to procedures researchers use to answer specific questions. There is no single methodology that all psychologists use. Instead, different schools and disciplines within psychology employ specific methods, some unique to a given discipline, while others are common across disciplines (Todd et al. 2004). For instance, for many psychologists, methodology refers to procedures and designs that permit the identification of causal relationships between independently defined variables. An explicit method by which such relationships are identified assures that other researchers can produce

identical results using the same procedures. This produces the single most important criterion identifying a discipline as a science, the public replication of causal claims. Thus, the major criteria that methodology addresses are repeatable findings by independent investigators in support of nomothetic laws or explanatory principles that apply to all instances of the same type of phenomena (Kuhn 1962; Motterling 1999). These laws are considered the scientific explanation of the phenomena studied. These assumptions and procedures are shared by psychologists who consider psychology to be a natural science (Roth 1987).

However, psychology is a many-faceted discipline, and not all psychologists consider it to have achieved the status of a natural science, and others would deny that it ought to strive to be one. Thus, there are a variety of methodologies used in psychology, each with its benefits and costs and all implying a particular set of assumptions regarding the nature of psychology. The assumption that psychology is or ought to be a natural science can be contrasted with the assumption that psychology is a human science (Denizen and Lincoln 2002; Wallerstein 1992). Those who identify psychology as a human science employ methods that are linked to the assumption that human beings are unique and have characteristics that are not reducible to the parameters of natural science. These psychologists have devised a variety of methodologies that do not simply focus upon causal relationships. Thus, contemporary psychology is characterized by methodological pluralism. No single method can be adopted uncritically; rather, methods are linked to assumptions investigators make about the nature of psychology and to the kind of questions they seek to answer. For instance, to ask “Under what conditions do dreams occur?” requires a methodology to identify causation, while to ask “What do dreams mean?” requires hermeneutical methods that assume dreams are meaningful phenomena capable of interpretation. This is one cleavage that divides methodology in psychology. Methods designed to identify causal relationships of necessity are quantitative as opposed to qualitative methods. Thus, we begin our discussion of methodology in psychology with quantitative methods.

Experimental and Quasi-Experimental Methodologies

Insofar as psychology is considered to be a natural science, the gold standard for methodology is the experiment. However, often experimental designs cannot be used, especially with respect to random assignment of participants to experimental and comparison groups. When this is the case, quasi-experimental methods are employed (Lee 2000; Todd et al. 2004).

Experimental Methods. For those committed to a natural science frame for psychology, the essential methodology is the experiment. It can be used most effectively for the study of basic psychological process such as memory or for identifying neurophysiological correlates of psychological phenomena. While random assignment is essential for a true experiment, quasi-experimental designs allow for meaningful comparisons between convenience samples who happen to differ on some significant variable.

Both experimental and quasi-experimental methods follow a similar pattern. The sequence is to (1) set the stage for the experiment, (2) create or identify one or more independent variables, (3) identify or create and measure one or more dependent variables, (4) conduct the experiment, and (5) engage in necessary postexperiment follow-up procedures, including debriefing if deceptions have been involved (Roth 1987; Todd et al. 2004). Experimental designs are heavily linked to measurement, or the capacity to assign numbers to psychological variables that have been operationally defined. Likewise, analysis of experimental data is heavily linked to various statistical procedures in order to test for significance of effects. While experimental and quasi-experimental designs are the methods that most clearly link psychology and the natural sciences, others methods are employed by those who assume psychology to be a uniquely human science.

Other Methods

The Use of Personal Documents, Questionnaires, and Diaries. Here, individuals are simply asked to report upon or keep records of specified experiences of interest to the researchers. Such reports can be analyzed by a variety of qualitative and

quantitative procedures and can yield a rich descriptive base to the report of lived experience as well as the ability to correlate these reports with a variety of variables of interest to the psychologist. All these methods are valuable but are tainted with established recognitions of the biases and limits of what are essentially self-report data (Denizen and Lincoln 2002).

Survey research methods allow for much wider sampling of persons. Several widely established surveys poll persons in sequential time periods, often using questions that are repeated and can track changes over time. Surveys can be administered by mail, phone, Internet, or personal contact. Each has identified problems that must be balanced against the value of the data obtained. Survey data has the advantage of assessing large numbers of persons across many demographic variables such as age, sex, income, and geographical location.

Scales and Measurement. The relationship of methodology and measurement previously noted is manifest in the use of scales and measurement by psychologists. Psychologists are well versed in scale construction, a major means by which variables of interest to the psychologists are measured. Most scales are multidimensional, suggesting that any construct has more than one facet. Scales assure at least ordinal measurement which identifies variations in degree, but most psychologists treat their scales as interval measurement by simply having individuals answer items on a continuous point scale.

This allows the requirements of many advanced statistical techniques to be met. Scale and measurement allow for the use of sophisticated statistical techniques to quantify human traits, aptitudes, and beliefs. A major methodological technique is to correlate various independent defined measures to test specific theories. Scales also allow for quantitative description of various psychological variables of interest. For instance, personality theorists can specify and quantitatively identify various factors or traits that comprise personality. Scales and measurement allow for the interaction between qualitative and quantitative methods. For instance, any nominally identified variable such as sex can be transformed into a quantitative variable by the simple assignment of numerals 0, 1 for each sex.

Case study methods are favored by psychologists who seek ideothetic (also ideographic) or detailed understanding of a single unique event. Psychoanalytic and object relation theorists have created specific methods to uncover unconscious mental processes assumed within these theories to be determinants of human behavior. While rejected by many as not consistent with natural science, methods of free association, dream analysis, and study of transference allow for detailed descriptions of individual persons. While most represented by psychoanalytic and object relation theorists, the case study method is used in a variety of clinical and personality studies linked to other theoretical traditions (Wallerstein 1992). Case studies are also heavily enmeshed in psychohistorical studies where individuals are analyzed in terms of their influence in history. Historical events are unique in that they are nonrepeatable in their specifics, even if repeated in terms of their general type. Social psychology, when embedded in the real world and conceived over time intervals, merges with historical studies. Thus, like history, some psychology has both nomothetic (lawful regularities) and ideothetic (unique event) qualities. This requires that psychologist use methods specific to the nature of the questions they seek to answer.

“Ideothetic” rather than “ideographic” is the preferred term to identify unique events for which no covering laws apply as in nomothetic events. While nomothetic methodologies ignore the uniqueness of events, ideothetic studies highlight what is unique about any phenomena of study and are thus essentially $N = 1$ studies. Nomothetic methodologies are heavily linked to statistical methods for the analysis of data while ideothetic methodologies are linked more to hermeneutical methods of interpretation. However, the distinctions are not absolute. While nomothetic studies employ a wide variety of quantitative methods, qualitative studies provide a rich descriptive frame and focus upon the meaningfulness of behavior. Nominal units of analysis identified in qualitative studies can be quantitatively analyzed as well by simply assigning numbers (1, 2) to nominal categories. Thus, nominal identification as a qualitative method is also rendered a quantitative measure.

Likewise, no matter how sophisticated the experimental study, nor how complicated the statistical analysis for the data, in the end the investigator must tell us what the data means. Thus, quantitative studies have an inherent and essential qualitative component as well.

Closely related to the case study is what can be called confessional research methods. They are particularly common in drug investigations, especially the study of entheogens that were previously identified as psychedelic drugs. Here, investigators experiment upon themselves with drugs in order to document the experience (Shanon 2002). Once common in psychology, where the term “subject” actually meant the researcher served as his own subject, confessional research is once again influential in modern psychology. For some confessional researchers, the use of drugs allows them to experience psychotic states and thus to empathetically relate more effectively to patients, for others drugs trigger spiritual experiences and allow for more sophisticated research strategies designed to capture the nature and determinant of such experiences. Controversy surrounding confessional methods ranges from a concern with a loss of objectivity to one of the dangers of rampant apologetics linked to a sense of the ontological wonder of altered states elicited by chemicals.

Field research includes ethnographic and participant observation. Often identified as field research, the crucial distinction is that the research occurs in a natural as opposed to laboratory setting. The researcher documents activities as he or she participates in varying degrees with the activities being studied. Ethnographers tend to emphasize “thick” descriptions and to capture an epic (insider point of view) rather than an etic (outsider’s point of view). Etic explanations move toward homothetic or covering law explanations; emic descriptions parallel case studies and ideothetic explanations but now of entire cultures rather than a single individual. Field research often includes unobtrusive measures, or the use of naturally occurring indicators available to the researcher (Denizen and Lincoln 2002; Lee 2000). For instance, wear patterns on a rug indicate traffic pattern flow.

Phenomenological methods allow participants to describe what appears to consciousness while

bracketing any claims to the reality status of such appearances. They are thus noncausal methods. These methods are particularly useful in allowing psychologists to understand how the world is experienced differently by people, ranging from those deemed mad to those who claim to have sensed the actual presence of God. Phenomenological methods can be linked to measurement. For instance, phenomenological descriptions can be specified as individual scale items and responded to by participants.

Self-identification

Science

Many, but by no means all, psychologists identify their discipline as a science. By “science” they mean natural science. Hence, they seek nomothetic or general laws that govern psychological phenomena. These laws are discovered by means of true experiments, with participants randomly assigned to experimental and various comparison groups. At least one independent variable is introduced in the experimental group, and differences in outcome are assessed on one or more dependent variables. The variables are measured and the data analyzed by statistical methods. Hence, the establishment of a causal linkage between one or more independent and one or more dependent variables in a research design that is specified in enough detail so that independent scientists can replicate the results (Motterling 1999; Pashler 2001). This is the foundation for psychology as a natural science.

However, some psychologists consider psychology transcends natural science limitations and to be therefore argued for a unique or human science. Human sciences tend to employ nonexperimental methods. However, the use of a variety of nonexperimental methods is justified by these researchers on the basis of the unique nature of the object of psychological study (Miles 2007).

Religion

Few psychologists identify psychology as a religion. For many, psychology replaces religion as the proper explanation for human action.

Often, critics of psychology argue that many psychological practices parallel religious ones. For instance, mental illness is used as a description in place of sin. Some claim that a secular psychology worships the self and that a humanistic psychology itself functions as a religion. However, regardless of perspectives, most psychologists would argue that they seek to discover by appropriate methodological procedures factors that influence actions, affects, and beliefs rather than to accept answers based upon traditions or authority, whether faith based or not. For many psychologists, religious phenomena can be studied in their own right using methods devised by psychologists that allow for description and explanation, but are often methodologically linked to assumptions that exclude the transcendent. However, psychologists associated with human science assumptions can study experiences that include experiences of transcendence that can be described and studied in ways that do not reduce them to natural science assumptions. Perhaps, this is most evident in subdisciplines of psychology that assure that the clinician has undergone a healing experience (as in psychoanalysis) or in contemporary studies with entheogens where the researcher who has ingested entheogens also is involved in their scientific study by using both themselves and others as research subjects.

Characteristics

Research methods are distinct in that they document procedure by which results can be replicated. Whether from a natural science perspective or a human science perspective, methods are synonymous with procedures that can be replicated. Even procedures that are not publically observable can be replicated in an individual's own experience. For instance, there is good agreement on the existence of altered states of consciousness that can be both individually experienced and publically reported when such individuals answer questionnaires of scales designed to assess such states. Closely related to methodology is measurement, or the assignment

of numbers to concepts which have been operationally defined. For instance, if aggression is measured by self-report of willingness to harm another, one can identify someone as aggressive or not (nominal measurement) or as more aggressive than another (ordinal measurement). Perhaps more than other disciplines, psychology is unique in the range of methods it employs (Roth 1987; Todd et al. 2004). Areas of psychology can be identified by both topics studied (e.g., developmental or social) and methods employed (e.g., psychoanalysis or experimental).

Relevance to Science and Religion

Methodology in psychology is interested in religion as an object of study. As such, it applies research methods to religious phenomenon as it would apply them to any other phenomenon. For instance, one can study how religious belief affects behavior just as one might study how political beliefs affect behavior. Arguments within the discipline center on whether or not there are unique religious variables or whether or not psychological variables uniquely interact with religious ones. While most methodologists do not exclude any religious phenomenon from investigation, they are cognizant that they study the human response to transcendence, not transcendence itself. Religious phenomenon then must fulfill the same criteria that other objects of psychological investigation must fulfill insofar as psychology as a natural science is concerned. Thus, they must be able to be operationally defined, measured, and subjected to some degree of experimental investigation. However, psychology as a human science permits a wider range of methods, many of them descriptive and influenced by *a priori* assumptions. For instance, both cognitive psychology and psychoanalysis assume that many of the determinants of human action are unavailable to introspection or accurate self-report as they are not consciousness. However, cognitive psychologists are likely to use experimental methods to uncover these determinants while psychoanalysts use techniques such as dream analysis and free association. Phenomenological psychologists on the other hand focus upon

that which appears to consciousness and is assumed the determinant of action. By triangulating results from these three methods, a richer description and explanation of human action is possible than by an exclusive reliance upon one method and associated with a specific set of assumptions.

Sources of Authority

Depending on basic assumptions, different methodologies are acknowledged. For those who assume psychology is a natural science, only causal properties accepted by other natural sciences and integral to their nomothetic laws are accepted. For instance, cognitive scientists accept that neurophysiological processes are intimately linked with thought and that there is no thought without brain activity. Thus, the ability to identify causal determinant of cognitive processes such as variation in memory requires close cooperation between cognitive scientists and neurophysiologists. On the other hand, those trained in psychoanalytic techniques privilege the analytic process that they themselves have undergone as a unique method to uncover unconscious determinants of behavior. This is contrasted with a phenomenologist who seeks to describe what appears to human consciousness while bracketing any ontological claim to either the reality status of that appearance or its causal efficacy in human action. In this sense, the authority of any method is linked to the nature of the question that the method addresses. Perhaps a major distinction between subdisciplines in psychology is in the role of authority in interpretation of data. Many experimental psychologists place authority in methods and procedures that permit replication of findings by independent investigators. Psychoanalysis places authority in their own successful analysis, allowing them to interpret the actions of others by the use of the same techniques used in their own psychoanalysis, required before they can treat others. Those committed to hermeneutical techniques rely upon the insight achieved when a meaningful interpretation has been offered. However, regardless of the method, all assume that if

the individual will (a) share the same assumptions and (b) follow the same techniques, (c) then consensus will be achieved. In this sense, all subdisciplines in psychology appeal to methodology as a source of authority for conclusions reached.

Ethical Principles

Ethical issues are involved in all aspects of methodology in psychology. For instance, in experimental designs, the experimenter often presents a plausible cover story to guide the research participants. This cover story involves deception as to the true intent of the experiment. The experimenter must weigh the value of the results obtained by deception with the actual act of deception itself. Often, after the experiment is completed, participants are debriefed and told the real purpose of the experiment. Experimental psychology avoids some ethical issues when it focuses upon nonhuman organisms. However, even here ethical issues arise, including perhaps extreme concerns with the use of laboratory animals under any conditions for research purposes. A more balanced approach is the adherence to explicit ethical guidelines for use with both animal and human subjects that are required of psychologists who are members of the American Psychological Association. On the other hand, many human science approaches require self-disclosure, often only achievable in interpersonal relationships that are either explicitly therapeutic or involved with efforts at personal growth and self-realization. In these instances, when the therapist or guide is a licensed psychologist, ethics of confidentiality, while not absolute, are nevertheless assured. Finally, universities have internal review boards that must approve any research project, whether involving animals or humans, that is done under its authority.

Key Values

The major values guiding methodology psychology are the desire to know and, for some, the desire to apply knowledge to the betterment of

humankind for others. Researchers must of necessity be curious and have faith that underlying all human actions are homothetic laws that are both capable of being discovered and useful to apply to the betterment of humankind.

All psychologists have some degree of commitment to values that inform empiricism and rationalism. Empiricism assumes that what the senses reveal is both real and important. Some knowledge is empirical and cannot be known unless there is empirical exploration of natural phenomena revealed by the human senses. Rationalism seeks what is necessary, not merely contingent. Rationalism assumes that reason must be applied to sense perception to allow for rational comprehension of the necessary appearance of phenomena. Rationalists assume that they may be universals that apply across cultures and can be discovered by applying the powers of the mind to what is perceived by the senses. Finally, psychology need not deny revelation as a source of knowledge nor deny the power of tradition as a form of collective wisdom. There are psychologies that embed themselves within the values of various traditions, religious and otherwise. They use the values of these traditions to inform the direction and nature of their research and to direct the identification and nature of treatments. For instance, as psychologists, homosexuality is no longer a mental illness, but for some more fundamentalist religiously committed psychologist, it remains a sin. Psychology is unique in having to balance various values that can at times appear incommensurate. However, higher order unities can be achieved, as for instance, to hate sin is not the psychological equivalent to hating the sinner.

Conceptualization

Nature/World

Methodologist in psychology conceived as a natural science assumes either that persons are to be understood in terms of the natural processes that operate in all natural life forms that have evolved from the natural world. For instance, evolutionary psychologists interpret the emergence of many human tendencies as selected for the survival

value in increasing reproductive success. While humans may be conceived as unique, their uniqueness is due to the emergence of properties associated with such unique, yet natural qualities, such as language. On the other hand, proponents of psychology as a human science argue for unique properties associated with forces not recognized by natural scientists. Often, the proponents of these forces rely upon phenomenological reports of experiences, including apparitions and various spiritual entities, including God. Human science advocates tend to reject the principle of the exclusion of the transcendent that is adhered to by natural science proponents of psychology. For instance, human science proponents are open to the possibility that part of the experience of God comes from God.

Human Being

Methodologists that subscribe to natural science assumption tend to accept some theory of evolution as the overarching covering law to explain all psychological processes. Random variation and natural selection are sufficient processes for the ultimate determinants of human belief, action, and affection. Persons are viewed as distinct from other species but not unique. Religion may have evolved to give persons a sense of meaning and purpose that is compatible with reproductive success. However, gods are the creation of persons and do not exist as independent forces or causal agents. Human science advocates are more acceptable to processes and realities that are not accepted by natural scientists. Unique methodologies not applied to natural science objects are often appealed to in defense of the gods or even God as an independent causal force operating in the world. Again, such appeals use methods not part of natural science methodologies such as phenomenology.

Life and Death

Methodologists, who assume natural science stance, appeal to evolutionary theory both for the origins of life and for the necessity of death. Life need have no independent creator God and likely emerged from chance variation and natural processes. Life need have no purpose. Death is the fate of all life forms, both individually and perhaps ultimately collectively of the human

species. The cycle of life and death assures random variation and natural selection, allowing for the diversity of life forms. Religion is viewed as part of the psychological process of the denial of death, a fate of which only human species are self-consciously aware. On the other hand, religion may be selected for survival value, especially for those evolutionary psychologists who accept natural selection processes operate for groups as well as individuals.

On the other hand, many human science advocates find a reality in religious discourse that suggests the transcendence of death. Investigators of such phenomenon as near-death experiences dispute the ontological claims of such experiences, varying from those who view the experiences are evidence of oxygen-deprived dying brain fooled by its own hallucinations to those who are assured that they constitute evidence of transcendence. Methodologically, all that assured that we are beginning to identify the conditions under which such experiences are reliably reported, regardless of what ontological weight they ultimately carry. However, many who do not accept that psychology must restrict itself to a methodological naturalism utilize methods such as phenomenology and various forms of self-report to accept the ontological reality of what others simply identify as altered states of consciousness.

Reality

Methodological naturalists assume that matter is primary and that sense datum is the basic reality. However, modern science has made the concept of matter sufficiently mysterious, especially quantum physics, that psychologists can no longer defend methods restricted to prequantum physics. Many psychologists essentially adopt a neo-Kantian perspective in which reality as dealt with by psychologists is socially constructed. Most psychologists avoid claims as to the nature of ultimate reality.

Perception

Sensation and perception are among the earliest topics studied by psychologists. Sensation refers to the more proximate appearances, stimulated by senses. Perception is more of a purely

psychological construct, referring to how phenomena appear to persons. All perceptions imply particular frames or schema that organize sensations and create a phenomenal world whose relationship to a postulated external reality is always tenuous. While methodological naturalists seek some correspondence to reality external to the observer, phenomenologists are content to describe in detail the nature of appearances.

Time

Psychologists are more likely to focus upon the experience of time than objective measures of chronological time. Reaction time is used in a variety of ways to infer internal mental processes and states. The experience of time, often identified as duration, has little relationship to measured clock time.

Consciousness

Consciousness is a focus of psychologists who approach its study from a variety of methods. Some seek to correlate consciousness with neurophysiological processes while others advance the notion that consciousness can be studied as a phenomenon in its own right. Efforts to avoid dualism associated with Descartes are not fully satisfactory. Both awareness and reflexive self-awareness are seen as evolutionary emergents, leading some to postulate a cosmic mysticism in opposition to naturalism. The methods employed largely determine the nature of consciousness being postulated.

Rationality/Reason

Psychologists distinguish rationality from logic. Rational behavior is behavior done for a reason or purpose. The psychologist views behavior as rational that is empirically a means to a given end. This begs the question as to the reasonableness of any given or chosen end. While some psychologists view rational behavior as an ideal for humans, others find much of human behavior to be less rational than functional for survival value.

Mystery

Many psychologists believe that accurate understanding removes any mystery from what is explained. Others assert that even when

explanations are provided, something essentially mysterious remains. Often, the mere fact of emergent properties is claimed to be mysterious. For instance, even if one could explain how we are conscious that we are conscious beings remain mysterious. In the broadest sense, when all explanations are provided, the question why still remains, and having no further answer is perhaps the greatest mystery of all.

Relevant Themes

Methodology is a required course in most undergraduate and graduate psychology programs. However, it has become apparent that psychology has no privileged methodology and is characterized by methodological pluralism. Each method implies both a metaphysic and ontology so that psychology is not a single discipline, but rather a fairly loose coagulation of persons interested in understanding the human condition. The American Psychology Association has over 50 divisions, ranging from particular specialties closely aligned with psychology conceived as a natural science (e.g., experimental psychology or behavioral neuroscience and comparative psychology) to applied specialties (e.g., clinical or industrial organizational psychology). One could easily identify the limit and range of methods courted by members of each of these divisions. Some are obvious such as the experimental analysis of human behavior. Others reveal a quest for equal status based upon methodological assumptions. There is a proposal pending for a division of qualitative inquiry obviously to balance the emphasis championed by a division simply called measurement. Not only are the methodological commitments obvious in various divisions, the values championed are often obvious subtexts. This is especially the case in explicit interest groups such as Society of the Study of Lesbian, Gay, and Bisexual Issues and Psychology of Religion, which once was simply Psychologists Interested in Religious Issues. Likewise, one does not have to be a psychoanalyst to note differences in values between the Society for the Study of Peace, Conflict, and Violence: Peace Division and the Society for Military Psychology.

It is apparent that the large number of divisions of the American Psychology Association reveals values and methods that are complexly intertwined. Diversity can be seen not as a fragmentation into special interests but rather an enrichment of the discipline of psychology. It is unlikely that psychology will advance its understanding of humankind by demanding a single or even limited range of methods. Likewise, a variety of value-oriented approaches refracts what is otherwise seen as a simple white light. A current challenge of psychology is to integrate its own understanding of humankind with those of the great faith traditions' current, past, and future, religious and otherwise, in ways that do justice to the persons that psychologists study.

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Microcosm

- [Science and Kabbalah](#)

Microprocessor

- [Electronic Circuits in Computers](#)

Migration

- [Latino Studies](#)

Mind

- [Externalism and Internalism](#)
- [New Age Religions](#)

Mind Uploading

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The belief that human beings can transmigrate into machine bodies. Mind uploading is predicated on the claim that human minds are patterns of neurochemical activity taking place in the body/brain. As that pattern could, in theory, be replicated in another substrate (a computer), the mind can be copied to this new home and acquire immortality – barring catastrophic destruction of the machines where the mind is housed and backed up. Mind uploading first appeared in A.C. Clarke's science fiction novel *The City and the Stars* (1955) but gained its first sustained scientific description in Hans Moravec's *Mind Children* (1988). Moravec described an operation whereby the brain is carefully dissected and its pattern replicated in a machine thereby "transferring" consciousness from the biological body. Subsequent mind uploading advocates have claimed that noninvasive brain scans will provide sufficient resolution for mind uploading (i.e., copying) without actually killing the biological origin.

Cross-References

- [Robotics and Religion](#)

Mind-Body

- [Dualism](#)
- [Self](#)

Mind-Body Problem

- [Dualism](#)
- [Functionalism](#)
- [Self](#)

Mind-Body Relationship

- [Dualism](#)

Mindfulness (Buddhist)

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Related Terms

Smṛti (Sanskrit); *Sati* (Pāli)

Description

Mindfulness is a quality of central importance in Buddhist meditation theory. The most basic nuance conveyed by the term *sati* or *smṛti* in its Buddhist use is a detached awareness of a situation, comprehensively capturing its internal and external aspects, in order to fully understand what is really taking place. This invests the cultivation

of mindfulness in the Buddhist traditions with a concern that bears considerable similarity to scientific investigation.

Mindfulness in its early Buddhist usage stands for an ability to fully apprehend, which at the same time bears a close relation to the ability to remember later what happened. Canonical definitions of mindfulness tend to highlight this recollective aspect, explaining that one who has mindfulness will be able to remember what has been said or done long ago (Trenckner and Chalmers 1888–1896, I, 356).

Further information on the significance of mindfulness can be garnered from a few selected similes found in the early Buddhist discourses. One of these similes shows that the Buddhist tradition to some extent identified the deployment of mindfulness as a scientific procedure. The simile in question describes a surgeon at work. In this context, mindfulness corresponds to the probe used to inspect the wound (Trenckner and Chalmers 1888–1896, II, 260), enabling the surgeon to gather the information for the proper treatment of the wound.

This in a way ground-preparing quality of mindfulness finds an echo in another image of mindfulness as the plowshare of a farmer (Feer 1884–1898, I, 172). In other words, mindfulness has an investigative quality to it, which turns up what has so far been unseen and thereby explores the situation for subsequent appropriate action, be this the planting of seeds or the treatment of a wound.

A somewhat different but complementary aspect comes up in one simile which compares mindfulness to a careful charioteer (Feer 1884–1898, V, 6). In other words, maintaining mindfulness while “driving” through life’s vicissitudes goes a long way in avoiding “accidents.”

Another simile describes a cowherd who earlier had to watch the cows closely to prevent them from straying into the ripe fields. After the crop has been harvested, however, he is able to relax and watch over them from a distance. The term used for this distant and relaxed watching over the cows is *sati*, “mindfulness” (Trenckner and Chalmers 1888–1896, I, 117). This image conveys nuances of a calm and detached observation from an uninvolved distance.

A closely similar notion can be seen in another passage, which compares the systematic development of mindfulness to having climbed onto an elevated platform or a tower, instead of being carried away by the stream of desire (Alsdorf and Norman 1966, Stanza 765). This image finds a complement in a stanza according to which mindfulness is what keeps the streams of this world in check, so that they can then be cut off by wisdom (Andersen and Smith 1913, Stanza 1035).

The function of mindfulness directed to the body in particular receives an illustration in a simile that describes a man who has to carry a bowl brimful of oil on his head through a crowd that is watching a beautiful girl performing a dance (Feer 1884–1898, V, 170). His task is to avoid spilling the oil, which requires close attention to the present moment and a good sense of balance.

In sum, the qualities associated in the early Buddhist discourses with mindfulness suggest a careful inspection of any matter at hand, combined with an inner distance or detachment that enables one to maintain one's balance at all times.

The systematic establishing of mindfulness (Sanskrit *smṛtyupasthāna*, Pāli *satipaṭṭhāna*) constitutes the seventh factor of the noble eight-fold path, which in Buddhist thought comprises the eight central requirements for progress to full awakening: right view, right thought, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration (► [Truths, Four Noble](#)). According to the standard definition, the task of right mindfulness extends over the following four areas of meditative contemplation:

- Body
- Feelings
- Mental states
- Dharms

These four areas receive a more detailed exposition in a discourse that has been transmitted by different Buddhist schools with some variations (Kuan 2008). Common ground among these parallel versions is that contemplation of the body is undertaken by directing mindfulness to the anatomical constitution of the body, directing it to

the body as made up of material elements and to the decay of the body after death. This suggests insight into the nature and constitution of the body to be a central theme of mindfulness concerned with the body, thereby giving rise to a sense of detachment from the body. It is noteworthy that these exercises clearly combine an element of evaluation with the deployment of mindfulness.

Contemplation of feeling distinguishes the affective quality of experience into pleasant, unpleasant, and neutral types. The task of mindfulness here is to recognize the affective input provided by feeling during the early stages of the process of perception. The three types of feelings are further differentiated into worldly and unworldly occurrences, a distinction aimed at the difference between feelings caused by ordinary experiences and those related to renunciation and spiritual practice.

The task of contemplation of the mind is to recognize the presence (as well as the absence) of unwholesome states of mind, such as lust, anger, and delusion. The chief role of mindfulness in this context is to avoid the mind getting carried away by any particular train of thought, so as to be able to recognize clearly which state of mind underlies the thought process. Practice undertaken in this way lays bare the motivating forces at work in the mind. Contemplation of the mind also covers recognition of the presence or absence of higher states of mind, related to experiences that would take place during more advanced stages of meditation practice.

Dharms in Buddhist thought can stand for “elements” or “phenomena” in a general sense. Contemplation of dharms, however, has a somewhat more specific meaning. The common core of this way of developing mindfulness in the different extant canonical versions is concerned with detrimental mental qualities and beneficial qualities. The detrimental qualities are the five hindrances of sensual desire, aversion, sloth and torpor, restlessness and worry, and doubt (► [Hindrances \(Buddhist\)](#)). These need to be recognized when they are present, in order to enable their removal. The beneficial qualities are the seven factors of awakening, a set of mental

qualities that are diametrically opposed to the hindrances and held to be of particular relevance for successful progress to awakening. The first of these seven is mindfulness itself, which thus provides the foundation for the others. Building on the establishment of mindfulness, the other factors follow: investigation of phenomena, energy, joy, tranquility, concentration, and equanimity.

The purpose of developing the four establishments of mindfulness is mental purification and the realization of Nirvāṇa (Trenckner and Chalmers 1888–1896, I, 55). Another discourse indicates that whosoever have escaped, are escaping, or will escape from [the bondage] of this world, all of them do so by way of overcoming the five hindrances, well developing mindfulness in the above-described fourfold manner and cultivating the seven factors of awakening (Morris and Hardy 1885–1900, V, 195).

The practice of mindfulness and its medical effects has been investigated and studied for several decades, and mindfulness has by now become a prominent feature in modern health care.

Cross-References

- [Attention](#)
- [Cognitive Science](#)
- [Meditation-Research](#)

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Mindfulness Research

- [Meditation-Research](#)

Mindreading

- [Theory of Mind](#)

Minimalism

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An approach to art characterized by reduction to the most basic elements. Minimalism arose as a movement in the 1960s and 1970s, with the works of such artists as Donald Judd, Ad Reinhardt, Ellsworth Kelly, Larry Bell, and Frank Stella. Minimalist art is typically monochromatic, often using neutral or primary colors in flat planes, untreated wood or canvas, metal, or glass. Minimalist artists strive for objectivity, often having their works industrially fabricated in order to reduce the emphasis on the artist's own personality or gesture.

Miracle

- [Divine Action](#)

Mirror Neuron Mechanism(s)

► Mirror Neuron System

Mirror Neuron System

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Related Terms

[Mirror neuron mechanism\(s\)](#); [Mirror neurons](#)

Mirror neurons are a set of sensorimotor neurons, discovered almost 20 years ago in a sector of the monkey premotor cortex, known as area F5. These neurons have both motor and visual properties: they discharge when the monkey performs a specific object-directed action (e.g., grasping an object, holding it, manipulating it) but also when it observes another individual, a conspecific or an experimenter, performing the same or a similar action (Rizzolatti and Craighero 2004). Until some years ago, in the monkey, only mirror neurons responding during the execution and observation of hand object-directed actions were known (Gallese et al. 1996). More recently, mouth actions-related mirror neurons have been found. These neurons discharge during the execution of active ingestion actions of the monkey (mouth grasping of food, chewing, sucking, and so on). As for visual properties, most of them respond during the observation of ingestion actions as well; very few respond during the observation of mouth actions with communicative functions like lip smacking (communicative mirror neurons). It has been suggested that communicative mirror neurons may play an important role in the evolution of language.

Basically, mirror neurons allow the mapping of an observed action onto the same neural population which controls the execution of that

action. It has been shown that mirror neurons' function to match perceived actions with executed actions is not limited to the visual domain. Some of these neurons also discharge during listening to the typical sound of an action, like peanut cracking, without observing the action. These neurons were labeled as audiovisual mirror neurons (Koehler et al. 2002). This finding indicates that a percentage of mirror neurons is able to code the same action regardless of the sensory modality involved in its perception and eventually code an abstract representation of actions.

Since mirror neurons have been found not only in the premotor cortex, but also in other brain areas of the monkey such as the inferior parietal lobule, it is more appropriated to refer to them as a mirror neuron system (MNS) (Rizzolatti and Sinigaglia 2010).

The functional properties of mirror neurons have substantially widened the role of the cortical motor system. It has been proposed that the MNS is involved in coding the goal of an action and hence in understanding actions. Since an observed action is mapped onto the neural substrates controlling its execution and given the fact that the observer knows the meaning and the consequences of his own motor repertoire, this knowledge can eventually be transferred to the observed action. This notion is supported by the results of an experiment where the activity of F5 mirror neurons has been investigated in two different conditions. In one condition, the monkey could observe the entire sequence of an action; in the second experiment the monkey was prevented from observing the final part of the action by means of a panel. The animal knew that an object was hidden behind the panel but could not observe the experimenter's hand grasping it. More than half of recorded mirror neurons kept on firing even when the last part of the action was obscured by the panel. This has been taken to indicate that mirror neurons are able to complement missing information, namely, to deduce the last part of the action and to infer its goal. A very recent experiment has tested the activity of monkey mirror neurons during the presentation of movies showing grasping actions from different visual perspectives. The majority of the tested

mirror neurons exhibited view-dependent activity with responses tuned to specific points of view. A minority of the tested mirror neurons exhibited view-independent responses. It has been suggested that view-independent mirror neurons encode action goals irrespective of the details of the observed motor acts, whereas the view-dependent ones might either form an intermediate step in the formation of view independence or contribute to a modulation of view-dependent representations in higher-level visual areas, potentially linking the goals of observed motor acts with their pictorial aspects.

By means of noninvasive techniques it has been possible to investigate also the human brain and many studies have been carried out that confirm the existence of mirror properties also in specific regions of the human brain cortex. In a pivotal study using transcranial magnetic stimulation, it has been demonstrated that the excitability of hand motor cortex is enhanced when individuals observed hand actions with respect to a control condition. Later evidence in favor of a motor resonance system has been collected using different techniques spanning from neurophysiological to brain imaging techniques. Using magnetoencephalography and quantified electroencephalography, clear similarities between observation and execution of actions have been found. In particular a suppression of 15–25 Hz activity, known to originate from the precentral motor cortex, during the execution and, to a less extent, during the observation of object manipulation has been shown. A functional magnetic resonance imaging (fMRI) study investigated which brain areas are active during the observation of actions performed with different body effectors (Buccino et al. 2001). The results indicated that different premotor regions are activated according to the effector involved in the observed action. Thus, the MNS in humans shows a somatotopic organization that resembles the homunculus motorius described for the execution of actions. It has been demonstrated that the motor resonance encoded by the mirror neuron system depends on the motor expertise of the observer. In a pivotal study participants were presented with mouth

actions related either to food ingestion or to communication. These actions were performed by a human being, a monkey, and a dog (Buccino et al. 2004). The results showed that observation of ingestion actions activates the premotor cortex regardless of the species to which the individual performing the action belonged to, while communicative action observation was effective only when participants observed a conspecific (human being moving the lips as during speaking) but not when they observed a communicative gesture performed by the monkey (lip smacking) or the dog (barking). These results have been interpreted as evidence that the human MNS can match the observed actions on the executed ones only if the observed action belongs to the motor repertoire of the observer. These findings have been confirmed by an elegant study showing that expert dancers resonate more strongly when they observe another dancer performing the same kind of dance they practice with respect to the condition in which they have to look at a different type of dance.

Besides action understanding, the motor resonance mechanism embodied by mirror neurons has been also involved in coding the intentions of other people's actions and to some extent their emotions (Hari and Kujala 2009). In a recent study, participants were presented with the same action embedded in two different contexts (Iacoboni et al. 2005). In one case they observed an actor grasping a cup lying on a table set for breakfast while in the other case they observed an actor grasping a cup lying on the same table at the end of breakfast. One group of participants had to just observe the actions while another group was required to explicitly state the different intentions subtending the same action of grasping performed by the actor in the two different contexts. Results showed that there was no differential activation of brain areas between the two groups of participants, suggesting that the brain automatically extracts the intentions of observed actions together with the processing of motor aspects of those same actions and of the context in which the actions take place. Indeed, active brain regions in the two groups were those typically belonging to the MNS. In keeping with this,

in another fMRI study, volunteers were presented with video-clips showing actions that did reflect the intention of the agent (intended actions) and actions that did not (non-intended actions). Observation of both types of actions activated a common set of areas including the inferior parietal lobule, the lateral premotor cortex, and mesial premotor areas. When directly comparing brain areas activated for non-intended and those activated for intended actions three regions specifically emerged: the right temporo-parietal junction, left supramarginal gyrus, and mesial prefrontal cortex, known to be involved in attentional processes (Buccino et al. 2007). The converse comparison did not show any activation. Thus, our capacity to understand non-intended actions may be based on the activation of areas signaling unexpected events in spatial and temporal domains, in addition to the activity of the mirror neuron system.

Recently, researchers have investigated the brain structures possibly involved in emotion decoding, postulating that a mirror mechanism should play an important role herein as well. Brain imaging studies showed that a resonance mechanism similar to that described for mirror neurons in the motor cortex is at work in cortical areas controlling the motor responses that accompany emotions. When someone feels pain or disgust and when she/he observes in other people the emotional responses elicited by painful or disgusting stimuli, two main cortical structures are activated: the cingulate region and the insula. This finding clearly indicates that perceiving and observing someone else's feelings and emotions activate the same neural substrate which allows us to feel those same emotions.

Cross-References

- [Action Control](#)
- [Autism](#)
- [Emotion](#)
- [Empathy](#)
- [Functional Magnetic Resonance Imaging \(fMRI\)](#)

- [Neurophysiology](#)
- [Social Neuroscience](#)

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Mirror Neurons

- [Mirror Neuron System](#)

Mistery

► Grace

Model

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Generally, one could say that a model represents something different than itself. A model can be defined as “a mental construction that based on the reality, reproduces the main components and relationships of the analyzed segment of the reality.” Simply put, models serve as tools for understanding reality. These models should not be regarded as entirely realistic but as simplified versions of the reality to be explained and, thus, always in some sense selective. Such comprehension of models has been used in empirical science since Galileo and are seen as *isomorphic representations* of reality, because they are simpler than reality but emphasizing its main features or, at least, those most relevant to the object of research (Cavero 2004). However, similar to the fact that there is no consensus concerning the meaning of model, there is no consensus concerning the meaning of isomorphism. Zbigniew William Wolkowski says that isomorphism may be defined in three different ways: Firstly, as “a one-to-one correspondence between elements in different systems such that the relationship between the elements is preserved”; (Wolkowski 1993, p. 61) secondly, as “a perfect analogy” (Wolkowski 1993, p. 61), that is, everything that the one system has, the other also has, and whatever happens in the one system, also happens in the other and conversely; thirdly, “whenever the symbols of one mathematical model stand in one-to-one correspondence with those of another, including the symbols of

relation, and whenever the relation is preserved when a pair of symbols in one model is replaced by their counterparts in the other, the two models are isomorphic” (Wolkowski 1993, p. 61).

Philosopher Ronald Giere does not understand *systems* in terms of *models*. He writes that “[instantial] models will [...] be isomorphic, that is, there will be a one-to-one correspondence between the elements of the different models” (Giere 1999, p. 42). However, the models in question must be *physical* and not merely mathematical (Giere 1999, p. 42). Cavero understand models as used in empirical science as *isomorphic representations*, while Giere makes a distinction between *interpretive or instancial models*. Instancial models provide an interpretation of a set of uninterpreted axioms, and *representational models* are “tools for representing the world” (Giere 1999, pp. 41–43). However, not all agree that models are isomorphic to reality and some make a distinction between models that (simplified and selective) *represent* reality, for example, simplified models of the universe; models that *replace* reality, for example, rats (instead of human beings) in medical research and *analogies*, for example, waves of water as analogies for waves of light.

Clearly, there is no real consensus on the understanding of isomorphism. Another idea is to distinguish isomorphic models by dividing them into *representative* isomorphic models and *structural* isomorphic models (Runehov 2007). From what is said above, it follows that representative isomorphic models should correspond one to one with the reality or substructure of that reality which it is meant to represent in such a way that the relationship is preserved.

A good example would be building models for *archaeological ships*. The constructors use precise details (material such as different sorts of wood, paintings, sizes of different parts, etc.) derived from the archaeological remains and preserved documentation of the ship to build the model to scale. Such models are used to rebuild the ship in full size, to put it in a historical museum or as research and study objects.

A good illustration of an isomorphic structural model is a city map. The different lines on the map represent the streets, railway lines, water, parks, and squares of the city. However, these lines (and thus the map) are not representative in the sense that they are reconstructed with the same details as the streets, railway lines, and so on, of the city. Structural models are also scale models, but they do not correspond one to one with the *real* city in the way the scale model of the ship corresponds with the *real* ship.

However, city maps are based on experience and measurements. For instance, we have the possibility to take satellite pictures, a possibility Gerardus Mercator did not have. Hence, the exactness of city maps (and other structural isomorphic models) varies with the amount and quality of information scientists have at their disposal.

Most but not all isomorphic models used in science are structural isomorphic models. Other models that are used are those with analogies and metaphors and *theoretical model* (Giere 1999). Clear examples of such theoretical models are Newton's laws, the Schrödinger equation, and the principle of relativity.

One variant of such theoretical models is known as the *deductive-nomological* (DN) explanatory model, which was created by Carl Hempel and Paul Oppenheim, explains events and things by way of scientific laws and theories. It is an idealized model that favors simplicity and aims to replace dubious and "ambiguous talk about the world with clear and precise talk about language (Hobbs 1993, p. 5). The DN model consists of an *explanandum* (a description of the phenomenon to be explained) and an *explanans* (a set of sentences being offered to account for it such as a scientific law). Thus, it is sentences that are explained rather than events. The explanation is deductive and ignores contextual factors (Hobbs 1993, pp. 3–10).

Another model used frequently in science is the *causational explanatory model*. That something x caused something y implies that x precedes y . Furthermore, if something x is true, then something y will follow, is logically valid. That the eight o'clock train was

delayed (x) caused me to miss my appointment with my son (y). However, it is important to note that causal necessity (in the causal model) is not equal to logical necessity, because causal necessity (in the causal model) is not equal to logical necessity, because causal necessity (in the causal model) only refers to a relevant causal factor that is specific for a thing to be in a certain way or for an event to happen. To illustrate this, if you hit the vase with the hammer, the vase will break, that is, your hitting the vase with a hammer causes the vase to break. According to the rules of logic, this implies that if the vase is not broken, you did not hit it with a hammer. This clearly is not what is meant by causal necessity as used in scientific causal models. Rather, what is meant is that the hammer and the vase are constructed of such material that when the hammer strikes the vase, the vase will break. The causing factor is the smash of the hammer being constructed in a specific way, striking the vase. An interesting distinction is the distinction between explanatory and exploratory models. Explanatory models are models as defined above which are used to explain that which is already known, for example, a model of the biological functions of the human heart. Exploratory models, however, may lead to further knowledge and insight, such as a model explaining the impact of rapid climate change on human behavior. This model not only explains expected changes in the climate but also explores the consequences this could have for human behavior. However, there is no real borderline between the two (Runehov 2007, pp. 48–51).

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Model Theory

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Description

In a broad sense, ► [model](#) theory is the branch of mathematical logic that studies the connection between formal languages and their interpretations, the latter construed as relational structures. In this setting, the structures obeying the axioms of a formal theory are called the “models” of the theory. More restrictedly, it means the study of models of ► [first-order theories](#) (Chang and Keisler 1973; Hodges 1993; Marcja and Toffalori 2003). Besides its foundational character, the model theory of first-order logic has become in the latter years one of the finest tools to solve classical mathematical problems, it has, moreover, strong relevance for other disciplines ranging from computer science to philosophy. Since the emergence of Syllogistics in Greece, the general trend of the development of logic was a gradual elimination of any ontological commitment, movement that culminated with the full formalization of mathematical theories at the beginning of the twentieth century. Preceded by some results of Löwenheim and Skolem, Kurt Gödel’s ► [completeness](#) theorem of first-order logic brought back semantics to logic and inaugurated model theory (Gödel 1930). His 1939 proof of the relative consistency of the axiom of choice and the continuum hypothesis by means of an inner model of set theory (the constructible universe) confirmed the importance of the model

concept. Model theory of first-order logic became a subject in its own in the middle of the twentieth century due to the works of Abraham Robinson (Robinson 1963) and Alfred Tarski (Tarski 1954), who introduced a wealth of new logical concepts and techniques to build and compare models. These fructified very soon in impressive results as Morley’s uncountable categoricity theorem, Robinson’s nonstandard analysis, Keisler’s ultrapower theorem, and the model theoretic solutions of various problems in classical mathematics, as Artin’s conjecture on solvability of homogeneous polynomial in p-adic numbers. Parallel developments were Cohen method of forcing to build models of set theory (Cohen 1966), Kripke semantics for first-order modal and intuitionistic logic, and Lawvere-Joyal categorical semantics for higher order intuitionistic logic (Goldblatt 1979). First-order logic is by far surpassed in expressive power by higher order logics, logics with new kinds of quantifiers, or (ideal) logics with infinitely long expression, but Per Lindström gave around 1969 a characterization of first-order logic as the most expressive containing the classical connectives and satisfying compactness and the downward Löwenheim-Skolem theorem, and similarly for other combinations of model theoretic properties. This gave rise to the systematic study of the hierarchy of logics partially ordered by expressive strength (Barwise and Feferman 1986). These logics restricted to finite models resulted in a useful tool to describe algorithmic complexity classes. In the last years, the main quest of model theory has been the classification of definable subsets of models of first-order theories (Shelah 1990), inspired in ideas of Morley, Shelah, and Zilber, which has allowed deep applications of logical methods in mathematics as Hrushovski’s proof of the Mordell-Lang conjecture in positive characteristic.

Self-identification

Science

Being part of pure mathematics, model theory self-identifies as a science inasmuch as

mathematics is considered a science. Being a division of logic, it shares the debate about the place of logic among the sciences and whether it is a science at all. In any case, its relevance for other disciplines, ranging from computer science to philosophy, gives it a special status among the sciences.

Characteristics

Model theory distinguishes itself from the other branches of logic (set theory, proof theory, recursion theory, nonclassical logics) by its object of study: the interrelation between syntax and semantics, particularly in the case of first-order logic. Although it shares with modern mathematics the classification of structures as a main object of study, it utilizes powerful logical methods unknown to ordinary mathematical practice.

Relevance to Science and Religion

The issue “science and religion” does not arise in model theory. Although a great part of the development of model theory could be considered philosophically motivated, this discipline is metaphysically neutral. On the other hand, model theory deals (in an avowedly limited but exact way) with concepts to which religion usually attributes great importance: truth, validity, worlds, knowledge, infinite, etc., being able to make subtle mathematical distinctions in these matters unavailable to theology or philosophy.

Sources of Authority

The only accepted validation criterion in model theory is mathematical proof or the explanatory power and productivity of proposed new concepts. The oldest and for many years the most influential periodical has been the *Journal of Symbolic Logic*. The book by Chang and Keisler (Chang and Keisler 1973) has been the most influential textbook. Some of the leaders who

signaled the conceptual bases of model theory and determined its development along the twentieth century are Kurt Gödel, Alfred Tarski, Abraham Robinson, Anatolin Malcev, Andrej Mostowski, Roland Fraïssé, Michael Morley, Richard Vaught, Jerome Keisler, Paul Cohen, Saul Kripke, William Lawvere, Angus Macintyre, and Saharon Shelah.

Key Values

Intellectual rigor, thirst for a description and explanation of all conceptual possibilities of being.

Conceptualization

Nature/World

“Nature” may have a local meaning: the complete system of the Earth, or a global one: the Universe. It could be construed model theoretically as the (local or global) bio-physic structure from which we are part and in which we act. In more restrictive terms, it would be a particular model of the physical theories in vogue, an incredibly complex differential or topological variety. “World” may be synonymous of nature, but it could refer technically to the following: (1) a particular model of an axiomatic set theory and (2) any one of the structures associated to the nodes of the relational frame in a Kripke model for modal, temporal, or intuitionistic logic.

Human Being

Mathematical logic and model theory pretend to understand the use of language for conveying information and drawing logical consequences, a characteristic human activity. Human imagination seems to be a kind of model-building ability. A reasoning agent plays an important role in the early interpretations of intuitionism, and several rational agents in the game semantics of classical and nonclassical logics. Although we may conceive objects exerting all observable functions of a human being belonging to various models of nature, these do not

capture the conscious human being able to place him(her)self outside of any model and to reflect about his(her) own reasoning activity.

Life and Death

Model theory does not address the usual conception of life and death attributed to biological beings. In models of physical theories, one may call life of an object the temporal interval on which the function representing it reaches a certain threshold. In models of temporal or intuitionistic logic, the life of an individual would be the domain of the local section representing it.

Reality

Between all possible models of nature, reality would be the “actual model,” but model theory does not seem to provide means of distinguishing it.

Knowledge

Model theory teaches that it may be impossible for a human being to know, even potentially, all properties expressible in a given language of a given structure. That is the case of the first-order properties of the arithmetic structure of the natural numbers, due to Gödel’s incompleteness theorem. On the other hand, Gödel’s completeness theorem says that the common truths of all models of a first-order theory are potentially knowable in a very precise and mechanical way, or by the time-honored methods of mathematical proof. Model theoretically speaking, knowing a theory would be not only deducing the consequences of its axioms but giving an account of all its possible models. Speaking about models of set theory, one may say that one model “does not know” certain property it has. For example, it may appear to be uncountable when viewed from *within* the model but to be countable to someone *outside* the model.

Truth

A well-defined mathematical relation between formulas and structures, usually inductively defined on the syntactical structure of the

formulas. If the structure A and the formula φ are in that relation, we say that φ is true in A (also: A satisfies φ , A is a model of φ). The truth of a formula is relative to the structure in which it is evaluated. In fact, mathematical truth does not seem absolute since it depends on the axioms of set theory one considers and, for a fixed axiomatics, on the model one considers.

Perception

Sensorial perception does not play a role in model theory.

Time

A dimension of the models of physical theories. In this conception, the models “contain” time, but they are out of time. In fact, all classical mathematical structures are similarly atemporal and their logical laws are immune to the structure of time. However, in certain nonclassical logics, time is a logical category explicit in the syntax, as in temporal or dynamical logic, or implicit in the way formulas are interpreted, as in intuitionistic logic. In this conception, logical laws may depend on the structure of time.

Consciousness

The consciousness phenomenon is an essential feature of our own experience, but it seems unreachable to any science because it does not seem necessary for any external description of the human activity.

Rationality/Reason

A human characteristic (see “[human being](#)” above). Mathematical logic attempts to describe and explain purely conceptual rationality. It has been successful with respect to the mathematical deductive discourse.

Mystery

Understood as things which cannot be known, even in principle, model theory provides many instances of “mysteries”; for example, the set of true sentences of arithmetic, the truth status of the continuum hypothesis, and the existence

of certain mathematical objects (certain great cardinals are colorfully labeled as undescrivable, ineffable, etc.).

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Models of How to Relate Science and Religion

- [Typologies in Science and Religion](#)

Modern Buddhism

- [Buddhism in the West](#)

Modern Hebrew

- [Language and Literature, Hebrew](#)

Modernity in Buddhism and in Islam

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Related Terms

[Allah](#); [Buddha](#)

Modern Appeal of Buddhism

Description

Amid the growing trend of secularization throughout the world, the appeal of Buddhism continues to increase. Buddhism, one of the oldest existing religions, continues to attract practitioners, not only in traditionally Buddhism territories, such as China and Japan, but also in the Western world. Important to this modern appeal, Buddhism gives the follower a complete and total way-of-being in the world that is directed toward the maximization of the individual's spiritual, mental, and physical well-being. Even the lay Buddhist adherent attempts to implement Buddhist thought and meditation in every act of living, thus allowing the *Four Noble Truths* and the *Eight Fold Path* to guide his or her life.

The Eight fold Path is developed by Siddhartha Gautama, and it is the way toward the liberation of the individual from his attachments and delusions. The ultimate goal is the cessation of suffering. They are broken up into three categories: (1) wisdom, comprised of right view and right intention; (2) ethical conduct, comprised of right speech, right action, right livelihood; and (3) concentration, comprised of right effort, right mindfulness, and right concentration. *The Four Noble Truths* are the basic formulation about suffering that was developed by the Buddha. They are as follows: (1) All of life is suffering. (2) Suffering is caused by attachment. (3) The cessation of suffering is possible. (4) The Eight fold Path can bring the cessation of suffering. These four statements represent the foundation of Buddha's understanding of human existence.

Buddhism ultimately developed out of Siddhartha Gautama's reaction to troubling aspects of human life. Having been born into a palace life-of-luxury, near the border between Nepal and India around 2,500 years ago, the *Buddha* or "enlightened one," was deprived of no material comfort, but was however lacking in the real human experience of suffering, until one day he escaped his palatial paradise and viewed human existence in all its ugliness. He was shocked by the site of the sick, the old, and the dead, and deduced that all of life was suffering. Furthermore, this suffering seemed to him to have no end, as the Hindu understanding of time posited the cycle of rebirth (*samsara*) that would ultimately lead the believer into another round of suffering. Somehow, for Siddhartha, this endless cycle of decay and death needed to be transcended. Having seen that the life of indulgence did not bring an end to suffering, Siddhartha attempted asceticism, but found no relief from suffering there either. Eventually, Buddha developed what he called the "middle way" – a path toward the "release" (*Moksha*) from of the cycle of rebirth, yet situated between the extremes of sensual pleasures and self-mortification. This new way of being-toward-enlightenment puts stress on practicality and simplicity in the contemplative life, while trying to avoid the extremes of asceticism and indulgence that ultimately become obstacles in the path toward enlightenment. Salvation from the suffering of the world comes through the "obtainment of enlightenment" (to literally become a Buddha) through the realization and understanding of reality itself. Once a devotee has obtained the status of a Buddha, he has achieved *nirvana*, or the ultimate state of "nothingness" (the literal absence of the former subject). Unlike the Abrahamic notion of heaven and hell, which can be understood as a physical place or a state of being, *nirvana* is explicitly understood as a state of nonbeing, and therefore not a place in space and time. Buddhists often use the metaphor of a candle flame literally being "blown out" to signify that what once was is now nonexistent or emptied.

Buddhism has a tripartite constitution, or the *Three Jewels*. This consists of the Buddha (Siddhartha), the dharma (Buddha's teaching and example), and the Sangha (community). In order to achieve enlightenment, a Buddhist practitioner must "take refuge," in the Three Jewels for their spiritual nourishment, for it is the Three Jewels that will aid the bodhisattva (an adherent prior to obtaining buddhahood) in obtaining enlightenment.

Despite the immense difference it has with traditional Western religions, Buddhism has attracted many new followers in the West and has had numerous revivals in its historical territories. For instance, in the West, the often perceived "impoverishment of meaning" through the increasing secularization of the modern world has generated a desire to reconnect with spiritual matters. Although consumerism has provided an abundance of material goods in wealthy countries, it has failed to provide existential meaning to many individuals' lives, which has ultimately led to their investigation of other religions. This need to explore alternative religious traditions has led many to Buddhism and to its nontheistic focus on the individual's redemption, spiritual well-being, and peaceful living. Its lack of theological concern, as can be found in the Abrahamic religions, has also allowed it to be practiced by those adherents of traditional Western religions as it causes no theological conflicts with their previously held beliefs about God.

Unlike many other religious traditions that are tied with nationality, race, tribe, or geography, Buddhism remains free from such restraints. In this sense, it can be considered a universal tradition that is adaptable to any and all cultures. Where others are tied to ethnic or nationality, Buddhists are free to invite converts from all nations and races.

Self-Identification

Science

Buddhism does not consider itself a "science" akin to modern natural sciences. Yet, unlike other religions, who see scientific explanations of reality as competition with their own, and therefore a threat, the history of Buddhism does

not bear such hostility to a natural or causal explanation of the physical world. With this in mind, Buddhism does see a close connection between its teachings on mediation, balance, and mental health to be precursors to psychology. Although psychology does not have an existential claim to salvation, it does share the concern for a peaceful and stable way of being in the world. This shared focus, centered on the individual, has led to some interesting work exploring their common concerns and common methods, especially in the book *Zen Buddhism and Psychoanalysis* by the psychologist Erich Fromm and Zen Master D. T. Suzuki. However, the same critique leveled against depth psychology or analytical psychology by cognitivists and behaviorists, that it is not scientific because there is no way to employ the scientific method upon its claims, would also be leveled at Buddhism if it were to claim to be a “science.” Most Buddhists claim that science is unable to answer all the questions and concerns about the human spirit, suffering, and the need for spiritual wholeness. These are topics in which science can uniquely contribute their own opinions, but are ultimately limited in their ability to adequately address the human being in his or her totality of experiences. Buddhism, while accepting many claims of the science, attempts to go beyond that which science can explain, and penetrate into the spirit of the human being, a realm that the natural sciences is unfamiliar with and incapable of understanding in a nonscientific way.

Religion

Despite the historical fact that the Buddha would not have claimed to have founded a “new” religion, the Buddhists of today understand that their explanation of reality and orientation of action fits the definition of a “religion.” In many ways, Buddhism is seen by their adherents to be a complete and total “way-of-being” in the world, as opposed to a “religion.” From the beginning of the tradition, Buddhism has proved to be a very fluid tradition. Early Buddhism’s minimal postulates have developed into much more complex forms of Buddhist practices, especially as it traveled farther from its

historical origins in the Indian subcontinent. Zen Buddhist practices, although rooted in Gautama’s basic postulates and practices, have developed a highly complex monastic life and monastic rituals, which bear little resemblance with early Indian Buddhism.

Characteristics

The modern appeal of Buddhism rests in its ability to answer the unanswered existential questions that still plague humanity in our secular age. Modern Western Buddhism is distinctively atomistic, focused on the salvation and well-being of the individual, which gives it great appeal to those socially mobile in the West where individualism is the dominant ethos. Furthermore, Buddhism is nondogmatic in comparison to traditional Western religions. Buddhism tends not to be threatened by the theological claims of other religion but rather adapts itself to various way of life. Because the Buddha does not claim to be a divine being, but rather a source of spiritual emulation, modern believers in Christianity, Judaism, etc., can incorporate Buddhist beliefs and practices into their daily lives without creating theological contradictions. In many ways, Buddhism has become a spiritual supplement for many believers in traditional Western religions. Indeed, it is well known that many Catholic and Anglican monks, including the famous Trappist monk Thomas Merton, have attempted to incorporate Buddhist meditation into their daily routines in the monastery.

Relevance to Science and Religion

Buddhism tends to be very ecumenical in its interactions with other religions, and many Buddhists have been open for a scientific study of religion. Although the methods of such study is secular and generally from the outsider’s approach, the ultimate goal has been a much more religious one. Buddhists tend not to want to deconstruct other religious traditions to find a flaw that they can drive a wedge through, but to find the commonalities between the religions in order to find common ground for discourse. Thus, similar to Islam, Buddhists are rarely effected by modern historical and textual research on their

tradition, but tend to be interested in the scientific study for the purpose of understanding the “other” and their religious worldview better.

Sources of Authority

Although certain sects of Buddhism have developed a sophisticated structure of authority, such as in Tibet with the Dalai Lama, Buddhism as a whole has never developed a centralized authority like the Papal authority in Catholicism, nor has it ever postulated a body of canon law that governs all the adherents uniformly. Because of this fluidity, Buddhism’s various branches have developed their own local systems of religious legislation, but all have attempted to root their authority within the basic structure of early Buddhism, that is, the Four Noble Truths, the Three Jewels, and the Eightfold Path. If there is anything that could be understood as supremely authoritative, it would be these three conceptions. However, due to this lack of formal structure, Buddhism by nature is very diverse, and often reflects the culture that it is in. This fluidity and diversity has been a strong factor in the appeal of Buddhism to postmodern thinking individuals in the West as it can easily adapt to Western culture.

Ethical Principles

A very important value that guides Buddhism is the ethic of nonviolence. Buddhism shares Hinduism’s belief in the cycle of samsara, and the negative effects of karmic energy. In order to avoid an unfavorable rebirth, the Buddhist adherent should live in such a way that nothing is harmed in his quest for enlightenment. This peaceful living, coupled with an intense concentration on the salvation of the individual from human desires and the power of rebirth, is the core value that guides the bodhisattva. As a missionary religion, Buddhism desires to bring more individuals into the community. For the Buddhists, the compassion for the suffering of others in this life is a motivational force to bring converts into the fold and to show them the way to end the suffering caused by desire. This urge to “save” the other from his present suffering motivates the believers to do missionary work.

Key Values

The most important value that drives Buddhists to do missionary work is the compassion they have for the other and the desire to decrease the suffering in the realm of living beings. They feel that they have the answer to the cessation of the horror and suffering of human existence and want to spare others from that fate. Therefore, social solidarity, rooted in eschatological concerns, drives the believers to spread their message to others.

Conceptualization

Nature/World

Buddhists are to live harmoniously within the natural world. Nature is to be respected by only taking from it what is needed for survival, while avoiding all acts of violence upon it. It is understood by most Buddhists that nature is amoral in and of itself; it lacks a morality as it lack agency. In this way, the Buddhists take a more pragmatic approach to the natural world: it is both beautiful and ugly, it is both productive and destructive, and it is both something to be admired as well as overcome. The natural world can be a major obstacle to enlightenment as attachment to this world is a source of desire and therefore suffering. Although the Buddhist is to live in harmony with this world, part of that harmony is nonattachment to this world and nature.

Human Being

Buddhists view human beings to be one part of an over system of life on the planet. Furthermore, they are one among many forms of sentient beings (beings with a mind and thought) that inhabit the earth. However, the special quality of humanity is that it is the only species that can break through the cycle of rebirth and obtain enlightenment.

Life and Death

Buddhists believe in the perpetual existence of life: that the individual will go through the cycle of rebirth forever until he or she is able to break that cycle through enlightenment. Once enlightenment is obtained, nirvana, or the emptied state of nonattachment, is the state-of-being in which the new “Buddha” lives. Since time is not

understood in a linear fashion as it is in the Abrahamic traditions, but is believed to be cyclical, Buddhists do not “fear” death in the same way as most Westerners. The cycle of rebirth (samsara), guarantees that the renewed existence of the spirit (atman) in the next life. If Buddhists fear anything about death, it is that they will not obtain enlightenment within a given life span before that particular death.

Reality

Like other religions, Buddhists see reality through a tragic lens. The mystical tradition of Buddhism and the prophetic tradition of the West both attempt to understand reality as the way things *are*, while focusing most of their attention on how the way things *should* be. Buddhists attempt to live within the world, without being a part of the world, in fear that to become fully absorbed or well adjusted to this world would have a negative eschatological effect on their lives. Buddhists emphasize the cessation of the suffering of reality by escaping its effects through a retreat into the Buddha, dharma, and Sangha.

Knowledge

Buddhists have maintained an almost exclusive concentration on spiritual knowledge: a knowledge that will lead them to enlightenment. Consequently, even when individual Buddhists engage in public discourse concerning political and economic matters, they do so from the position of spiritual value. The proper knowledge of the spirit and the human condition of suffering allows Buddhists to engage in public discussions of the good they wish to establish the social conditions that are best suited for the cessation of human suffering. Buddhists have relied on their vast resources of knowledge to argue their positions in their attempts to make their traditions attractive to outsiders. Indeed, the wealth of learning and the tradition of intellectualism in Buddhism has been a major factor in attracting converts.

Truth

Buddhists believe that absolute truth exists. They understand that there are universal norms and

laws that can be postulated by the humans such as Gautama Buddha and other Buddhas. These norms and laws are based within the experience of the Buddhas with cosmic norms. Truth can be established by spiritual experience, not only through empirical experimentation. Buddhist communities understand their founding figures to be exemplars of that truth and as such attempt to understand and implement their teachings into their own lives, thus embodying the truths that their founding figures articulated. Therefore, for Buddhists, the truth of Buddha, dharma, and Sangha can be verified through the personal attainment of enlightenment by the bodhisattva.

Perception

Buddhists remain skeptical of human perceptions, as they are easily misguided or misinformed. The Buddhist teachings for the attainment of enlightenment are used as criteria for which to judge the perceptions of the believers. Anything in contradiction, or that cannot be reconciled with the norms of the tradition, will be helpful in suspecting a misguided perception.

Time

In Buddhism, time is cyclical and constantly reoccurring. Time therefore is a force to be overcome by Buddhists. Often symbolically depicted as the demon “Mara,” representing death, Buddhists seek to overcome physical impermanence and time through the attainment of enlightenment.

Rationality/Reason

Buddhism’s relationship to reason and rationality, as a way of thinking about religion, really began in the modern period, when Buddhism met Western thought. Until that time, the mystical, not bound to formal logic or reason, was the creative force behind Buddhist cosmologies/theologies. Nevertheless, contemporary Buddhists understand reason to one of many avenues to understand human existence, the cosmos, and all that is. Yet Buddhists do not necessarily believe that reason is the only faculty that humans have for understanding existence, but is limited by its

very structure. In agreement with the Western philosopher Kant, Buddhists believe that reason cannot penetrate the thing-in-itself, that is, the phenomenon that as it is. Enlightenment, no skilled reason, reveals the mysteries of the universe in their totality.

Mystery

Buddhists understand that not all things can be comprehended or even known by human beings, and that there are aspects to existence that will always remain a mystery. This “mysterious” is not seen as a deficiency within the tradition but as an understanding that not all things can be grasped within the limitations of the human mind.

Relevant Themes

We do not see any other concepts, etc., that are important for our discussion on science and religion at this time.

Modern Appeal of Islam

Description

Amid the growing trend of secularization throughout the world, the appeal of Islam continues to increase. Islam, the youngest of the three Abrahamic-monotheistic religions, is gaining converts in the West as it enjoys a revival in the traditional Islamic world. Important to this modern appeal, Islam understands itself to be a complete and total way of life, rejecting the separation of the private and public spheres. Taking Prophet Muhammad of the seventh century as their example, *Muslims* believe that Islam informs and guides every aspect of life. Today, much of the Muslim world is beginning to reject the claim that Muslims must live according to secular governments, economy, and education system, and are attempting to reintroduce Islam into the public sphere in total. For others, fearing the complete Islamization of society, these Muslims all appear to be modern fundamentalists. Nevertheless, even average Muslims who reject Islamic fundamentalism and extremism are calling for a new birth of Islam within society: that Islam should emerge once again at the center of Islamic life.

Islam was founded in the time of *Jahaliyya* (age of ignorance) in seventh-century Arabia by Prophet Muhammad ibn ‘Abdallah. In distinction from the social, political, and economic contexts that surrounded him, which was marked by slavery, female oppression, clan warfare, drunkenness, and polytheism, Muhammad attempted to introduce a radically different set of priorities. He focused on the emancipation of slaves, equality for women, unification of clans, sobriety, and strict monotheism; all of which were rooted in the Islamic imperative to create a just society. According to the tradition, *Allah* (God) delivered his divine message to the Prophet through the angel Gabriel (Jibrail) and was later compiled in what is called the Qur’an. It is important to note that Muhammad’s teachings and actions are not recorded in this sacred text, but in the books of *Hadith* (sacred traditions), which serve not only as a guide for Islamic belief in actions, but also as a tool in interpreting and understanding the Qur’an. Islam insists on five basic pillars: (1) the *Shahada*, or “declaration of faith.” It states, “There is no god but God, and that Muhammad is his Messenger.” (2) The Muslims are enjoined to make the ritual prayers called *Salah* five times a day at specific times. (3) *Zakat* (almsgiving), Muslims are commanded to designate a set portion of their excess income to the poor and needy. (4) *Sawm*, or fasting during the month of Ramadan, in which the believer does not eat, drink, smoke, or have sexual relations between sunrise to sunset for the entire month, and (5) Every Muslim, both male and female, have the obligation to make the **Hajj**, pilgrimage to Mecca, at least once in a lifetime. These five “pillars” represent the minimum qualification for a Muslim to identify himself or herself as a believer.

Since the twentieth century, Islam has attracted many new followers in the West and has had a revival in Muslim majority territories. Although some reasons for Islam’s new attractiveness are similar to other religions that are gaining converts, many are very different. For instance, the often perceived “impoverishment of meaning” through the increasing secularization of the modern world has generated a desire to reconnect with spiritual values.

Although consumerism has provided an abundance of material goods in wealthy countries, it has failed to provide existential meaning to many individuals' lives, which has ultimately led to their investigation of other religions. In the West, this need to explore alternative religious traditions have led many to Buddhism, and its nontheistic focus on the individual's redemption, and Islam, with its focus on social justice and its more traditional understanding of social values. Furthermore, the increasing Westernization of Islamic lands have fueled a reactionary return to traditional identity, often due to the fear of seeing the disintegration of the native culture. In the case of Muslim world, a much more militant form of Islam has often developed in reaction to globalization and Westernization.

Unlike many other religious traditions that are tied with nationality, race, tribe, or geography, Islam remains free from such restraints. In this sense, Islam is often considered a universal religious tradition. Where others are tied to ethnicity or nationality, Islam is free to invite converts from all nations and races.

Self-Identification

Science

Islam does not consider itself a "sciences" akin to the natural sciences. Yet, unlike other religions, which see scientific explanations of reality as competition with their own, and therefore a threat, the history of Islam does not bear such hostility to a natural or causal explanation of the physical world. Islam has had a long history of scientific discovery and development. Having spread from Arabia to Spain in the West, and India in the East within a few hundred years, the early Muslim community absorbed and augmented the technological, mathematical, philosophical, and medical knowledge of the territories they encountered. Muhammad himself commanded his followers to "seek knowledge from the cradle to the grave." The "scientific" advances of Islamic Spain, al-Andalus, which were rooted in many cases in Baghdad, were to be the foundational sciences in the European Renaissance and later the Enlightenment. Muslims understood scientific examination of

the physical world as a way of understanding Allah's creation. Unlike in medieval Christianity, where science was experienced as a competitor, the Muslims understood the exploration of natural phenomenon as a "religious science." Indeed, Muslims are often fond of saying that doing natural science is a way of understanding the divine, as to understand the divine's creation is a moment of comprehension of the divine itself. Bearing this in mind, Islamic society has often been at the forefront of the natural sciences, a historical fact so often forgotten in the West.

Religion

Despite the historical fact that neither the Buddha or Muhammad would claim to have founded a "new" religion, the Buddhists and Muslims of today understand that their explanation of reality and orientation of action fits the definition of a "religion." In many ways, both Buddhism and Islam are seen by their adherents to be a "way-of-being" in the world, as opposed to a "religion." Islam insists that it is a complete and total way of life, perfected by Prophet Muhammad. Consequently, as a "perfected" religious tradition, any later *innovation* (bid'a) within Islam is condemned. The opposite may be true in Buddhism, which from the beginning was a much more fluid tradition. Early Buddhism's minimal postulates have developed into much more complex forms of Buddhist practices, especially as it traveled farther from its historical origins in the Indian subcontinent. Zen Buddhist practices, although rooted in Gautama's basic postulates and practices, has developed a highly complex monastic life and monastic rituals, which bear little resemblance with early Indian Buddhism.

Characteristics

The modern appeal of Islam rests in its ability to answer the unanswered existential questions that still plague humanity in our secular age. Islam has a stubborn resistance to the secularization process and the atomization that follows it. It insists on the importance of the social dimension of life: family, society, community are utmost concerns. Because of this, it has great appeal to those who find themselves alienated within a secular and

individualistic culture. Furthermore, many modern people have lost faith in the social values that were once norms that society aspired to. The modern secular world has all but limited or nullified the truth-content of concepts such as truth, justice, and freedom; they have become catch words that have been exploited and drained of their meaning by politicians, advertisements, and militarists. The modern revival of Islam emphasizes the rescue of such values, principles, and concepts, by reintroducing them into popular discourse with their substantive meanings restored. For Muslims, these notions are deeply rooted in normative religious beliefs, emanating from the life of Prophet Muhammad, the Qur'an, and early Muslim community, and as such cannot be diminished of their meaning potentials. This stubbornness toward the functionalization and depletion of meaning potentials in normative values is very attractive to those who see life quickly becoming about *having* and not *being*.

Relevance for Science and Religion

There is not much interested in the scholarly study of "science and religion" within the Muslim world. The secular – outsider's – approach to the study of world religions is a foreign concept to Muslims who see all activities to be a form of religious life. In that sense, a Muslim could study religion and science from the academic angle, but he or she would still, at least in the Islamic sense, be doing a religious act; for study is a commandment of the divine in Islam. In this sense, the academic study of religion, which by no means is completely absent in the traditional Muslim world, is a religious act itself. Consequently, the advances in historical research on the origins of Islam have no real effect on the way Islam is understood or practiced by Muslims. As of now, the secular Western tradition of "higher criticism," which has examined various aspects of Christianity for centuries, has produced no measurable change in Islam or the Islamic world.

Sources of Authority

Islam has a comprehensive understanding of authority. The Qur'an, with the help of the hadith, is the textual authority, while the Imams

(pray leaders), 'Alims (scholars), and Shaykhs (preachers) represent the clerical authority. In Shi'a Islam, the minority sect of Islam, there is a very strict clerical structure within the 'ulama (community of scholars), with the highest possible position achieved being the Ayatollah (sign of God) and a Marja-i Taqlid (source of emulation). In Sunni (majority sect) Islamic history, the Khaliph (successor) of Prophet Muhammad held temporal and often religious authority over those in his dominion. However, the First World War saw the cancellation of the Khaliph in Istanbul with the destruction of the Ottoman Empire. Ultimately, it is the legal and theological scholars that hold authority within Islam, but their ability to impose their legal and theological rulings on the Muslim community is limited, unless through certain political structures such as the theocratic government of Shi'a Iran.

Both Sunni and Shi'a Muslims agree that the Qur'an is the highest authority within Islam because it is recognized as being the "kalam Allah," or the "speech of God." Muslims have been careful over the centuries to preserve the Qur'an in its original Arabic language. A translation of the Qur'an is not accepted as the Qur'an, but only a "translation of the meaning." The revelation that was given to Prophet Muhammad during his 23 years of prophethood was in the Arabic language; therefore, only the Qur'an in its original language has the authority that comes with being the word of God.

For the Shi'a, authority begins with Allah, who bestows a certain level authority on to Prophet Muhammad, who designated his cousin and son-in-law 'Ali ibn Abi Talib to be his successor, a claim that the Sunnis have rejected. The Shi'a also contend that the 'Ali's authority was passed down to his sons Hasan and Hussein, who would later pass down their authority to the following Imams. In all, the Shi'a believes that the last of the Imams, Muhammad al-Mahdi, remains the sole legitimate authority on earth, but he has been in "occultation" since 874 CE/AD.

Ethical Principles

In Islam, the most important value is that of radical oneness (tawhid) of the divine. The one

God of Islam commands his followers to be “*in* the world” but “*not of* the world.” With this radical monotheism comes a strict ethical code that is focused primarily on piety and righteous behavior. Islam, like Judaism, is an orthopraxis religious tradition that insists on ethical behavior based on the prophetic model of Prophet Muhammad. Furthermore, Muslims are enjoined to abide by the norms of the juristic code (Shari’a) that has been developed within the first centuries after the death of the Prophet, and continues to be a source of ethical and moral guidance. As an evangelizing religious group, Muslims desire to bring more individuals into the community. In Islam, this life is a test to determine whether or not the individual is worthy of paradise (jannah) that the divine is offering. In order not to end up in the hell-fire (jahennum), the Muslims attempt to spread Islam by way of *dawa* (evangelism). This urge to “save” the other from his or her future suffering in hell (Islam) motivates the believers to do missionary work.

Key Values

The most important value of Islam that motivates Muslims to do missionary work is the compassion they have for the other. They feel that they have the answer to the cessation of the horror and suffering of human existence and want to spare others from that fate. Therefore, social solidarity, rooted in eschatological concerns, drives the believers to spread their message to others.

Conceptualization

Nature/World

In Islam, nature is understood to be a creation of Allah; the Qur’an even encourages the believer to “look to nature” for the signs (proofs) of God are within it. Muslims historically have attempted to live in balance with the natural world: on the one hand, it is seen as a trust from the divine to be used by humanity, but on the other hand that same trust must not be violated by doing unnecessary harm to the planet. Furthermore, the depiction of paradise in the Qur’an is that of a garden, full of

wonderful foods, shady trees, flowing water ponds, etc. In essence, paradise is the natural world in utopian form.

Human Being

In Islam, humanity is a creation of Allah and is finite. There is a special relationship between the divine and humanity that does not exist with other creatures. Allah gave humanity the ability to accept or reject the divine, which determines one’s own fate in the afterlife. Muslims believe that Allah created all humans in a state of “submission,” only later do they decide to either rebel against the divine or accept their natural state of submission to the creator. Furthermore, humans have a special charge over the earth, as it is their trust and their responsibility to care for Allah’s creation. This comes with Allah’s granting humankind with the faculty of reason and sole the recipient of divine revelation; both demonstrate the creator’s favor for his human creation.

Life and Death

For Muslims, all life is created through the act of “willing” by the divine. The Qur’an says the creation comes about by Allah saying “be” and it is. Death is not supposed to be a fearful act in Islam, as it is a homecoming to the divine if the individual led a righteous life. However, the day of judgment, when every individual is confronted with a book of his good deed and of his bad deeds, and is asked to account for them, is a process that every human has to face. Furthermore, as a missionary religion, Islam sees the cessation of life as a possible tragedy or a cause of celebration; either the deceased passed on to a place of infinite torment (Jahennam), or is within the presence of the divine and his prophets (Jannah). Indeed, for the Sufis, mystic Muslims, death of a devout Muslim is described as their “urs,” or “wedding day,” as they are wedded to the divine postmortem.

Reality

Muslims often see reality through a tragic lens. The prophetic tradition of Islam attempts to understand reality as the way things *are*, while focusing most of their attention on how the way

things *should* be. Muslims, as instructed by Muhammad, attempt to live within the world, without being a part of the world, in fear that to become fully absorbed or well adjusted to this world would have a negative eschatological effect on their lives. Muslims insist on transcending this world (*dunya*) by altering and or modifying it to produce a more just society where righteousness and piety can be easily lived.

Knowledge

Islam has mandated the believer to acquire sacred as well as temporal knowledge, with the understanding that both are needed to produce a just society. Muslims have relied on their vast resources of knowledge to argue their positions in their attempts to make their traditions attractive to outsiders. Indeed, the wealth of learning and the tradition of intellectualism is a major factor in attracting new converts, especially among the educated classes.

Truth

Absolute truth exists in the Islamic concept of reality. Islam maintains the belief in universal norms and laws that can be determined by humans as understood by direct revelation from the divine to Prophets. The Muslim community understands Prophet Muhammad to be an exemplar of that truth and as such attempt to understand and implement his teaching and way-of-being into their own lives, thus embodying the truths that the last prophet articulated. For Muslims, the truth of Muhammad's revelation can be verified through the application of Qur'anic norms in personal and social life. The perfection of society and the individual comes through a righteous and thoughtful application of the Islamic ideals.

Perception

Although they do not reject the human intellect, Muslims remain skeptical of human perceptions, as they are easily misguided or misinformed. The sources for Islamic norms are in the Qur'an and are used as criteria for which to judge the perceptions of the believers.

Anything in contradiction, or that cannot be reconciled with the norms of the tradition, will be held suspect of being a misguided perception.

Time

For Muslims, time is not eternal as only the divine can claim to be such. Time is linear in the Islamic tradition, especially in regard to the human life. Humans are born, their life serves as a test, and their death brings them to judgment. Muslims understand that they can effect the occurrences and happening within time, but that time itself is entirely within the realm of other forces, that is, the sovereignty of the divine. However, the limited time in which the individual life exists is a cause of urgency to implement the theory and praxis of the religious traditions.

Rationality/Reason

In the Islamic tradition, reason and rationality, especially in their Aristotelian form, have been employed both in the realm of theology and law. Long before the Western Enlightenment, the Muslim world had been using formal logic within various disciplines, including math, sciences, medicine, geometry, architecture, etc. Furthermore, Islamic theology has been formulated through the use of reason and rationality. The Muslim mystics (Sufis) have pointed to the limitation of the use of reason to understand the divine and have insisted on the "nonrational" experience of the divine through mystic ritual. Reason, on the other hand, is understood to have limits within the Islamic perspective. In agreement with the Western philosopher Immanuel Kant, human reason does not give Muslims the ability to understand the divine as the "thing-in-itself." If humans could do so, their intellect would rival that of the divine's. Therefore, humans can rationally think about the creator and all that is created, but is reminded that the human intellect is allowed only to know that which Allah wants it to know. Anything beyond that transgresses the limitation of reason established by the divine.

Mystery

Islam understands that not all things can be comprehended or even known by human beings, and that there are aspects to existence that will always remain a mystery. This “mysterious” is not always seen as a deficiency within the tradition, but as an understanding that not all things can be grasped within the limitations of the human mind.

Relevant Themes

We do not see any other concepts, etc., that are important for our discussion on science and religion at this time.

Cross-References

- ▶ [Buddhism in the West](#)
- ▶ [Four Noble Truths](#)
- ▶ [God and Devil in Buddhism](#)
- ▶ [Islam: An Overview](#)
- ▶ [Mindfulness \(Buddhist\)](#)
- ▶ [Muhammad, Prophet](#)
- ▶ [Psychobiography](#)
- ▶ [Science in Buddhism](#)

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Molecular Modeling

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Related Terms

[Computational chemistry](#); [Quantum chemistry](#); [Quantum physics](#); [Theoretical chemistry](#)

Nowadays, one of the most important research fields in chemistry is the study of large systems. In this sense, one of the most active research areas is the field of supramolecular chemistry, chemistry of big molecules (Atwood and Lehn 1996), which involves the use of noncovalent interactions to assemble molecules into stable, well-defined structures and which plays an important role in biological processes. Thus, it is crucial to examine the interactions between molecules and their environment. Well-known systems include host-guest and protein-substrate complexes, molecular clusters, or simply molecules within their medium.

Currently, there is great interest in the theoretical study of supramolecular systems. Molecular modeling includes all theoretical methods and computational techniques used to model or mimic the nature. The techniques are used in the fields of computational chemistry and biology, drug design, and materials science for studying molecular systems ranging from small chemical systems to large biological molecules and material assemblies. Computers are required to perform molecular modeling of any reasonably sized system. The common feature of molecular modeling techniques is the atomistic level description of the molecular systems. This may include treating atoms as the smallest individual unit (molecular mechanics approach), or explicitly modeling electrons of each atom (quantum chemistry approach).

Molecular mechanics is one aspect of molecular modeling, as it refers to the use of classical mechanics or Newtonian mechanics to describe the physical basis behind the models. Molecular models typically describe atoms (nucleus and electrons collectively) as point charges with an associated mass.

For this purpose, molecular mechanics (MM) methods are the most widely used in treating such large systems. Unfortunately, in general MM methods do not accurately describe the geometries or energetics of intermolecular interactions. With no representation of electron density, many chemically important quantum-based effects are missed. Additionally, intermolecular interactions for a number of MM force fields are known to be poorly reproduced.

In MM treatments, atoms are assumed to be spherical. However, in some cases this approximation is inadequate such as when dealing with hydrogen atoms. Hydrogen possesses only a single electron, which is always involved in bonding to a neighboring atom. For this reason the electron distribution about the hydrogen nucleus is not spherical, which could affect MM description of the hydrogen bonds. Then special caution must be taken when applying MM methods to the calculation of hydrogen bonds (Jensen 1992). Although MM methods do not consider time, there is a version of them that models the behavior of the system with propagation of time. This method is known as molecular dynamics. It involves solving Newton's laws of motion, principally the second law: $F = m \cdot a$.

Other methods like semiempirical methods employ approximations to accelerate solution of the Roothaan-Hall equations; thus, they are quantum mechanical in nature and are an improvement over MM methods in accounting for quantum phenomena. However, empirical solutions are substituted for the large number of multi-electron integrals, and these are parameterized to reproduce experimental observables for a large number of molecules. These approximations sharply limit the precision of semiempirical methods, particularly in treating systems that were not present in the initial parameterization procedure. Among the most widely used semiempirical methods are

AM1 (Austin Model 1) (Dewar et al. 1985) and PM3 (Parametric Method 3) (Stewart 1989). A concern in applying these semiempirical methods to supramolecular problems lies in the fact that they were parameterized to reproduce molecular rather than intermolecular properties.

Over the last few years there have been some efforts (Bernal-Uruchurtu et al. 2000; Repasky et al. 2002; and much more) to improve treatment of the core parameters in semiempirical methods that play a large role in the non-reproducibility of experimental data. One particular problem of semiempirical methods is that they present an unphysical stabilization effect for short-range H...H interactions (Casadesús et al. 2004).

In the continual drive to treat ever-larger systems with ever-greater precision, theoretical chemistry has turned its interest to the so-called hybrid methods that use multiple approaches of varying accuracy and cost to simultaneously treat different parts of a system. The use of hybrid methods is very important for the study of large molecules or supramolecular systems (Casadesús et al. 2002). Within these schemes the computational cost diminishes considerably and the entire system can be considered without needing to generate simplistic model systems. Among these hybrid approaches, the ONIOM method developed by Morokuma et al. (Dapprich et al. 1999) is especially appealing as it can combine any quantum and MM method simultaneously at different parts of the same molecular structure.

To conclude, molecular modeling methods are now very often used to investigate the structure, dynamics, surface properties, and thermodynamics of inorganic, biological, and polymeric systems (Casadesús et al. 2006). The types of biological activity that have been investigated using molecular modeling include protein folding, enzyme catalysis, protein stability, conformational changes associated with biomolecular function, and molecular recognition of proteins, DNA, and membrane complexes.

Cross-References

[Quantum Chemistry](#)

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their effects or significance within regulating functional circuitry in the peripheral nervous system (PNS) or central nervous system (CNS) (Kandel, 2000). Methodologically, MN aims at identifying the physiological role of one variable, one molecule, in a particular assay, most commonly by expressing or silencing a particular gene or protein. MN is different from (general) neuroscience by focusing on molecular aspects of scientific questions even though the general goals of analyzing complex phenotypes are the same. Although the term “molecular” is not specifically limited to one class of molecules, most frequently, recombinant DNA technology is used to specifically probe the effects of regulating its expression and monitoring a specific readout.

Self-Identification

Science

Molecular Neuroscience identifies itself as a science by strictly relating to empirical methods for generating insight and by adhering to material evidence, that is, the description of phenomena by direct or indirect sensual, interindividually exchangeable experience, and more specifically in the context of science by performing controlled, repeatable experiments examining as few variables as possible, at best one. The subject of MN is the central and peripheral nervous system, its organization, output, cellular, and molecular basis.

Characteristics

Molecular Neuroscience states that molecules are the ultimate causal effectors in events of the peripheral and central nervous system, its cells, and molecular and functional circuitries. MN is distinct with its methods, its attempts to modify only one molecular variable by mutation, overexpression, knockdown, or silencing of a protein or gene, and with observing the ensuing effects that can be simple or complex. The prevailing MN method of varying only

Molecular Neuroscience

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Description

Molecular Neuroscience (MN) is the systematic and scientific study of specific molecules and

one variable at the time is thought to be particularly suited to uncover causal relationships in distinct circuitries of the functioning CNS and PNS or their components. Of note, this is not to mean that MN's method is limited to deterministic relationships, that is, the calculable and possibly hierarchical chain of events. MN also comprises nonlinear dynamic patterns.

Relevance to Science and Religion

The principally different methodological approach by which MN defines the world or reality leaves at first sight only limited overlap with what is called "religion."

There are, however, indirect touching points where MN and ethics/religion encounter:

- Experimental freedom in MN is not unlimited: by society's convention, for some experimental methods including the fields of animal experimentation, human-animal chimera, human embryonic stem cells, and experimentation with humans or human materials, limitations are implemented by ethical values, many of which have historical origins in societies' religions. In that sense, ethical values relating ultimately to religious beliefs do influence the field of MN and its experimental space.
- We assume that religion is an experience/behavior confined to humans. Therefore, MN can only answer this question in the context of human MN. Here, however, religion or religious experience relates to a complexity that is currently not amenable to systematic investigations. In a few studies, neuroscience has investigated mental states and religious experience from a behavioristic point of view, that is, the religious beliefs from others are taken as descriptions of reported inner states and can be correlated to biological markers, for example, to regional blood flow in distinct areas of the brain. Accordingly, religious experiences are understood to correspond to particular activation patterns of the brain. Here, MN is

attempting to make the physiological basis of religious experience intelligible but does not make statements about its contents.

Sources of Authority

The main source of authority is the community of current molecular neuroscientists present in globally organized conventions, organizations, peer-reviewed publications and grants, as well as academic teaching.

This authority is obviously in steady flux and historically rooted in the beginnings of using molecular tools for the investigation of the nervous system like with Rita Leve-Montalcini and the discovery of nerve growth factor, the advent of recombinant DNA technology, or many others.

MN is a subdiscipline of neuroscience which has still the main authority on the complex read-outs used by MN. Many techniques and methods used in MN are also from neuroscience, but with a stronger influence of molecular biology, protein biochemistry, and genetics.

Ethical Principles

Ethical principles that guide MN are ultimately the responsibility of the individual MN researcher who on a day-by-day basis has to decide whether his research is in accordance with general ethical agreements and conventions within the social context in which the individual MN researcher is living and performing his research. These permanent evaluations obviously depend on the education and values that have been received during the years of upbringing and education in society and are thereby rooted in the cultural and religious traditions of society. In the Western world, our current predominant human and animal rights have their origins in the religion of Christianity.

These ethical guidelines have been institutionalized by official conventions like the Declaration of Helsinki for experimentation involving humans, European or national laws, grant agency directives,

and other implementations of society's checks and balances, as well as control mechanisms.

Key Values

The key value is the absolute primacy of the truth of experiments, that is, to regard the experimental outcome as the supreme element of constructing the MN scientific reality. To achieve this, MN researcher and the MN community adhere to secondary key values like methodological diligence and thoroughness, frankness and honesty of discourse and data publication, as well as ingenuity of solutions and moral integrity.

Conceptualization

Nature/World

Nature/world is defined as the space of material things or phenomena that can be assessed by empiric, that is, direct or indirect sensual experience or experimentation.

Human Being

The human being is the result of an evolutionary process leading to the most complex form of life with the most complex and versatile CNS. It is recognized that, beyond MN, through the CNS of human beings, emergent phenomena like cultural evolution have originated which actively feed-back on the CNS and possibly on consciousness. But empirical research in this area, certainly in the context of MN, has been difficult and sparse so far.

Life and Death

Life is seen as the result of an evolutionary process from the level of prebiotic molecules to cells, multicellular organisms, and species. It is seen as a principal continuum from anorganic to organic molecules, compartmentalized molecule assembly to self-replicating molecules and cells. Genes are seen as the minimal unit of selection in the tripartite evolutionary process of variation, selection, and heredity in the so-called Modern Synthesis of Darwinism, combining insights

from classical Darwinian evolutionary theory with recent ones from molecular biology.

Life of a human being is thought to start upon the fusion of the egg from the mother and the sperm cell of the father and its first successful mitosis. Death of a human being is its inability to permanently maintain an independent metabolism.

Reality

On the level of interindividual space, reality is seen as the space of intelligible materials and events accessible by empiric as the prevailing method of MN. Reality is set equal with nature/world (see above).

On the level of individual brains, for example, during the scientific discourse between MN scientists, it is generally accepted that different realities within different observers can exist and lead to different conclusions even though the same experimental methods have been used. In that sense, reality, reflecting the entirety of an individual's perspective on the world, is seen as something relative and subjective. For experimental procedures exploring individual reality, for example, in primates or humans, a behavioristic attitude is preferred, that is, only the observed (motoric) behavior is taken for real, not any assumed intentions of the affecting animal or individual.

Knowledge

Knowledge of an individual or a community is seen as the ultimately finite (although huge) accumulation of experiences, descriptions, and documentations on phenomena that are interchangeable between individuals, that is, by language, writing, or reading.

Truth

Truth of a fact in MN is seen as evidence that is verifiable by experiments or sensual experience.

Perception

MN sees perception as an outside signal that is able to elicit a molecular response in signaling circuitry of a dedicated sensory cell. In MN, perception does not have to be a conscious

experience but can involve unconsciousness responses as well as lower organisms or species.

Time

Time is accepted as a fundamental variable of physics and in most biological experimental settings handled as a linearly and continuously progressing variable (objective time).

For purposes of computational modeling in neuroscience, time is sometimes divided into subsequently following time frames to simulate a sequence of states, for example, of neuronal networks. Here time is merely seen as defining the directionality of a sequence rather than a linearly progressing continuum.

Since neuroscience's subject includes the CNS and also an individual's experiences and time perceptions, time perception or time assigning experiments with nonhuman primates and humans have also led to the notion of subjective time with intriguing and still unresolved results (see, e.g., the work of Benjamin Libet, Libet 2005). Here subjective time perception is ultimately seen to be able to deviate from objective time.

Consciousness

Consciousness is seen as an emergent phenomenon of the brain with several definitions. A more narrow definition of consciousness includes a reaction of an organism to a perceived stimulus that it can reflect on. Unconsciousness is often set opposite to consciousness. An example is the phenomenon of blindsight where during cortical blindness (e.g., due to a stroke) and with intact eyes, clear motoric reactions can be evoked without becoming conscious for the affected individual.

One problem with a definition of consciousness is that its borders are not well-defined, for example, when a human being or a nonhuman primate becomes self-conscious during development. Recognition of oneself in a mirror is evidenced by particular behavioral reactions in humans or nonhuman primates and is generally seen as a sign of self-consciousness.

"Theory of mind" is a consciousness-related construct of an individual's ability to attribute of mental states to others. It is one's awareness of the other individual's awareness of oneself.

This concept has been linked to higher cognitive functions like consciousness. It has recently been discussed whether a specific cell in the premotor cortex, the mirror neuron, is a precursor of a physical correlate for a theory of mind since it is activated by both motoric actions and the perception of the same motoric action in another individual (Rizzolatti et al. 2008).

Rationality/Reason

Rationality/reason is the computational method necessary to link the empirical observations from experiments into causal relationships and algorithms. Rationality/reason is a cognitive/executive function of the highly developed brain and dependent on consciousness, that is, a reflection of a phenomenon.

Mystery

Mysteries in the religious sense, that is, as passive experiences of a divine, unexplainable message, are not accepted in MN. In common language, a "mystery" is meant to designate an unexplored phenomenon that is worth being tackled by experimental approaches.

Cross-References

- ▶ [Blindsight](#)
- ▶ [Evolution](#)
- ▶ [Experience](#)
- ▶ [Neuroimaging](#)
- ▶ [Theory of Mind](#)

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Monism

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The word “monism” does not have a clear-cut meaning and its content has been subject to frequent change and reformulations. Thus, there is disagreement what monism is actually about. On the one hand, monism – when related to religion – was suspected of being too philosophical or rationalistic to express the core essence of some religious systems (Hinduism as one of the main candidates for being a monistic religion). Not all monistic religious systems obviously hold to be ones and at a closer scrutiny do acknowledge their monistic character depending on how the rational element is represented in the unity to be achieved (The terms came under closer scrutiny like “desire to identify itself,” “permanent union,” “realize the underlying unity,” etc.). The reason for introducing the term “monism” was to offer a consistent scientific worldview, not divided in scientific and religious competence fields. Though monism was suspected of rejecting the personality of God on one hand and self-sacrifice on other hand, both believed in religions like Christianity, Judaism, and Islam. And the controversy about self-sacrifice and self-fulfillment belongs to the lively discussed issues since 9/11. Monism was attributed in Christian scholarship of the nineteenth century to Asian and so-called pagan (tribal) religions. Both attributions were called in question. The attributions of speculative (philosophical) terms (monism, dualism) to phenomena like “mythic worldview” appeared to be inappropriate. From a strictly philosophical point of view, any monism is only partially so and therefore not monistic enough, remaining conflated with dualistic elements. One might further ask: What are the reasons for introducing dualistic elements in a system conceived of as monistic in other respects? Oneness by the negation of the difference and conflation into one are an equally

important point of disagreement. It depends on whether the involved dualities are mutually exclusive, coextensive, or codependent. There is a strong commitment to endorse the monistic worldview for reasons of scientific consistence. But what is understood as scientific depends on the dominant paradigm. For modern science, it has been a mechanical explanation and the use of mathematical models. And any attempt to make the worldview more scientific and therefore monistic means to adjust it to this dominant model of explanation as close as possible. The preferred way to fill in the gaps in the nineteenth century was to employ the notion of development. The problem with the scientific furnish of monistic attempts is that the required unity cannot escape some religious or mythological imports anyway. Darwin was just as unable to overcome some background assumptions of theological origin. Emphasizing the creative role of natural selection, he unwittingly personifies it and unconsciously endows the natural selection as the keystone of his monistic view with features that makes it similar to the Creator (infinitesimal changes taking place in very long periods of time, identifying with the standpoint of God by evaluation of evolutionary changes and their “appropriateness”) (Nelson 1996). While trying to unite or reconcile science and religion, the monistic enterprise should respect both the paradigm procedures for contemporary science and the existing ways to define religion within a given sociocultural whole. No wonder that there are many kinds of monism, given the diversity of principles which are seen as conflicting and in need of being united. The value of monism can equally vary. The need for radical changes in the existing thought system or worldview might articulate itself as the need for emphasizing or introducing elements of dualism. No wonder that the father of modern thought is the dualist Descartes, or that the father of Protestant Neo-Orthodoxy – Karl Barth, etc. Some sociocultural support for monism might be detected in Enlightenment and post-Enlightenment elites and their distanced attitudes to society while dualism was taken up by elites coming from socially lower or middle strata in societies of radical or rapid changes

(revolutions, etc.) and pluralism sometimes is advocated as a worldview of liberalism and democracy.

The term was coined by Christian Wolf in the eighteenth century and designated that philosophical system which allows for only one kind of substance. Monism is a model of explanation and substantiation that rather departs from coexistence of different opposed forces, principles, or states and proves, that and how they lead to unity. The term *advaita* (non-dual) might be a good example of this negative point of departure in the constitution of the monistic system. Monistic teachings or models are opposed to the dualistic approach (assumption of two opposing and independent of each other basic forces, principles, or states that form or determine the world; Zoroastrianism, Manichaeism as examples under religions; mind-body dualism in philosophy) and pluralistic view (reality is derived from or comprises many independent entities). Sometimes it is referred more concretely to belief in the unity of mind and matter, both being two different instances or modes though. Caution is expressed not to confuse non-dualism or non-dual knowledge (directed against duality) with monism in attempting to grasp the essence of Hinduism (Advaita-Vedanta, Milne 1997). It is not an objective description of phenomenal existence that is envisioned by this kind of knowledge. The non-dual knowledge that is derived from the authority of Scriptures (*sruti* teaching reality is one) transcends the grasp of reason and refers merely to the Self, in which the knower is the same as the known. The one Reality only appears as multiple realities by identifying itself with mind and body. Duality being an experiential fact (dual appearance of reality) evokes a religious desire to know the underlying unity, the ultimate nature of the real.

All monisms attribute oneness only differing in what they target, how they count or what are the units, and how the attribution of oneness itself is performed or understood (Schaffer 2007). One can discern existence monism, which ascribes the existence to one object, and priority monism, ascribing priority to one token existing among many. Existence monism maintains that only

one concrete object exists. Priority monism holds that but one object is basic, others being part of it as a whole. The presuppositions of notions like “basic” are generally not explicated. Religious assumptions and beliefs may equally infiltrate such assumptions. Existence monism might be materialistic, idealistic, or neutral (meaning something deeper). There are no strong philosophical arguments against priority monism, just on the contrary – there are some in favor of it, especially from emergence and from gunk. The argument from emergence is made by way of quantum mechanics, maintaining that the whole is emergent due to quantum entanglement and therefore prior to its parts. In belief systems there may exist value-monism, meaning ethics that recognizes only one thing as having value (e.g., duty, happiness, etc.). The distinction between respects (existence, priority, value, etc.) in which the unity is thought or otherwise achieved may be a good tool to get rid of some difficulties in consistent representation of religions possessing monist, pluralist, and dualistic representations alike. This distinction may be useful for the way the unity of Divine person against its Trinity is represented in Christianity, or for the way the Unity of God is thought of in Judaism though there are strong dualistic elements in it (radical monism of Rav Kook). It seems that all religions maintaining transcendent transcendence (against the immanent transcendence in immanent monism or immanent pantheism) are bound to break with a monism which is strong in all respects. Taking issue with concrete monistic and dualistic or pluralistic tensions within religions themselves accounts for conceptualizing in which respect monism has to be kept and remains fundamental in every concrete constellation.

There may be different mixtures of monistic and dualistic determination systems. Dualistic overtones might be detected even in such a paradigmatic monist as Parmenides (thought vs. doxa). A striking example is late antique Gnosticism. The split in spiritual and material components has to be overcome in a monistic way, in order to regain unity with one origin or even with one divine source (Goldammer).

Another example is the dualistic monism of Zhenyan tantric school. There are also mixtures of monistic and pluralistic models. Spinoza's monism is that of one substance and pluralism of infinitely many attributes. David Lewis' view (1966) of universe is based on pluralism and manifests itself as a pluriverse (against monistic universe). The mixture of terms does not mean in this context that the system should be incoherent. There are attempts to reduce the speculative outlook to the sociological. Mary Douglas gave a political or anthropological twist to the theological and religious interpretation: philosophical and theological discussion about relationships of either principles or forces only arises when the relations between subgroups alienated to society become an acute political problem.

Although the notion might be traced back to the Greeks (Parmenides, Platon, Plotin, Empedocles, Heraclitus, all distinctive for their own peculiar dualities), the term is associated with the movement in the late nineteenth and early twentieth centuries to unite science and religion through a unitary view of nature. Attempts have been made to stress the close connection between monism and (natural) science. Unity of Science movement (established by Otto Neurath) sought a common empirical attitude toward all the sciences and strove to develop a single, comprehensive scientific language referring to itself as a "Monism free from Metaphysics." It was accused of reductionism. German evolutionist Ernst Haeckel (1834–1919) defined monism as based on one common fundamental law that emphasized "the essential unity of inorganic and organic nature" (Haeckel 1894). His "monistic Religion" set for its task to free science from the restraints of "dualistic" Christianity with its doctrine of creation, of metaphysics and irrationality. Dualism was conceived in the sense of opposing (religion) to science and therefore monism acquired some antireligious impulses. Haeckel postulated that all organic matter was sensate and had evolved from cell-soul to human soul. He actually had the conviction that one spirit lives in all things. Matter, energy, and Psychosoma (world soul) were three aspects of the Trinity of substance set up by him.

The missing link in progression between inorganic and organic matter was postulated to be the cell-soul. Soul-life operated through the same laws of psychophysics. Monism has to unite idealism and materialism, spirit and matter through the Monistic Law of substance. He saw in the "theory of descent" and in view of spontaneous generation appropriate tools for explication of this genesis. His general philosophy of nature linked God to the eternal persistence of matter and energy throughout the universe and it was the law of substance, the supreme and universal law of nature that enabled such a link. Science needed religion (or rather forms of scientific faith) in order to fill in the gaps in existing knowledge with the help of theories as a logical aid when empiricism failed. Actually it was an attempt to redirect religion into monistic direction. This task, given the ever-changing agenda of sciences, appears to be a permanent one. It was God that in Haeckel's book "The Riddle of the Universe" (Weltraetsel 1899) (being rather the riddle of substance) was defined as the "universal substance," or "divine essence of the world." The book was influential but it could not serve to unify all monists. Haeckel's monism attracted followers among scientists (including Wilhelm Ostwald, Ernst Mach, and August Forel) and people among the educated lay public. In 1906, the German Society of Monists (Deutsche Monistenbund) was founded in Jena and counted among its members over 4,500 individuals. Haeckel insisted that the Monistic Religion was to be recognized by the state. He did not approve of the direction of *Monistenbund* toward antireligious stance, also maintaining that since knowledge was a "physiological process of nature," distinctions between "religion and philosophy" were artificial as well. In the Anglo-American world, monistic philosophy was popularized through the journal *Monist*, founded in 1890 in Chicago by the German émigré Paul Carus. Carus understood Monism as a Religion of Science and viewed science as a religious revelation. For him the task of Monism was to reconcile science and religion by creating a "scientifically tenable conception of God" and to build up a "new scientific

theology,” by making God and “moral law” the subject of scientific scrutiny. Carus found in Haeckel deification of matter and energy and insisted that God of science is the law. That was the reason why Carus referred to Spinoza’s monism as henism (from hen to one) reproaching it in substantiality. Carus’ concern was to understand monism in a framework of religious historical development and he put forward the following scheme: polytheism – monotheism (implying an impulse against idolatry) – monism. Some scholars argued that polytheistic systems develop in the direction of monism rather than that of monotheism (Bianchi). Spiegelberg insists that historically religions were dualistic and only as a result of development, they were mitigated or even substituted with monistic or mystic explanations. Indeed, monism is welcomed in the guise of mystic in religions like Christianity, Judaism, and Islam. Anti-monistic groups also arose to counter the threat posed to traditional religion, most notably the Kepler-Society (Keplerbund 1907). They attempted to provide an alternative religiously and ethically determined worldview based on scientific knowledge.

It was the mind-body identity theory that monism postulated against Cartesian dualism. Though mental and physical terms differ semantically, they refer to the same objects or tokens. This approach was criticized for reductionism in the early 1970s. Recently Davidson (1995) offered theory which is the most influential and lively discussed today and put forward the so-called anomalous monism argument of identity between mental and physical event tokens. The same event according to him might be described in physical and mental terms. The asymmetry of the physical and the mental nevertheless remains since solely physical events are postulated to be of fundamental kind. It is not the question of every physical event being a mental one. Anomalous monism theory did not share the assumption about predictability of mental events on the basis of the knowledge of physical laws and using terms of physical description: Mental events do not fall under physical laws and are unpredictable, i.e., the mental is an anomaly and there are no strict psychological and

psychophysical laws due to the fact that Psychology like Biology is not a closed Theory. Though the relation between mental and physical is here law-like, this relation allows for anomalies as well. The issue is not about predictability of mental events in mental terms within the framework of this theory which would be of outmost interest for the relationship between science and religion connection. This theory itself does not take the issue off the table however. Dualistic remnants are still there in the view that some mental predicates (including propositional attitudes concerning belief) cannot be reduced to physical predicates. Cartesian interactionists would anyway insist that a comprehensive theory (aimed at description and explanation) should include physical and mental terms because what the latter designate might be force-generating properties and therefore indispensable for any comprehensive theory of the world. The argument for monism is that should there be many existences, relations between them would have to be reaching to infinite regress. The argument against this argument was that relations are not things and are not subject to this dilemma.

A special problem is the relationship between monotheism (see ► [Monotheism](#)) and monism. Given the problems of historical monotheism endowed with polytheistic impulses, philosophical monism sometimes was regarded as more consistent than the former and even truly philosophical monotheism. Another problem is the relationship between pantheism (see ► [Panentheism](#)) and monism. While some scholars argue for identity of pantheism and monism (H. P. Owen), others defend the view that they may be (Spinoza) but should not necessarily be identical (M. P. Levine). Pantheism more often than not proves to be pluralism and not monism.

Ernst Mach converted to neutral monism that was a perception-based phenomenalist monism. Together with Russell and James, he held that the mental and the physical are different aspects of a single stuff that in itself is neither mental nor physical. While acknowledging “neutral elements” which in some relations belong to psychical experience, but in others to physical world, he

tried to dissolve the problem of dualism inherited from Descartes. Ontological dualism of Self and the World was supplemented through epistemological dualism of the inner experience, given to the subject with immediate certainty, and knowledge about the outer world, uncertain and unfounded. Whereas the existence of the outer world could be open to question, the fundamental attitude of this subject has become the attitude of cognition. Idealist monism sees material bodies as a way of speaking about mental states. Material monism acknowledges that there are only material existences and reduces everything mental to the facts about matter. The Christian philosophers do currently take the materialist challenge seriously and try to integrate the materialistic line of thought into the Christian understanding of reality and history (incarnation, afterlife). The encounter with materialist monists on those conditions seems to be possible. Dualistic overtones can be mitigated by dialectics and therefore cannot help involving monistic speculations. This might be seen in Marxism and other varieties of dialectical thought with dualistic assumptions.

The attacks from pluralists were challenging and stimulating the proponents of monism as well. Since the paramount task in contemporary philosophy as seen by phenomenologists is to solve the problems stemming from the ontological dualism of Cartesian and neo-Cartesian provenience having negative logical (interaction) and historical (evolution) consequences, the phenomenological ontology is offered as one possible solution of this problem. A. Lovejoy presented his own theory of monism and dualism. He called monism, especially epistemological monism primitivistic. The ontological monism of Bruno and Spinoza, as well as later on monisms of F. H. Bradley and Bergson came under heavy fire. Lovejoy has combined both pluralistic metaphysics and dualistic epistemology. Epistemological monism holds that there is only one set of truths which are valid. Pluralism stating that conflicting or incommensurable views may be equally true is at best appropriate to use it for substantiating polytheism in the modern sense of this term (see ► [Polytheism](#)). Epistemological

pluralism might have important consequences for the whole philosophy of science. The most zealous attacks against monism came from the camp of logical atomism. Russell's theory of logical atomism triggered the development of analytical Philosophy; it was formulated against the monistic teaching of Britain absolute idealism, inspired by Hegel's logic, which held that there is only one indivisible substance. Against it was set a logic that acknowledges many independent things (particulars) which are independent of each other and not causally interrelated. It is logical atomism in the guise of pluralism. It has been held that Wittgenstein's *Tractatus Logico-Philosophicus* at best characterizes this view. This case appears to be more complex than presumed. The usage of monistic vocabulary is indispensable for a fruitful religious dialogue today.

Cross-References

- [Monotheism](#)
- [Panentheism](#)
- [Philosophy of Science](#)
- [Polytheism](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)
- [Transcendence and Immanence](#)
- [Typologies in Science and Religion](#)

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Monotheism

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Related Terms

[Personal God](#)

Description

Monotheism is a religious belief which acknowledges one transcendent and personal God who is distinct from the world and superior to it. One may believe that there exists only one God and reject the existence of other gods (exclusive or prophetic monotheism). One may believe that there are many gods but accept that only worship of one God is appropriate and legitimate (different terms like relative monotheism, potential monotheism (F.W.J.Schelling, Schelling 1927), or insular monotheism (Adrianus van Selms, Van Selms 1973) are used to describe this kind of monotheism) (Van Selms 1973; Schelling 1927). The notion of monotheism is closely related to the notion of the Supreme Being, which was developed in the eighteenth century religious studies and emphasized the ability of primitive/preliterate peoples to construe one single God. Monotheism is a controversial notion used for theological, ideological, and metaphorical goals. It has to be distinguished from Henotheism (notion introduced by Max Mueller as

a result of his Indian studies), which designates worship of one God for a relatively short time and by small communities or of rather insignificant local deities endowed for that period of time with the highest and worthiest attributes (Hornung in regard to Egypt, see: ► [Polytheism](#)). Monotheism is unattested in Greece before the Biblical time although there was a proposal to count Xenophanes “one greatest god” in Fr. 23 as an assertion of monotheism. Judaism, Islam, and Christianity are usually regarded as classical monotheistic religions. While it has not so far been questioned for Judaism until recent times (see below) and for Islam, it was subjected to doubt in case of Christianity, either by pagan authors (Celsus, Porphyrius, Maximus of Madaura), or by Jewish (and Muslim) authors. While their argument was primarily directed against Christian Trinity, European Enlightenment accused Christianity of polytheistic attitudes in its adoration of saints and angels (David Hume, Ernst Gibbon, Ernest Renan, Friedrich Engels, Adolf von Harnack and Eduard Meyer, Schopenhauer). Christian apologists defended Trinity saying that the unity of divine person can be grasped with the help of notions like homoousios (consubstantialis, co-substantial) and perichoresis (circuminssio, mutual penetration) of three hypostases. Angels were declared to be subordinated to One God and no divine beings with autonomous will. Apologetics with regard to Virgin Mary was more complicated but it is not our concern here.

In Judaism can be found a classical definition of monotheism in the Book of Deuteronomy: “Hear, O Israel, the Lord our God, the Lord is one” (Dt. 6,4). The Jewish philosopher Maimonides comments on this passage: “I believe with complete faith that the Creator – blessed be his Name – is One and Alone; that there is no oneness in any way like Him; and that He alone is our God – was, is and will be.” Christians express this with the words of Paul in 1 Cor. 8:4: “We know that an idol is nothing at all in the world and that there is no God but one.” Quran, Sura 5, 73 states: “There is no god except the one god.”

The most widely debated questions on and around monotheism in the last 150 years have been: Is monotheism the result of some

developments or is it an original phenomenon? Is monotheism a normative or a descriptive notion or both? Does any real monotheism exist at all or is it no more than an idea or ideal? How many monotheisms are there? Is monotheism – given its transcendent orientation – friendly to the nature? Is monotheism tolerant to other religions or are monotheisms tolerant to each other (if there are many of them)? Is monotheism “democratic?” Many of these questions are very complex. The debates are hardly understandable without recourse to such notions as Polytheism, Pantheism, Monism, and Panentheism.

There are two competing views on the origins of monotheism. One type of theory stresses that monotheism is a result of a long religious development, a late and high level of it. The other type insists that monotheism is an original and very authentic form of religious experience representing a kind of natural truth. Sixteenth century deists (Herbert of Churbery, Voltaire, Lessing) and Catholic missionaries preferred the latter view. It was heavily criticized by Ethnologists who found the notion of Monotheism inappropriate for primitive religions (existing in small-scale, preliterate societies), too abstract and implying hierarchic evaluations which in those societies do not exist. There are nevertheless monotheistic traits in some primitive religions (Nuer). The evolutionary treatment of monotheism was criticized as well. Both theory types would now and then return in a somewhat different setting in different phases of historical and theological development. Pettazzoni suggested using the term of Supreme Being in case of primitive religions not to be confused with God of Monotheism (Pettazzoni 1955, 1956). Nevertheless much of the contemporary research runs against this warning. An attempt has been made to reconcile the evolutionary perspective with the original one and to relate the “Supreme Being” (exchangeable with the “high god”) to the “God of monotheism” in order not to abandon the evolutionary picture altogether. North American cross-cultural and empirically tested research since the 1960s (leading scholars: Guy Swanson, Robert Underhill, William Irons) asked after the preconditions of monotheism,

operating with the notion of “high god” that is presumed to be the sole creator of the universe and that rules the world and heavens. This representation was detected even in preliterate societies. Five explanations were given. The presence of high gods can be related to the number of hierarchically organized sovereign groups a society possesses, a sovereign group being one that has an independent jurisdiction over a particular realm of social life. The high god is a personified being that represents a sovereign group’s desire to maintain order and diversity among subordinate sovereign groups. Swanson used a sample of 50 preliterate societies derived from the *World Ethnographic Sample* of 556 societies and in societies with four or more sovereign groups, 91% possessed a high god. This kind of questioning corroborated the view the classic French sociologist Emile Durkheim that monotheism is able to integrate economically and politically complex social structures. Davis found that as societies moved to higher technological stages and became more complex, belief in a high god not only became increasingly common, but high gods were progressively more perceived as being concerned with human morality. A high god was seen as morally active in only 9% of hunting and gathering societies but was perceived as active in 37% of simple and advanced horticultural societies and 67% of intensive agricultural societies. Underhill followed the Marxian line of argument that the economic base and productive forces of a society are the primary determinants of the superstructure, and religion, as part of the superstructure, is a reflection of the material conditions of social life. Underhill introduced independent and dependent variables. Monotheism was a dependent variable and was operationalized by noting whether a “high god” was present or absent in the sampled societies. The independent variables were the levels of economic and political complexity. Underhill found a strong positive relationship (zero-order, $\gamma = .63$) between Economic Complexity and Monotheism and a similarly strong positive relationship (zero-order, $\gamma = .56$) between Political Complexity and Monotheism. Simpson criticized

Underhill's Marxian presumptions and asked after other fundamental structures besides the distribution of power and authority upon which the belief in a high god may rest. He showed the relationship between high gods and the means of subsistence, for example, that "the extent to which subsistence raw materials are active or inert makes a significant contribution to explaining the presence of a high god. Active raw materials have instability, unpredictable resistance, or wide variation in those features that must be attended to in order to control the material. Conversely, inert materials are stable and exhibit predictable resistance and uniform properties that are easily controlled. Active raw materials present non-routine stimuli while inert materials project more routine patterns of attendant features. As a consequence, task performances associated with active materials tend to be fraught with uncertainties while responses to inert materials have a fixed programmatic quality." Simpson's argument extended dominant sovereign groups correlation with the presence of high god, elaborated by Swanson. "Both dominant sovereign groups and autonomous pragmatic individuals are associated with the presence of a high god because they both exemplify an acting unit carrying out its own purposes" (Simpson 1979). William Irons offered another "good Marxian" explanation that a moral high god emerges in stratified societies as a way to sedate the masses while preserving the privileges of powerful elites. Irons' hypothesis was discarded; Roes found but a weak correlation (Pearson $r = .24$) between class stratification and the presence of high gods. Richard Alexander proposed a very modern sounding explanation. As societies increase in their size they encounter new problems in terms of unifying very large numbers of people, and thus religion not only serves as a major means of this unification, but even does so in the form of moral rules. The Alexander hypothesis met with support. Sanderson and Roberts (2008) tested all five hypotheses directly against each other by means of multiple regression techniques. The high god variable was substituted by the stage of Religious evolution variable. The mode of subsistence

economy (active-passive raw materials), writing and record keeping, and total population size were responsible for each higher stage of religious evolution, including the presence of high gods. The sovereign group hypothesis became a weak support. Sanderson (2008) suggested that the new religious doctrines emerged to deal with the heightened sense of ontological insecurity produced by major increases in the highly disruptive consequences of rapid urbanization and intensified warfare.

Other research strategies were developed in studying Jewish monotheism. Robert Karl Gnuse explored the emergence of Israelite monotheism out of Canaanite religion ("emergent monotheism"): "monotheism developed over the course of many centuries. . . and these developmental stages often come in 'bursts' in response to particular social and religious crises" (Gnuse 1997). Gnuse understands Israelite monotheism as developing throughout the first six centuries of Israel's history and as coming to full expression only in response to the social and religious crisis of the exile. Most of the biblical scholars who discuss the emergence of monotheism are favoring an evolutionary model that culminates with a full-blown expression of monotheism in the exilic period. This evolutionary model can be improved on through the notion of "chain of revolutions," that is, a chain of rapidly following each other successive revolutions in the direction of monotheism (Lang), pushed forward by "prophetic minority" (e.g., the revolt of Elijah, Elisha, and Jehu, the reforms of Josiah, and the crisis of exile). Rainer Albertz, Othmar Keel, Bernhard Lang, Mark S. Smith, and Robert Karl Gnuse hold this view. There are theological implications of an emergent model of monotheism. An evolutionary model with relation to monotheism allows us to look upon the biblical faith as still evolving and consequently allows us to reject some of that faith's outmoded conceptions, such as its patriarchal bias. Even if one like Albright holds the view that monotheism appeared in Israel early, biblical faith taken more generally could still be described as a tradition in process. Indeed, Gnuse works out his theology of "process." This research strategy

finds its complement in an attempt to locate the development of Israelite monotheism within the larger intellectual climate of the ancient world. He especially concentrates on the emergence of Vedic monism in India, which he refers to as “pseudo-monotheism,” in Zoroastrianism, and of the more than “monotheistic intuitions” of Xenophon of Colophon and other pre-Socratics, all of which occurred at roughly the same time that many scholars have called the “Axial Age.” Nevertheless, according to him, monotheism reached its full expression in Israel. Gnuse further argues that these simultaneous points of “intellectual breakthrough or transformation” might well be described using the biological model of “Punctuated Equilibria,” whereby “small mutations over a long period of time are stored as recessive genes in the matrix of a species, and at some point they emerge in tandem . . . to produce an evolutionary breakthrough” (Gnuse 1997). “In effect, the ancient world was creating mutations which would lead to breakthroughs in several places . . . [including] the monotheistic breakthrough of the Jews or the Jews and their contemporaries” (Gnuse 1997). To be sure, the application of a scientific model to the field of cultural history is methodologically controversial.

The attempt to extend the notion of monotheism on other high cultures of the Far East has parallel development in stressing the impact and role of “philosophical monotheism” in Western thought and civilization. Sometimes, gods are seen as members of one God (*membra*, Maximus of Madaura, Letter 16, PL 33, 82). The notion is closely related to that of philosophical (natural) Theology, favored by Varro and Posidonius, contrasted to civil and popular Mythology. Lang holds that philosophical monotheism is inclusive in relation to popular polytheism (see ► [Polytheism](#)).

Monotheism had deep roots in the Mediterranean world. Some classical scholars argued against the opinion that belief in one God was the exclusive preserve of a Judaeo-Christian tradition (orthodox or heretical), isolated from the classical world which surrounded and enveloped it (Frede) (Athanassiadi and Frede

1999). M. L. West examined monotheistic thinking in early Mesopotamian, Hebrew, and Greek (down to Xenophon’s *Memorabilia*) religions (monotheism was mingled with polytheism here, although the extent to which monotheism came to the fore varied); John Dillon in the various monistic forms of Gnosticism (Gnosticism presents us with a monistic system where the first principle has no countervailing entity not of his own making. This principle is far more transcendent and impersonal than the Jewish or Christian God); and Wolf Liebeschuetz develops syncretic arguments for a Supreme Deity advanced by Praetextatus in Macrobius’ *Saturnalia* (and paradoxically states that the whole of ancestral religion was fundamentally monotheistic). Frede concludes that “not only philosophers, but a very substantial portion of late antique pagans was consciously monotheistic” (Athanassiadi and Frede 1999) and the gap between pagan spirituality and Christian faith was not decisive. There are substantial continuities that connect monotheist thought after Constantine with much preceding religious practice and theological speculation. The pagans in late antiquity came to adhere to different forms of monotheism, which ultimately enabled them to accept Christianity. Lautner, Bowersock, Fowden, and J.P. Kenney showed that with its monotheistic tendencies, Platonism in the imperial age decisively contributed to the process of assimilating Judeo-Christian and pagan traditions.

Even the exegesis of the late second century Chaldaean Oracles by some neo-Platonists (Proclus, Damascius) shows that, despite differences between them, neo-Platonists tend to explicate these sacred texts in monotheistic terms although the texts themselves may be expressions of polytheist theology. This tendency may be accounted for by a variety of explanations. There was a long-term internal process of elaboration going on, or possibly the monotheistic “spiritual globalization” of the ancient world was the result of a series of convergences and overlaps between long-standing monotheistic theologies and Christianity. These may also have been important factors in provoking “sharper contours and a clearer definition to

polytheistic belief” (Athanassiadi and Frede 1999), as well as a growing sense among polytheists of “themselves as a group with a common cultural past and a common interest” (Athanassiadi and Frede 1999).

Christian Theology found a bridge between philosophical and Christian monotheism and the same may be said about deism, which asserts that philosophical faith in God is a natural religion and does not require any revelation (Herbert of Cherbury). David Hume distinguished between the aspiration of philosophically thinking elite to grasp the world as unified (that is rather monism) and popular monotheism using monotheistic dispositive for more effective achievement of its goals.

Paul Radin emphasized that monotheistically thinking individuals are everywhere likely to occur with a certain frequency – in all societies regardless of its stage of development because monotheistic conceptions are rooted not in a distinctive form of civilization but in a peculiar type of temperament. We must – according to Radin – expect to find monotheism as on obligatory faith at every cultural level. It is the devout – as opposed to the intermittently religious – temperament that must be credited with monotheism.

Sometimes, the Supreme Being is seen as failed evolution, where the differentiation of deities has not been carried out yet: every important function is ascribed to one divinity (Gladigow). The evolutionary picture should not be completely given up in this case, only the Supreme Being does not fit in the picture. Pettazzoni insisted (Pettazzoni 1955) that the evolution starts with a high all-seeing heavenly being of primitive religion, followed by the highest all-knowing heavenly God of polytheistic Pantheon, and reaches its highest stage in the unique and all-knowing God of monotheistic religions. Pettazzoni held that it is necessarily ambiguous. His theory seems to fit for Echnaton in the case of Egyptian monotheism, but it is hardly applicable to Judaism. The sun god, represented through the sun disc, was selected in Egypt for that construction of the highest God by Amenophis IV. God was named “sun of

righteousness” by Maleachi 3.20; Essenes worshipped the rising Sun. This suggested that the sun deity is predisposed for monotheistic constructions. On the other hand the problem of influences of one religion/monotheism upon another was also debated. Aton-Hymns were compared with Biblical tradition (Ps. 104). Egyptologists have not ruled out the influence of Echnaton on Judaism (Hornung). This influence was stressed by Freud in his famous *Moses and Monotheism* as well. Although lively discussions are being held about Freud’s work today, this hypothesis finds hardly any supporters within Judaism or Judaic studies (Assmann – Bernstein debate).

The critique of monotheism was prepared by David Hume, who emphasized intolerant traits in popular or institutionalized monotheism as well as inclination to passivity. Although this assertion is widely quoted today, another statement by Hume is almost forgotten, namely, that monotheism represents a more perfect religion and correlates with a higher educational standard of society and more elaborated and comprehensive thinking. Schopenhauer followed Hume’s footsteps in his critique of intolerance in monotheism and so did Nietzsche. Nietzsche objected to Christian monotheism being sterile in the mythological sense (Antichrist) and called for creativity as “a creation of new gods.” Even scholars who highly acclaimed monotheism in the evolutionary perspective, like Comte, charged it with antisocial dispositions: monotheism favors direct connection of individual being with God and ignores social structures. There is a line of extreme critique in modern scholarship (although it is not widely shared in scholarly communities) which links monotheism with patriarchalism, totalitarianism, monotonous character, and holds that monotheism is opposed to political pluralism. Regina Schwartz states that monotheism and all that it entails is responsible for a whole laundry list of Western civilization’s historical and modern sins: exclusivism, authoritarianism, intolerance, misogyny, ill treatment of minorities, jingoistic nationalism, fundamentalism, patriarchy, and, in general, violence toward the Other (Schwartz 1997). Using observations

about the relations of identity constructions and their religious validations, Schwartz wants to argue that it is “the myth of monotheism” that “grounds particular identity in universal transcendence”; it is specifically monotheism “that forges identity antithetically-against the Other.” The argument here is that monotheism entails “scarcity” in contrast to “plenitude,” at best – according to Schwartz – represented through polytheism. Schwartz defines “scarcity” as a sort of metaphysical principle that delimits all sorts of things: Monotheism presumes oneness – the oneness of God and the oneness of His favor and of His people. “[T]here can be no multiple allegiances, neither directed toward the deity nor, apparently, emanating from him.” She renames monotheism into a “myth of monotheism” that is depicted as “a system in which identity depends upon rejection of the Other and subjection of the Self.” Schwartz establishes a difference between “bad” monotheism and “good” monotheism: “bad” monotheism is particularistic, exclusive, and bound up in the metaphysics of scarcity and the violence accompanying it; “good” monotheism is universalistic, inclusive, embraces the principle of infinite bounty, and is presumed to steer humans away from violence. “The logic of negation should be distinguished from one of multiplicity, a logic that sustains contraries without obliteration that multiplies differences” (Schwartz 1997). The principle of plenitude contains an “infinite potential.” Schwartz points to a few biblical narratives and passages where God is depicted operating under the “ideal of plenitude” and wants to define those as politically correct monotheism, a theology for the postmodern age (*Exod. 16:15-18*). But even good monotheism can go bad: good, universalistic monotheism results all too often in imperialism. This Levinasian line of critique taken up in Schwartz’s conception and originally (in Levinas) rooted in his understanding of monotheism is directed here against monotheism itself in order to rule it out, which detects a heavy misunderstanding of relationship between monotheism and otherness.

Rodney Stark speaks of inherent logic of monotheism. The God with the greatest scope

and power is, by definition, the best, so having One True God will always trump lots of little limited gods. To be a “One True God,” you have to be personal, conscious, rational, responsive, and dependable according to rational belief theory, favored by Stark, so that people can develop a relationship with you over time. Others with competing One True Gods will be reluctant to change, but those with weak gods will be easiest to convert. Unfortunately, competition between monotheisms always results in contempt for the other. Monotheisms will missionize, will fight each other, and can survive in hostile circumstances. This logic of monotheism is what allows Stark to argue that Hinduism despite its apparent polytheism, is essentially monotheist, because they are effective missionizers.

Richard Niebuhr puts forward the notion of “radical monotheism” that evoked debates in the North American space (Niebuhr 1943). He stated that the mind of man is a perpetual factory of idols. “Radical monotheism” is monotheism taken with utmost seriousness. Nevertheless, it has nothing to do with morality. He objects to modern moralism that it “has subordinated all other value categories to those of the morally good and morally bad.” Science and art have more or less successfully resisted the tyranny of moralism but religion has accepted the yoke willingly and allowed its concept of sin to be reduced to “moral guilt.” Monotheism is seen as a contrast term to “Henotheism” or social faith, the term that describes the beliefs resulting from the fact that finite tends to elevate some finite thing to the place of God, as an object of loyalty and trust (which makes a finite society, whether cultural or religious, the object of trust as well as of loyalty and which tends to subvert even officially monotheistic institutions, such as churches). In henotheism, there is worship of one God among many, not of one supreme God above all. Niebuhr asserts that human nature is sinful and idolatrous but not morally bad; sinfulness is disloyalty to the true God, to the only trustworthy and wholly lovable reality, which implies a false loyalty to something that is not God but which claims deity. “Idolatry leads inevitably to polytheism and polytheism is conflict” (Niebuhr 1943) Man’s common life and culture are at war with

monotheism. Radical monotheism finds its center of loyalty only in the principle of being itself, only in a loyalty to that One Reality by which all other realities exist and in which they participate. When Western man is not henotheistic, he is likely to be polytheistic (see ► [Polytheism](#)), thereby losing even the limited unity which henotheism (strong identification with national or state values) affords. Scholars like Zizek (transcendental materialism), Catholic authors like John Courtney Murray and many Protestants alike saw reliance on human orders as dangerous and involving one or other form or variety of paganism or idolatry.

Protestant Theologian Paul Tillich opposed monotheism to idolatry by stressing the idolatrous identification of the ground of our being with the God of ordinary theism. Idolatry meant for him the magical identification of the Divine with the bearer of the Divine. The representatives of Theism, like William Alston, indicated that this definition is vitiated by difficulties. Symbols always have a tendency to replace that to which they are supposed to point, but it is impossible for the ground of the being. The holiness of the things may perhaps be considered as inherently holy in the case of idolatry. But if their holiness is inherent and not defined through reference to deity, how can they be holy (and “idolatrous” as a kind of perversion in treating the holy matters) at all? The difficulty lies in the fact that we could frame a possibility that the very place of being has been taken by something else only if “symbolize” (and “ultimately concerned with”), on the one hand, and “being itself,” on the other, had already been defined independently of each other, which is not the case here (W.P. Alston).

There are scholars and rabbis who maintained the compatibility of the Jewish tradition, including monotheism, with pluralism. The Chief Rabbi of England Jonathan Sacks suggests that all monotheistic religions revise their religions explicitly. Sacks makes this (self-)required revision in the form of an additional constitutional amendment to Jewish monotheism stating that the one God, creator of diversity, commands us to honor his creation by respecting diversity. He invites each faith to word this statement (formulated in the Jewish language) in its own termini. It is

formulated in one particular language and at the same time it has a universal meaning as a statement in a meta-language. “God is the God of all humanity, but between Babel and the end of days no single faith is the faith of all humanity.” Jewish critics argued that it is incompatible with Jewish belief (“The Revelation at Sinai was a unique event and never to be repeated in history,” Jonathan Rosenblum). In any religion, traditionalists consider that their scripture alone is the voice of the living God (that is called triumphalism, and supersessionism), which is sure to cause problems. Hilary Putnam maintains that the claims to infallibility always conflict and even the claims to infallibility made by one single religious community always conflict with themselves, which may lead to horrible consequences. Putnam expects that some people will be willing to accept this “amendment,” but not the majority in the foreseeable future. His call echoes Sacks’ plea: each of the religions should find resources within its own texts to support the idea that God values diversity. Reference of epistemologists to the “privileged access to the truth” should be discarded in the case of religion. Any religious tradition and institution is fallible; no one possesses an epistemic authority. A middle way has to be found between the skeptical antireligious view according to which religions should be replaced by some other source of enlightenment, and the view that religion is the final view, time and again ascribed to monotheism. The love of God and the love of one’s fellow beings have at times been treated as if they could be in conflict (Putnam 2006). For Putnam, it is the inconsistency of any human institution in its ideology and working which generates it (this remark reiterates the statements already expressed by Schopenhauer in *Parerga*). Putnam suggests—reiterating Kierkegaard and Wittgenstein—taking a critical stance toward the notion of “superstition” (a counterpart notion for idolatry) as an improper way of embracing the religious truth, as a wrong *kind* to be religious; religion cannot be deduced scientifically. The words said, however “true,” may not suffice to show that one is religious, or that one is worshipping God and not an idol. This allows Putnam to speculate that if it were so that Jews

and other monotheists always lived up to *their* values, while “idolators” only professed to do so, the monotheism – idolatry opposition in relation to monotheistic and non-monotheistic religions might still work. Hence, representatives of other religions expressed critique of their institutions and practices, which shows that there are inner resources in almost each culture to criticize itself. That explains why both Sacks and Putnam are ready to add to monotheistic religions not only Judaism, Christianity, and Islam, but also Hinduism, Buddhism, Taoism, and Confucianism as self-improving religions, a statement that might echo Martin Walzer’s concept of self-improving communities.

Jewish scholar and Rabbi David Novak countered the above-mentioned objection to monotheism by laying emphasis on the concept of a transhistorical redemption, which makes room for true tolerance and a more sophisticated universalism that allows for a wider variety of human responses to the divine presence. Novak distinguishes between “common monotheism” that promotes international relations and the “historical revelation” that makes possible a “truly unified community.” He insists on leaving redemption to God rather than expecting it as the result of human efforts that allows for a greater openness to religious variety and particularity in the present age. Transcultural covenants between different communities are possible in his view only between monotheists. A kind of universal monoculture of humanity is not possible altogether (Novak 2005).

Some uneasiness with “monotheism” can be detected even in the Jewish scholarship since the 1970s. This term is beginning to be used more cautiously. It has been said that the term is not appropriate to describe the Jewish idea of God, that no progress beyond the simple formulas of the Book of Deuteronomy can be discerned in Judaism before the philosophers of the Middle Ages (who performed massive allegorization of the tradition), and that Judaism is hardly likely to escape from the legacy of the battles for supremacy between Yahweh, Ba’al, and El from which it emerged. The opinion was heavily challenged that the experience of mystical unity with God is missing in Judaism because it is incompatible with

Jewish definitions of monotheism. Sometimes scholars see no difference between the range and scope of rabbinic polemic against the angels and the prophetic polemic in the Old Testament against the worship of other gods. The rabbis even had to ban the making of images of angels and other heavenly creatures, as well as the practice of sacrificing to angels, especially to archangel Michael. The existence of such practices testifies to the fact that lots of Jews had continued the old Israelite pagan practices and substituted the angels for the Canaanite gods, similar to the minor nature divinities of the Greek pantheon and the nature spirits ubiquitous in all human societies. Jewish angelology shows that the Second Temple and rabbinic periods are characterized by moving away from the monotheism which is more closely attained in the Book of Deuteronomy. Some scholars explain the apparent proliferation of belief in angels in the post-exilic period as a reaction to the distancing of God from Israel consequent upon the adoption of a transcendental monotheism. Corbin maintained that monotheism is not possible without angels altogether and called this a paradox of monotheism. Another explanation was that Deuteronomy stands apart from the mainstream of Israelite and Jewish beliefs and witnesses to the views of a small coterie of priests and scribes, the group to which Morton Smith gave a name “The Yahweh Alone Party” (Smith 1987). Whatever would be the term that seems more appropriate than monotheism – “a cooperative dualism,” the belief in “two powers in heaven,” multiplied in patterns like Yahweh – Michael (or Yehoel or Metatron, or Melchizedek), God – Logos (Philo), God – Shekinah or the Sefirot, God – Active Intellect (medieval Philosophy), till the Attribute of Justice and the Attribute of Mercy of God (rabbinic literature), supreme God and the demiurge (Hellenistic Judaism, see ► [Gnosticism](#)), and many others, the very notion of monotheism has to be clarified in a more sophisticated manner. Raphael Patai responded to this challenge by distinguishing the popular from the high doctrinal level. Middle Eastern religions are polytheo-demonistic at the popular level and monotheistic at the higher doctrinary level; Western religions in their turn are polytheo-demonistic at the

folk-cultural level, indifferently monotheistic at the modern popular level, and exclusively monotheistic at the official religious level. There are other clarifications of this state of affairs. David Novak claims that monotheism was predominant in Israel from its very beginnings and idolatrous distortions like worship of minor deities were seen as being compatible with the worship of the one God. Post-exilic prophets like Maleachi (1:11–12) state that Jewish worship to Him is inferior to that of some other nations, which allows us to look back at philosophical monotheism. Even the existence of the above-mentioned aberrations may be regarded as the reason for rabbinic teaching that polytheism is prohibited universally (with reference to Talmud, Avodah zarah 8.4 and B.Sanhedrin 56 a-b).

Some uneasiness can be observed in the use of the notion of ethical monotheism as well. This term was introduced by Protestant theologian Abraham Kuenen in 1877, taken over by Julius Wellhausen in 1894, and especially favored by German Jewish philosopher Hermann Cohen. It meant that the only God is righteous and demands ethical behavior on the part of Man. It further implied that the mission of Judaism and the Jewish people is to teach ethical monotheism to the world until the world is fully ready to accept and practice it. Cohen's approach and reaction to it can at best indicate the tension between philosophical monotheism and monotheism as a historically particular revelation to one particular people or community. North American neoorthodoxy (Richard Niebuhr) rejected the notion of ethical monotheism as well. The faith is to be understood more widely than one separate branch of human behavior (ethics). It was favored by liberal theologians in Europe and North America. The debate is still going on.

The term "ethical monotheism" has sometimes been applied to Zoroaster. At the existing level of (rather insufficient) clarification of the term "ethical monotheism" it appears rather unusual to employ it actively. This can be said about the term "monotheism" more generally as well.

Ecoteology (Lynn White) believes that environmental crisis can be overcome only through return to pagan or Asia's religions – there have

been only a few Christian counterparts like St. Francis of Assisi who offered alternative "eco-friendly" religious attitudes. The answer of Christian Theologians is as follows: Darwinian laws of jungle do not prescribe protection of other species. Only Biblical message (especially the statement on man as image of God) is responsible and capable to do this protecting. There is virtual self-contradiction in play: man has to look to the nature for the values of right behavior but is instructed to behave by a standard found nowhere else in nature. This standard cannot be established even by science, which regards man as subjected to the same laws of nature. It was stressed that dominion demand in Genesis 1 has to be seen in juxtaposition to the care demand in Genesis 2, and Ps. 8 and 24, as delegated dominion that involves Biblical model of human stewardship.

Cross-References

- [Biblical Studies](#)
- [Concept of God in Contemporary Philosophy of Religion](#)
- [Creationism](#)
- [Evolution](#)
- [Monism](#)
- [Mysticism](#)
- [Myth](#)
- [Panentheism](#)
- [Polytheism](#)
- [Transcendence and Immanence](#)

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Mood

- [Emotion](#)

Moore's Law

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First described by Gordon Moore of Intel in 1965, Moore's law has been variously defined (over the years) to state that the number of transistors on an integrated circuit doubles every year, 2 years, or 18 months. As computer speed doubles with the doubling of transistors, this indicates that progress in computational speeds has been, for several decades, exponential. Some roboticists and AI theorists believe that Moore's law will continue unabated, providing near limitless computation and, eventually, transcendently intelligent machines.

Moral Evil

- [Evil, Problem of](#)

Moral Judgment

- [Attribution/Attribution Theory](#)

Moral Panic

- [Deviance and Social Control, Sociology of](#)

Moral Philosophy

- [Ethics](#)

Morality

- [Altruism](#)
- [Ethics](#)
- [Sin \(Vice, Human Limits, Negativity\)](#)

Movement Disorders

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Description

Movement disorders delineate a subdiscipline of *neurology* and are caused by affections of the central nervous system (with is composed of the brain and spinal cord. Your brain and spinal cord

serve as the main “processing center” for the entire nervous system, and control all the workings of your body). Movement disorders comprise a group of neurological conditions that are characterized by problems with movement – either unwanted movements or slowness and poverty of voluntary movement – which are a subject of diagnosis, therapy, and research. Within the central nervous system especially deep brain structures, the ► [basal ganglia](#), and their interactions with other brain areas are involved in the *pathophysiology* of movement disorders. Early descriptions of illnesses associated with alteration of movements as well as the anatomical distinction of cortical and subcortical brain areas go back to the Middle Ages. Systematic studies on disease entities and their pathological correlates have been published since the nineteenth century. In the 1980s, an international organization ([The Movement Disorder Society](#)) was founded and today movement disorders are an expanding discipline of clinical and experimental *neuroscience* and treatment by means of *pharmacology*, *neurosurgery*, and *physiotherapy*.

Self-identification

Science

Movement disorders as a speciality developed within the disciplines *medicine* and *neurology*. The discipline identifies itself as a *natural, life and human science*. On the basis of description and classification of movement *phenomenology* different clinical syndromes are distinguished. The discipline aims to provide knowledge about *etiology*, *pathology*, and *pathophysiology* of different diseases by discovering structural and functional changes of the nervous system. Scientific methods are applied to establish an objective basis for specific curative or symptomatic therapy. Methods of all disciplines of *neurosciences* are accessed for research such as *neurophysiology*, *neuroanatomy*, *neuropathology*, *neurochemistry*, *neurosonology*, *neuroimaging*, *neuropsychology*, *neuroradiology*, and *molecular neurobiology*. Using this scientific background, evidence-based therapeutic regimes



Movement Disorders, Fig. 1 Early medical photography illustrating the movement disorder athetosis (Extracted from Bourneville and Regnard 1878). Conserved at and permission granted for reproduction by: Bibliothèque Charcot (UPMC-Université Pierre et Marie Curie) – Hôpital de la Salpêtrière)

in the fields of *neuropharmacology* and *functional neurosurgery* have been developed from movement disorders.

Characteristics

Accrued from *neurology*, movement disorders also refer to affections in functional nervous systems and disease-induced impairments of neurological functions. But different from other fields of neurology, movement is in the focus of interest. Accordingly, special scientific methods for movement analysis have been developed from the field of *electrophysiology* and *neurophysiology*. Additionally, *medical art*, *photography*, and *videography* have always played a key role in the documentation of movement disorders ([Fig. 1](#)).

Distinctive from general *neurology* is the fact that especially involuntary, automatic, and stereotyped aspects of motion are analyzed. According to a hierarchic concept, movement disorders give insight into basic aspects of motor parameters (e.g., rhythm, speed, duration, topography), which have to be distinguished from higher-order programs of movement planning. Since these automatic executions of motor plans are mainly attributed to subcortical structures like the basal ganglia, movement disorders focus on this distinct brain area.

As *sensation, cognition, emotion*, and especially *affective gesture* and *mimic (psychomotoric)* can also be altered in movement disorders, this discipline also deals with stereotype and automated subconscious aspects of these functions and its relevance from basal ganglia interactions with other brain areas. Accordingly, the discipline movement disorders is related to *neuropsychology* and *psychiatry*.

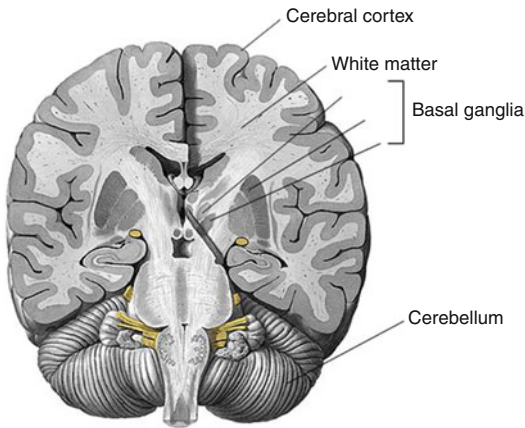
Relevance to Science and Religion

Movement disorders are a domain among *clinical neuroscience*, which uses input from and also provides input to all other neurosciences. With some of its specific methodological approaches, such as invasive electrophysiological neuronal recordings during *functional neurosurgery*, it can contribute to a deeper understanding of brain *physiology* and especially involuntary, subconscious control of behavior within the discourse of *neurosciences* and *humanities*.

Sources of Authority

The history of movement disorders is strongly associated with the first systematic reports of typical disorders, which still bear the name of their first descriptor. In 1686 Thomas Sydenham published a report on a typical movement disorder with increased involuntary movements (hyperkinesia): the so-called chorea minor, which today is still known as “Sydenham Chorea.” James Parkinson wrote his “Essay on

the Shaking Palsy” in 1817 describing a disease, which is up to now called “Parkinson’s Disease” (Parkinson 1817). Besides its clinical presentation with tremor this disease is still the most exemplary form of a movement disorder with decreased movements (hypokinesia). The description of these diseases marked the dualistic concept of movement disorders with hyperkinesia and hypokinesia at opposite ends. Focusing on Parkinson’s disease and other tremorous conditions, Jean-Martin Charcot (1825–1893) made fundamental contributions to the correlation of clinical syndromes with brain *anatomy* by means of regular autopsy. He also developed diagnostic methods to differentiate movement types and made basic considerations for pharmacological treatments. The term “basal ganglia” first appeared in English with David Ferrier’s writing of 1876 adopted from the German term “Stammganglion” coined by August Forel in 1872. William Hammond, William Osler, George Huntington, George Gilles de la Tourette, Hermann Oppenheim, Cecile and Oskar Vogt, Constantin von Economo, and S. A. Kinnier Wilson were seminal figures of the nineteenth and early twentieth century regarding pathological and clinical description of different movement disorders. One of the most central authorities in movement disorders of the late twentieth century was C. David Marsden (1938–1998) who combined *neuropsychology*, *neurophysiology*, and *neuropathology* in this field and established an international respected laboratory at the Institute of Neurology, Queen Square, University of London. He was also a founding member of the Movement Disorder Society, which today is the central international society of specialists and authorities in this domain ([The Movement Disorder Society](#)). Marsden, Mahlon R. DeLong, and Garret E. Alexander established the today widely accepted anatomical and physiological model on the functioning of the basal ganglia. With respect to therapy of movement disorders, the introduction of levodopa in the 1960s by André Barbeau, Walter Birkmeyer, and Oleh Hornykiewicz represents a milestone in the pharmacological treatment of parkinsonian



Movement Disorders, Fig. 2 Anatomical view into the human brain. Neurons of the basal ganglia, the cerebellum, and cerebral cortex are highly connected through pathways of the white matter. Functional changes of the basal ganglia can lead to movement disorders and can be modulated by drugs and electrical stimulation. Pathological examinations of as well as electrical recordings from these structures have a major impact on movement disorders research (From Putz/Pabst 2006; Permission granted for reproduction by Elsevier)

syndromes by replacing the deficient neurotransmitter dopamine. Based on topical models of the basal ganglia and stereotactic brain atlases established in the middle of the twentieth century by Jean Talairach and later by Georges Schaltenbrand and Waldemar Wahren treatment of movement disorders nowadays also experiences a renaissance of *functional and stereotactic neurosurgery*. Tracing back to early operations by Victor Horsley and Robert Henry Clarke in 1909, today movement disorders surgery mainly became a field of electrical ► **neuromodulation** by means of ► **deep brain stimulation** via implanted impulse generators introduced 1986 by Alim Louis Benabid and Pierre Pollak (Fig. 2).

Ethical Principles

Movement disorders as a medical discipline was historically guided by the oath and law of Hippocrates. Modern research is also based on the rules of the “Declaration of Helsinki” and its amendments by the World Medical Association.

This declaration is regarded as standard in medical ethics. Local and regional standards are discussed and regulated by institutional ethical committees.

Key Values

Movement disorders are devoted to increase the understanding of specific disorders and mechanisms of the respective brain subsystem to alleviate or even cure the underlying disease.

Conceptualization

Nature/World

Nature is everything of the physical world which is not originated by the human being. In *biology*, the term nature contains biotic forms – contrasted to abiotic nature – as animals, plants, and human beings. World is the totality of everything in the time- and space-defined universe that builds up reality and – in respect to biologic beings – their existence.

Human Being

The human being is a distinctive bipedal primate of the hominidae family equipped with a highly developed brain capable of *emotion, language, problem solving, introspection, abstract reasoning, intentionality, self-consciousness* and the knowledge of a *personal identity*. Movement disorders mainly focus on the treatment of human beings, although pathophysiological considerations are derived from animal models.

Life and Death

Life distinguishes organisms from nonliving objects (abiotic nature) by physical adaption and communication with the environment and especially self-regulation and replication. In complex biological systems with organ substructures, especially in the human body, life includes metabolism and functional states of the nervous system, which in a specific pathological state can induce movement disorders. Death is the final termination of biological functions. As the brain and its functional

state are considered to be correlated with human distinctive attributes like *personal identity*, brain-death is considered the death of the human being.

Reality

Physical reality is the objective true state of the world and includes everything whether or not comprehensible by beings.

Knowledge

Knowledge as possessed by humans is a justified, true, and believed statement about reality. Knowledge needs not to be conscious and can be the basis of biological dynamics and self-organization in biological systems. In medical disciplines like movement disorders, knowledge is intended to be produced by scientific methods.

Truth

Truth is the correspondence of belief with the objective fact of reality.

Perception

Perception is the *reception* and *awareness* and/or mental representation of reality by means of *sensation*.

Time

Time and space are the fundamental dimensions of the universe and human perception. Human perception of time can be affected by the focus of *attention* and impaired by diseases of the brain like movement disorders and also be modulated by therapy of these.

Consciousness

Consciousness is a mental state of a subject which is responsive to the outside world. Concerning *alertness*, it is quantitative. In human beings, it can also involve different qualities as *thoughts*, *sensations*, *perceptions*, *moods*, *emotions*, *dreams*, and *self-awareness*. Neurological diseases and movement disorders can alter states of consciousness. As automatic, nonvoluntary, sub-conscious movements are the focus of movement disorders, the definition of consciousness is a crucial point in this discipline.

Rationality/Reason

Rationality is a logical basis of organization of behavior, understanding reason as ultimate authority. Rationality can be altered in some movement disorders, and many involuntary movements are mainly executed without conscious reason.

Mystery

Mystery is a secret condition which seems not explainable by rationality and objective scientific methods. As movement disorders are nonrational behaviors, C. David Marsden provocatively pointed out “the mysterious motor functions of the basal ganglia” (Marsden 1982).

Relevant Themes

A critical issue in movement disorders in regard to science and religion is the definition of nonvoluntary movements. It raises the question concerning definitions of *free will*, *intention*, and *consciousness*.

Cross-References

- [Neuroimaging](#)
- [Neuropathology](#)
- [Neurophysiology](#)
- [Neuropsychology](#)
- [Neuroradiology](#)
- [Neuroscience](#)
- [Neurosurgery](#)
- [Psychiatry](#)

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M-Theory

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It is conjectured that there might exist a law of nature capable of spontaneously producing universes, including our known universe. It arises out of string theory – a theory based on the idea that the fundamental building blocks out of which everything is made consist of tiny vibrating strings. It is expected that the various universes spawned by M-theory would have different laws of nature and different values for the physical constants. There is as yet no evidence for this theory, and it has yet to be formulated.

Cross-References

► [Time](#)

Muhammad, Prophet

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Related Terms

[Muslim prophet](#)

Introduction

Muhammad, the Prophet of Islam, who received revelation from God contained in the Muslim

scripture, the Qur'an (Koran). Questions surrounding the life of Muhammad continue to puzzle some, but it is safe to ascertain that he was the source of inspiration for the development of Islam into a separate monotheistic religion in the seventh to tenth centuries CE and the establishment of many of its practical aspects. The traditional Muslim sources, such as *sira* (account of the life of Muhammad), collections of ► [hadiths](#) (reports about what the Prophet said or did, usually referred to as "traditions"), commentaries on the Qur'an, and works of history, describe the background of his life as that of the Arab pagan society which had little awareness of and connection with the established monotheistic traditions of the Near East of the seventh century CE. More recent scholarship, however, proposed to view the context of Muhammad's life as part of what is now termed as the Late Antiquity, a period of important religious, political, and social changes and fluidity in religious and intellectual life. The reason why we have such different pictures of the context of Muhammad's life is tied to the persistent problem of sources for the life of Muhammad. For this reason, any discussion about Muhammad inevitably involves description of the existing sources and why they cannot tell us much about the historical Muhammad.

The Problem of Sources

Sources on the life of Muhammad are many, but they all go back, at the earliest, to a century later than the events they describe. For a detailed description of sources on the life of Muhammad and overview of the earliest works, see Raven (2006). Also, see Rippin (1999, p. 455), Cook (1983, pp. 61–76), and Hawting (2005, 21–22). The earliest compilations of reports about Muhammad are those by Ibn Ishaq (d. 767), whose work we have in several later reductions, notably that of Ibn Hisham (d. 833), al-Waqidi (d. 822), Ibn Sa'd (d. 845), and al-Tabari (d. 923). Earlier sources do not exist in their original or complete forms and are extremely difficult to date. External to the Muslim tradition sources

(Hebrew, Syriac, Greek, or Armenian) are few, cannot be considered totally objective or disinterested. Moreover, their information is often at variance with the Muslim sources. The archeological and hard evidence (inscriptions, buildings, and coins), datable to the first decades of Islam, is also scarce and is inadequate for producing a historical picture of the period. It is, therefore, very difficult to talk about Muhammad outside the historical and religious context within which the Muslim tradition has firmly placed him.

Among the various genres of the Muslim historical and literary tradition, the bulk of which is written in Arabic, the *sira* literature in particular has always been viewed as the major source for the life story of Muhammad. Recent scholarship, however, showed that attempts to reconstruct the historical account of Muhammad's life from *sira* are futile. Instead, some scholars have increasingly concerned themselves with the new ways in which *sira* can be used to understand the concerns and preconceptions of the Muslim tradition about important issues of doctrine, theology, and authority (religious as well as political). Scholars who take this approach use *sira* works to understand the context within which they have been composed rather than that which they claim to portray.

Sira in its present form is a literary text and, as a result, the narrative and the image of main personalities of its stories developed in accordance with the conventions of a literary work. There are numerous versions of *siras* produced by many Muslim authors living in different historical, political, and intellectual milieu. *Sira* as a life story of Muhammad served many tasks. In particular, it helped to build his image in rivalry to other prophets, established his status as a statesman, provided context and a chronological framework for the Qur'anic text, reflected concerns of Muslim scholars with the early history of Islam, continued the ancient Arab tradition of storytelling, and addressed concerns of a didactic and legal nature by setting standards for the newly emerged community.

The Qur'an, also considered an important source for the life of Muhammad, contains very few direct references to Muhammad himself. His name is mentioned only four times in the Qur'an

(3:144, 33:40, 47:2, and 48:29). Moreover, the Qur'an does not provide any overall context for the early history of Islam or some of its most important doctrinal and theological aspects. It scarcely mentions personal or geographical names. It is allusive and fragmentary in nature. Therefore, almost every Qur'anic verse gives way to several possible interpretations, which is often skillfully used by scholars of various generations and persuasions to argue for their own case. On the one hand, the Qur'an is accepted as an important source for the life of Muhammad. On the other hand, the life of Muhammad is meant to provide a contextual framework for the understanding of the Qur'anic text. The Muslim tradition as well as much of the scholarship in the West, therefore, often ends up in a circularly reading of one in the light of the other. For an interesting approach to these issues, see Wansbrough (1978, especially Chap. 1, pp. 1–49).

Another important source for the life of Muhammad is the collections of ► *hadiths* (traditions). These are used primarily for normative purposes. The most famous collections of ► *hadiths* are that of al-Bukhari (d. 870) and Muslim (d. 875) in the Sunni tradition and al-Kulayni (d. 941) and al-Tusi (d. 1067) in the Shi'i tradition. Most of the material contained in these collections repeats that of the *sira*. However, unlike in the *sira*, where the reports are arranged in a chronological order, more or less the same reports in the ► *hadith* collections are arranged either according to the subject matter or according to the authorities who narrated them from Muhammad. This is because all genres of Muslim literary and historical tradition rely on a common pool of materials and authorities but use them for the specific purposes of their respective genres. As a result, similar problems arise when we try to use ► *hadith* collections with the aim of putting together the story of Muhammad's life.

The Traditional Account of Muhammad's Life

Despite the existing problem of sources, a somewhat standardized traditional account of

Muhammad's life is available. For an example of the traditional account of Muhammad's life see Ishaq (2001) and Watt (1961). Also, see Cook (1983). Most of it is concerned with the pre-Islamic Arabia, and Muhammad's genealogy and his military campaigns, known as *maghazi* (sing. *ghazwa*). Little information is given about his life in the period before the beginning of his prophetic mission. According to our sources, his prophetic career lasted around 22 years.

The Muslim tradition tells us that Muhammad was born around 570 CE in Mecca. An oasis town in the Hijaz area of the Arabian Peninsula, Mecca was believed to be an important center of trade at the time of Muhammad's birth. The exact date of his birth is not available, but it is usually associated with the "Year of the Elephant" or "Expedition of the Elephant," referred to as such because the march of Abraha, the ruler of south Arabia, against Mecca on an elephant took place in the same year. The date of Muhammad's death is given by the tradition as 632 CE.

Muhammad was born to Abd Allah, the son of Abd al-Muttalib and Amina, the daughter of Wahb, and belonged to the Banu Hashim section of the Quraysh tribe. The ancestry of his tribe goes back to a man named Fihr ibn Malik who lived about ten generations before the birth of Muhammad. The tribe gained prominence much later under the leadership of Qusayy, who succeeded in winning over the Meccan sanctuary by striking political alliances with various tribes. Hashim, a grandson of Qusayy, established his tribe as prominent merchants in the Hijaz setting up trade agreements with the rulers of the Roman Empire, Persia, the Yemen, and Ethiopia. He also initiated two major caravan journeys, one in the summer and the other in the winter referred to in the Qur'anic *sura* (chapter) 106.

As a sanctuary, Mecca was not only the center of trade, but also the center of pilgrimage. According to the tradition, the Meccan sanctuary had monotheistic origin and was built by Prophet Abraham. Several generations after his death, however, the Arabs abandoned the original monotheism of Abraham and the Meccan sanctuary became a pagan sanctuary. Muhammad's task was to restore the original monotheism of

Abraham. The well of Zam-Zam next to the Ka'ba is also associated with the story of Abraham's wife Hagar, their son Ishmael, and the foundation of the sanctuary in Mecca (Hawting 2005, pp. 9–10). It was the grandfather of Muhammad, Abd al-Muttalib, who rediscovered the well of Zam-Zam before the birth of Muhammad (Hawting 1999, p. 22). Apart from this, there are many other signs in the early life of Muhammad which foretold his future mission: the story about the aborted sacrifice of his father Abd Allah who was spared because he was to father an Arab prophet, the story of a woman who wanted to marry Abd Allah so that she can give birth to the future prophet, the story about a Christian monk who recognizes the future greatness of Muhammad on his journey to Syria, and many more.

Muhammad lost his parents at an early stage of his life and was cared for by his grandfather. When his grandfather died, his uncle Abu Talib took charge of his upbringing. While living with his uncle, Muhammad became involved in trade and even accompanied his uncle on trips to Syria. On one of such trips, a Christian monk named Bahira recognizes the future greatness of Muhammad and asks his uncle to protect him. Muhammad became known for his good conduct and trustworthiness among the Meccans. Eventually, a wealthy widow named Khadija employs him in her commerce, and later they get married. Unlike the custom of the time, Muhammad did not take another wife till after her death. Khadija gave birth to several of Muhammad's children. Although none of their male children survived, Muhammad is often referred to by his *kunya* (honorific title) of Abu al-Qasim (the father of Qasim). Subsequently, Muhammad married several other women among whom Aisha (d. 678) is the most famous. She was the daughter of Abu Bakr (d. 634), the famous companion of the Prophet who took over the leadership of the Muslims after Muhammad's death. Many ► *hadiths* are reported on her authority.

Muhammad was in the habit of going on retreats to Mount Hira' located not far from Mecca to contemplate in solitude. It was not until he was 40 years old that these retreats

resulted in an experience of the divine. During one such retreat, the angel Gabriel appeared to Muhammad and informed him that he had been chosen to be the messenger of God and that he should obey the command of the one God, Allah. The Muslim tradition connects the Qur'anic *sura* 96 to this incident which starts with the following verses: "Read, in the name of your Lord Who createth, createth man from a clot! Read, and Thy Lord is the Most bounteous, Who teacheth by the pen. Teacheth man that which he knew not." This event is sometimes taken to mean that Muhammad was illiterate, because in reply to Gabriel's command to read Muhammad is said to have answered that he did not know how to. It is also said that in the beginning Muhammad was puzzled about the call to prophethood, but soon began to preach what God had commanded him to.

The beginning of Muhammad's prophetic mission was very difficult. He succeeded in converting only the closest members of his family, among them his wife Khadija; his cousin Ali (d. 661), who would later become his son-in-law; and his manumitted slave Zayd. During this period, his prophetic experience remained private. Muhammad's attempts to intensify his preaching resulted in a bitter confrontation with the prominent members of the Meccan society. He was mocked for what he preached and his followers faced bad treatment. People demanded miracles from him to prove his prophetic status, but he was commanded to reply that the unseen belonged only to God (Q, 10:20). There was even an instant when Muhammad was ready to compromise with the pagan Meccans to accept their gods to secure the safety of his followers. When the followers of Muhammad began to be subjected to harsh treatment and sanctions, he first ordered them to immigrate to Ethiopia in the hope that the Christian ruler there will protect them. Meanwhile, Muhammad himself remained in Mecca and continued to look for alternative places of refuge. It is during this period that Muhammad had one of his most important spiritual experiences. One night when he was sleeping near the Ka'ba, Gabriel appeared to him and took him to Jerusalem where he was joined by

Abraham, Moses, and Jesus and led them in prayer. Then he ascended to heaven, an event that is known as *mi'raj* (ascension) in the Muslim tradition (Q, 17:1), which plays particularly significant role in the esoteric traditions within Islam.

Following the death of Khadija and his uncle Abu Talib in 619 CE, Muhammad realized that it was no longer possible to remain in Mecca. Abu Talib was in the position to protect Muhammad against the attacks of the Meccan elite thanks to his status and influence there. His death, therefore, was a heavy blow to the security of Muhammad and his followers. Eventually, Muhammad ordered his remaining followers to immigrate to Yathrib and joined them there later.

Yathrib was a small oasis to the north of Mecca, which eventually became known as *Madina* (city), short form for *madinat al-nabi* (the Prophet's city). When the first Muslims arrived in Yathrib, the inhabitants of the city, among them several ancient Jewish tribes, welcomed Muhammad and accepted him as an arbitrator in the hope that he may heal the recurrent local strife among the various groups. The event of Muhammad's move from Mecca to Medina, which the tradition places in 622 CE, is known as *hijra* (emigration). This date was later adopted as the beginning of the new Islamic calendar with the establishment of Islam as a state religion (Kennedy 1986, pp. 32–33; Cook 1983, pp. 52–53; Rippin 1999, pp. 33, 88). Those who fled Mecca to join Muhammad in Medina became known as the *muhajirun* ("emigrants"), while his local supporters became known as the *ansar* ("helpers").

In Yathrib, Muhammad succeeded in unifying the various fractions at conflict: the Jewish tribes, the Arab tribes of Aws and Khazraj, and others. The rules of this union were set in a document which came to be known as the "Constitution of Medina" (Kennedy 1986, p. 34; Cook 1983, pp. 21–22). This document was binding for Muslims and the people of Yathrib, together making up one *umma* (community of believers), who were to strive in the course of God together. All disputes were to be referred to God and Muhammad. However, the relationship with the

Jewish tribes of Medina soon deteriorated to the extent that most of them were expelled from Medina. This was often explained by the fact that the Jews were jealous that God had chosen his latest prophet from among the Arabs. In addition, the relationship between the Meccan and Medinese followers of Muhammad was also tense. They were accusing each other of hypocrisy and were suspicious of each other.

Despite these challenges, once Muhammad established his position in Medina and gathered enough support, he began his campaigns against Mecca. He aimed at disturbing the Meccan trade by attacking camel caravans and taking over the wealth of these caravans for the benefit of the Medinan community. His first major victory was achieved in 624 CE at the battle of Badr, which reinforced his position in Medina and shook the confidence of the Meccans. A string of battles between 624 and 629 CE resulted in providing Muhammad with such a strong basis, both militarily and politically, that in 629 CE he attacked Mecca itself. However, this campaign was not won by a battle but ended in the treaty of Hudaibiyya which gave the Muslims the right to perform pilgrimage to Mecca the following year. Muhammad died two years after this agreement in 632 CE by which time he had established a strong position for himself in Arabia. Following his death, these raids gave way to the conquest of the Near and Middle East by the Arabs, which went hand in hand with the spread of Islam in the region.

Historical and Religious Context

The traditional account of Muhammad's life places him squarely within a pagan setting of Arabia. His religious message is directed at idolatrous Meccans, who are surprisingly well aware of the biblical tradition. What the Muslim tradition does not tell us though is how the Meccan society relates to the Near East of the sixth and seventh century CE, an area of important political and religious developments dominated by monotheistic religions. As mentioned earlier, recent scholarship attempts to understand the period

prior to the emergence of Islam as part of the wider developments of the period in question. For an overview of the historical context prior to the rise of Islam and the early decades of Islamic history, see Kennedy (1986, Chaps. 1 and 2, pp. 1–49), Rippin (1999, pp. 4–8), and Hawting (2005, pp. 9–27). The term Late Antiquity, referred to earlier, is a new way of understanding this period in the history of the Near and Middle East. It roughly covers the third to eighth centuries CE and ends with the establishment of the Islamic state in the region. The Arabia of the seventh century CE was located between two powerful empires of the time: the Byzantine Empire in the West and the Sassanian Empire in the East. See Kennedy (1986, Chaps. 1 and 2, pp. 1–14). Several conditions lead to the success of the Arab conquest of the Near and Middle East and the eventual demise of these powerful empires: complex social and political changes, religious disaffection among some monotheistic groups, the rise of local cultures at the expense of the dominant Greek culture, and the disinterest among the general population to rise against the Arab invasion.

One particularly important change of this period was the spread of the monotheistic religions, Judaism and Christianity, and subsequently Islam in the area. The period is also marked by the rapid fall in the use of Greek and Latin languages and coming to the forefront of languages of the peripheries of the empires, such as Syriac, Armenian, Arabic, and Coptic (Hawting 2005, pp. 17–18). Therefore, looking at the rise of Islam as part of these developments helps us understand the rise of Islam in the Middle East as part of this picture with the further spread of the monotheistic traditions, continuity in sciences such as philosophy, mathematics and medicine, and some legal and social practices.

This is contrasted with the Muslim tradition's depiction of the society within which Muhammad lived as that of ignorance and idolatry. The Muslim tradition puts an emphasis on the discontinuity between the Near East of this period and the Islamic message. The term of *jahiliyya* (state of ignorance) is used in the Muslim tradition to

refer to the pre-Islamic context immediately preceding the emergence of Islam in Arabia (Hawting 1999, pp. 1–2, 4–8, 99–100, 2005, pp. 16–17). It is also used to refer to the context within which Muhammad preached his message. Although we are told of men who were in search of one true God, the society of this time is described as ignorant of God and morally corrupt and is contrasted with Muhammad's message of the oneness of God, peace, and ethical behavior. We are not told about how the society in Arabia related to the above-mentioned changes of social, political, and religious nature. The fact that we do not have this information is also related to the problem of datable sources on the life of Muhammad and the early history of Islam. Therefore, major questions concerning the understanding of the life and message of Muhammad are tied to the understanding of the historical, political, and religious contexts of his life.

Consequently, some scholars have moved the shift from the question of the authenticity of sources on the life of the Prophet to the question about the aim and role of these sources in shaping the identity of Islam as an independent religion. Scholars who take this approach are more interested in understanding why the sources for the life of Muhammad, in particular *sira* and ► *hadith* collections, exist in the form they do; why they contain certain type of material; and what function they intended to serve at the time of their emergence and during later periods rather than in questions of authenticity and reliability of these sources.

The Religion of Muhammad

The Muslim tradition emphasizes that God has revealed his final revelation to an ordinary man from among the Arabs, but the revelation itself is of the divine nature and is universal for all mankind (Q, 18:110, 41:6). Muhammad's main task as a prophet was to deliver this divine message to people. While commanding him to deliver the message, the Qur'an, 13:30 says: "Thus We send thee (O Muhammad) unto a nation, before whom other nations have passed away, that you

might recite unto them that which We have inspired in you, while they are disbelievers in the Beneficent. Say: He is my Lord; there is no God save Him. In Him do I put my trust and unto Him is my recourse."

The revelation was sent down through an angel in segments over more than twenty-year period (Hawting 2005, p. 10). It was not revealed in the order in which the Qur'an in its present form exists. The present order of the text came about after the death of Muhammad. The Qur'an, 33:40 emphasizes the position of Muhammad as a prophet: "Muhammad is not the father of any man among you, but he is the messenger of Allah and the Seal of the Prophets; and Allah is ever aware of all things." Thus, Muhammad is not the only prophet, and there have been many prophets before him, but he is the seal of the prophets. Muhammad is asked to warn by the book of the day of judgment, remind his people of the nations and prophets' past, and give good tidings. His audience is asked not to worship anything but God and not to associate anything with him (Q, 6:162–163). Moreover, Muhammad's task was to serve as the final link in the chain of many other prophets (Adam, Noah, Abraham, Moses, and Jesus) and complete what had been revealed to them. But Muhammad has a distinguished position too; he is to deliver the final message, but at the same time reaffirm and continue the original monotheism of Abraham (Q, 3:67–68) (Rippin 1999, pp. 16–19; Rubin 2005, pp. 444–445). The authenticity of his message is ascertained by many verses of the Qur'an (Q, 2:119, 252, 4:170, 9:33, 35:24).

Although Muhammad's name is mentioned only four times in the Qur'an, there are various words which have been taken to indicate his relation to God. He is called *rasul Allah*, the messenger that conveys the divine message. He is *abd Allah*, the servant that serves his God and obeys His command. He is the *bashir*, the announcer of good tidings to his fellowmen and the *nadhir*, who warns them and prepares them. He is the *shahid*, the witness of the glory and greatness of God. He is also the *da'i* who summons his people to goodness and to the *sirat al-mustaqim* (the right path). And he is the *siraj*

munir (the light-giving lamp) that illuminates the right path for those who choose to follow him (Rubin 2005, p. 440).

The Qur'anic word for God is Allah. The central message of Muhammad's teaching is the unity and oneness of God. The God of the Qur'an is omnipotent, has no similitude, and is the creator of all that is in the heavens and on earth. He is also transcendent, all-powerful, magnificent, yet compassionate, merciful, forgiving and just. God in Islam has attributes, which are expressed by his 99 beautiful names. He has revealed his will and message to human beings through His prophets, which has been completed by His revelation to Muhammad.

The Islamic law, *shari'a*, is a divine law; the basic principles of which are reflected in the *sunna*, the normative example of Muhammad known from the ► *hadiths*. It is interpreted and transmitted by Muslim scholars of jurisprudence. The two major sources of law common to all Muslim groups are the Qur'an and the *sunna* of the Prophet (Rippin 1999, pp. 74–80).

The official five pillars of Islam (sometimes referred to as rituals) are the *shahada* (the confirmation or testament of faith "There is no god but God, Muhammad is the messenger of God"), *salat* (the five-times prescribed daily prayer), *sawm* (fasting of the month of Ramadan), *zakat* (alms tax), and *hajj* (pilgrimage to Mecca during the month of Dhu'l-Hijja). These are vaguely described in the Qur'an, but one can find detailed description in other Muslim sources, notably the ► *hadiths* (Rippin 1999, pp. 86–99).

The Qur'an as well as the *sunna* emphasize ethical principles of charity, compassion, fulfillment of one's commitments, trustworthiness, and courage. These are the principles that the life of Muhammad epitomizes for every Muslim. Many verses of the Qur'an associate the belief in God with charitable and good deeds, emphasizing that being ethical is part of fulfilling God's command. An example of this is the Qur'an, 47:2: "And those who believe and do good works and believe in that which is revealed unto Muhammad – and it is the truth from their Lord – He riddeth them from their ill-deeds and improveth their state." In Islam, such ideas about good and ethics matured over time and successfully incorporated the

teaching of Muhammad with elements from the pre-Islamic Arabian, Greek, and Persian traditions under the unifying Islamic framework. It was further developed in the Muslim literary tradition which built on what the ► *hadiths* and Qur'anic verses had to say on the subject.

The Centrality of the Figure of Muhammad in Islam

The major characteristic which sets Islam apart from other monotheistic traditions is the doctrine of the unity (or oneness of God) and the prophethood of Muhammad. The *shahada* is a witness to these two essential principles and thus shows the centrality of the belief in Islam that Muhammad is the messenger of God. But the centrality of Muhammad's position in Islam goes beyond that. Muhammad's example plays central role in establishing Islam as an independent religious tradition. The accounts of his life function in a way that their normative role in elucidating the various aspects of Islam is as important, if not more so, as their task of relating the story of Muhammad's life. The establishment of most important aspects of Islam is projected back to the life example of Muhammad with the intention of confirming him as their founder. That is why the *sira* of Muhammad, the scripture of Islam, and his *sunna* are most important in this respect.

Muhammad's main task as a messenger was to deliver God's revelation to mankind, yet the Qur'an depends on his *sira* to provide a framework for its understanding. *Sira* was one of the first types of literature to develop in the Muslim tradition which continued to influence other genres of Muslim literary and historical tradition as they grew out of it and their development went hand in hand with its development. The *sunna* of the Prophet is the major source of Islamic law in terms of its importance and size. The idea of a *masjid* (mosque) as a place of prayer and worship is also traced back to the example of the early Muslim community lead by Muhammad in a congregational prayer. Although its form developed and transformed over time, the basic function and form of a mosque remained the same.

In sum, Islam as an independent monotheistic religion has its own prophet, scripture, religious law, calendar, place of worship, and rituals. Their origins, function and form are traced back to the life time of Muhammad and are authorized by his example. Muhammad's life is accepted as a model for every Muslim because while reaching the highest spiritual experience (such as his ascension to heaven on the night of *mi'raj*), he is said to have remained true to his worldly commitments of taking care of his family, managing the affairs of his community, and leading his followers. His example, therefore, continues to inspire Muslims in the way they practice their religion and live their lives today.

Cross-References

- ▶ [Allah](#)
- ▶ [Caliphate](#)
- ▶ [Islam: An Overview](#)
- ▶ [Names of God](#)
- ▶ [Theology in Islam](#)

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Multi-criteria Decision Analysis (MCDA)

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Multiple-criteria decision analysis, or multiple-criteria decision-making (MDDM) is a subdiscipline of operations research that explicitly considers multiple criteria in decision-making environments. MCDA can be defined as the study of methods and procedures by which concerns about multiple conflicting criteria can be formally incorporated into the management planning process. There have been important advances in this field since the start of the modern multiple criteria decision-making discipline in the early 1960s. Different schools of thought have developed for solving MCDM problems, being the most known the multiobjective mathematical programming school, the goal programming school, the French school with its outranking methods, the evolutionary multiobjective optimization school, the analytic hierarchy process, the fuzzy-set theory, or the multiattribute utility theory.

Multiculturalism

- ▶ [Cross-Cultural Psychology](#)

Multiple Intelligence

- ▶ [Intelligence](#)

Multiple Intelligences

► [Intelligences, Multiple](#)

Multi-robot Systems

► [Robot Societies](#)

Multiverse

► [Christian Cosmology](#)

Museum Art

► [Art, Studio](#)

Music in Islam

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Related Terms

[Medieval Arabic music](#); [Music literature](#)

Little is known of medieval Arabic musical repertoire save for an exercise for the ‘ūd by al-Kindī (d. after 870) where the notation is expressed in terms of fingers and frets, and for transcriptions by Ṣafiyy al-Dīn al-Urmawī (d. 1294), of songs and pieces where durations and pitches are given. Musical notation in the early ‘Abbāsīd era was apparently very precise yet rarely used. We know from *Kitāb al-Aghānī* (*Book of Songs*) that Prince Ibrāhīm ibn

al-Mahdī (d. 839) asked Ishāq al-Mawṣilī (d. 850) to send him a notation of a song the latter had just composed; Ishāq did and the notation enabled Ibrāhīm to perform it (10: 105). We do not know the nature of the notation used, but that it was used in the rare circumstance when the performer was far away from the composer and thus unable to learn it orally. In addition to the type of notation mentioned above, al-Fārābī (d. 950) invented a very precise syllabic notation for rhythm influenced by the fifth-century Byzantine treatise *Anonymous Bellermand* and complemented it with geometrical symbols.

What medieval Arabic music lacked in notation, it made up with reliable sources in the field of music theory and literature. Music theory relied on the writings of the practitioners, especially Ishāq al-Mawṣilī; the *lingua franca* used was that of the skilful musicians, a language rich in metaphors to explain musical practices. Theory also relied on models derived from Arabic and Persian humanities. For instance, it borrowed from grammar and phonology the sounds of case endings (nominative, accusative, and genitive) to denote loud, moderate, and soft musical sounds. From prosody it borrowed the concepts of lengthening and shortening syllables to describe elongating and reducing musical bars. From poetics it borrowed the poetical device known as *taṣdīr* (where the word in the rhyme is quoted at the beginning of the verse) to describe the upbeat/anacrusis in music. From rhetoric it borrowed the concept of metaphor to explain the attacks at the end of a bar that facilitate the passing and transference of attacks to the next bar. From Qur’anic sciences it borrowed the term *tartīl* and *ḥadr* (slow and fast recitation of the Qur’ān) to describe slow and fast tempo. Theory also relied heavily on the works of the Greeks: thanks to the translation movement started in the Umayyad era and culminating in the *Bayt al-Ḥikma* (House of Wisdom) in the ‘Abbāsīd era in Baghdad, the methodology of Ancient Greek theory, philosophy, and mathematics were made available in Arabic translations via Syriac. The first to fuse Greek and

Arabic theory was the philosopher al-Kindī; not being a practical musician, his work did not always reflect musical practices. Al-Fārābī being both a performer and logician was more successful. His work owes much to the Arabic practitioners but also to Euclid, Aristotle, and Aristoxenus. From Euclid's *Postulatum* he borrowed the concept of lengthlessness of the point and applied in music to the timelessness of the attack; from Aristotle he borrowed the standard of time measurement, and from Aristoxenus, the definition of rhythm as organized durations and the idea of rhythmic variations. The latter, having a practical and aesthetic musical function, preoccupied al-Fārābī so much that he produced an unsurpassed theory of ornamentations.

Music literature, influenced by Persian and Arabic models, was included in many disciplines: *adab* (belles-lettres) and poetical literature; anthologies and anecdotal literature; *ṣamāʿ* literature (lawfulness or unlawfulness of listening to music); biobibliographical literature; historical and geographical literature; and dictionaries. The most important document in music literature is *The Book of Songs* of al-Iṣbahānī (d. 967), compiled over a period of fifty years. The monumental collection, now in 10,000 pages, treats in anecdotal form the activities of poets and musicians inside and outside the court from early Islam to the beginning of the tenth century. His sources include oral and written history related by the poets, the musicians, their descendants, and friends. The anthology encompasses much now-lost material and sheds light on anthropological aspects of musical practices: socioeconomic status of male and female singers; uses and functions of songs; role of musicians as refined friends of the aristocracy; evaluative criteria for musical excellence; and process of composition and improvisation. Songs punctuated many aspects of social life, including birth, circumcision, wedding, love, farewell, greetings, and sickness; they described nature and wine; they also celebrated military victories and praised the rulers on their accession to the caliphate and vizirate. Thus music making was very widespread; it was

unlawful only when the performance context was, e.g., when interfering with prayer time, involving alcohol consumption or in the company of badly behaved individuals.

Cross-References

- [Anthropology in Islam](#)
- [Arithmetic in Islam](#)
- [Caliphate](#)
- [Feminism in Islam](#)
- [Humanism in Islam](#)
- [Philosophy in Islam](#)

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Music Literature

- [Music in Islam](#)

Muslim Prophet

- [Muhammad, Prophet](#)

Muslim Religious Psychology

- [Islamic Religious Psychology](#)

Muslim Scripture

- [Qur’an](#)

Mutakallimun

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Practitioners of kalam (Islamic speculative theology). Kalam seeks to prove the Muslim faith through the dialectical use of reason. The medieval kalam argument in favor of the demonstrability of the created nature of the world (a form of the cosmological argument) was opposed by Moses Maimonides on the grounds that reason does not suffice to prove either the created or eternal nature of the universe, and that our belief in creation must have its source in revelation.

Mysterium Tremendum et Fascinosum

- [Das Heilige](#)

Mystical and Religious Experience

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This kind of experience can be classified in various ways. When any experience includes sense-perceptual or introspective content, it is classified as an *extrovertive* experience. When not extrovertive, the experience is *introvertive*. An experience of “nothingness” or “emptiness,” in some mystical traditions, and an experience of God resulting from a disengagement from sense experience, would be an example of introvertive experiences.

One might also make a distinction between *theistic* and *nontheistic* experiences. Theistic experiences are purportedly of God while nontheistic experiences can be of an ultimate reality other than God or of no reality at all. There is also a rich family of experiences of *union* with God. “Union” involves a falling away of the separation between a person and God, short of identity.

Mysticism

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Related Terms

[Cabala](#); [Cabalism](#); [Cabbalism](#); [Orphism](#); [Pietism](#);
[Quietism](#); [Spiritualism](#); [Spirituality](#)

Description

The term “mysticism” comes from the Greek “myo,” meaning “to conceal.” In the Hellenistic world, “mystical” referred to secret religious rituals. In early Christianity, the term came to refer to allegorical interpretations of Scriptures and to hidden presences, such as that of Jesus at the Eucharist. Only later did the term begin to denote mystical theology, which included direct experience of the divine. Mysticism usually centers around a practice or practices intended to nurture that experience or awareness. Mysticism is a phenomenon within religion and religious traditions, but it also occurs independently to defined religion. Mysticism as an element in religion some argues is an essential part of religion. The point debated is whether mysticism is reducible to religion or not.

The term “mysticism” is used to refer to beliefs and practices which go beyond the liturgical and devotional forms of worship of mainstream faith, often by seeking out

inner or esoteric meanings of conventional religious doctrine.

Mystic traditions generally form subcurrents within larger religious traditions – such as Kabbalah within Judaism, Sufism within Islam, Vedanta within Hinduism, and Christian mysticism within Christianity – but are often treated skeptically and held separate due to their emphasis on personal experience over doctrine.

Mysticism might be studied within a wide variety of disciplines, such as church history, dogmatics, exegetics, psychology, and philosophy of religion. Research on “mysticism” has been conducted within these diverse disciplines, through a vast diversity of methodological applications, and with a variety of phenomena in mind (McGinn 1999). Psychologists and sociologists of religion have primarily focused on the psychological mechanisms and qualitative aspects of mystical experience, as well as on the pathological and therapeutic outcomes of experiences classified as “mystical.” These investigations largely circle around the experiences of mystics and the states of consciousness confirmed by their reports, by the results of various neurological and biological measures, and by any postexperiential attitudinal and/or behavioral changes that may have been reported or observed. Exegetical approaches, on the other hand, focus less on the experiences of mystics and more on their writings – and perhaps other expressive modes such as art or music – which, of course, are not always about their mystical experiences per se. Hermeneutical methods as well as theories of language and of mystical truth claims dominate the exegetical disciplines.

Mysticism is related to epistemology to the extent that both are concerned with the nature, acquisition, and limitations of knowledge. However, where epistemology struggles with foundational issues, mystics often appear more concerned with process as the means to true knowing (Cupitt 1998). One question is therefore, what kind of knowledge is involved and how is it possible to claim objective truth?

A vital area for the study of mysticism is religious experience or mystical experience; the two words are more often than not used interchangeably. A distinction is made between apophatic and

kataphatic mysticism concerning what can be said of objects and state of affairs that mystics experience. Examples of other keywords are consciousness, religious language, and the question whether language is descriptive or not and what is expressed by metaphors, analogies, and symbols.

Mysticism as we know it today originated with William James and his standard work *The Varieties of Religious Experience* 1902. James claimed four criteria for the possibility to discern religious or mystical experience: ineffability, noetic quality, transience, and passivity. James' criteria have influenced the understanding of mysticism, and most researchers in one way or other discuss them either embracing them or rejecting them. At the beginning of the last century, Evelyn Underhill made mysticism attainable for the broad public by her book *Mysticism*. It is more a historic outline than a profound work of theology or philosophy.

New within the studies of mysticism is the gendered aspect and questions pertaining to feminism. Grace Jantzen maintains that a connection can be traced between the domestication of women and the domestication of religion such that claims to religious experience become permissible for women in direct proportion to the decline of overt public importance of religion.

A lively discussion has been focusing the character of religious or mystical experience (Kimmel 2008). Steven T. Katz argues that mystical experience is contextual, that is, always shaped by pre-experiential expectations, beliefs, and concepts resulting in mysticism being conservative in character. Robert Forman, challenging Katz' understanding, argues that there are indeed such things as "pure consciousness events" – events that are independent of any given religious tradition. By and large, when all is said and done concerning the theoretical scholarly aspects of mysticism, mysticism is a way of life pertaining to a certain outlook on the human existence.

Cross-References

- [Consciousness](#)
- [Epistemology](#)
- [Religious Experience](#)

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Mysticism in Islam

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Related Terms

[Dervish](#); [Sufism](#)

Description

The most widely used term for the Islamic mystical tradition is "► [Sufism](#)," with its practitioners known as Sufis. The word "dervish" is also common. From the mid-eighth century, roughly one century after the rise of Islam, distinctly Sufi teachings were formulated in both the majority Sunni branch and among the Shi'a. The earliest regions of activity were Iraq and Khurasan, but Sufism quickly established itself throughout the Muslim world. From the twelfth century onward, various Sufi orders developed, each based on the teachings of a saintly founder. Sufism has

balanced the literalist and exoteric impulses of the religion and, in the modern period, become a foil to Islamist and Wahhabi interpretations.

Self-identification

Science

In the premodern period, as articulated in poetry, philosophy, and ethics, Sufism was often considered one of the “sciences” (Ar. *‘ulûm*) of religion. Some grounding in this branch of knowledge was expected of scholars and other Muslim elites. Knowledge of the self and one’s direct experience of the divine are the primary concerns of Sufism. Spiritual anthropology, cosmology, visionary experiences, and ascetic practices are all important categories of such mystical speculation.

Religion

Sufism sees itself as essential to Islam, particularly as a complementary dimension to that of religious law or Sharia. However, the most extreme mystical practices and esoteric theorizing have normally been criticized and rejected by mainstream religious scholars. In the modern period, Wahhabism and Islamist groups such as al-Qaida have sought to reject Sufism categorically – often lumping it in with Shi’ism and other “heretical” movements. Wahhabism is a modern revivalist movement in Arabia, characterized by literalism, intolerance toward Shiism, Sufism, and all religious practices not established at the time of the Prophet and the earliest Muslim community.

Characteristics

Sufism has much in common with the mysticism of other monotheistic traditions. Perhaps the most obvious similarities are their Neoplatonic and gnostic tendencies.

Relevance to Science and Religion

The systematic understanding of self – its nature, appetites, and training – constitutes a premodern

psychology. Some contemporary Muslim mystics have claimed that Sufism presaged modern Western psychoanalysis.

Sources of Authority

The sources of authority are the Islamic revelation, as preserved in the Qur’an and the model of the prophet Muhammad, as well as the teachings of prominent Sufis whose esoteric knowledge is based on visionary and ecstatic experience.

Ethical Principles

A significant component of Sufi discourse revolves around the concept of *adab*, or proper comportment. While the essential Islamic conception of right action rests largely within the purview of Sharia, *adab* treats ideas relating to personal introspection, such as sincerity and intention. Reflections on proper comportment also dealt significantly with the relationship of Sufi adherents to their teachers and the duties of aspirants toward one another.

Key Values

Sufism promotes direct personal knowledge of God, which when coupled with observance of divine law leads to the perfection of the human condition.

Conceptualization

Sufism expands variously on the esoteric and symbolic dimension of all of these concepts.

Relevant Themes

Since great emphasis has been placed on improving the self in order to facilitate rapprochement with the divine, Sufism has developed complex models of the psyche. Controlling the “lesser”

impulses, and improving one's noble faculties, leads the individual to mental and spiritual completion and thus true happiness.

Cross-References

- [Alchemy in Islam](#)
- [Allah](#)
- [Islam: An Overview](#)
- [Mysticism](#)
- [Philosophy in Islam](#)
- [Pilgrimage](#)
- [Psychology of Religion](#)
- [Religious Experiences](#)
- [Self](#)
- [Theology in Islam](#)

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Myth

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Related Terms

[Fable](#); [Fairytale](#); [Fictional tale](#); [Folktale](#); [Legendary](#); [Story](#); [Tale](#)

Description

Myth is a Greek term *μῦθος* that means “word” or “story.” In all cultures, myths are recounted by ritual mimes and celebrated in public festivals

with the aim of appeasing the gods or warding off evil. They are the originating source of the religious institutions of a clan or a city. Myth is always the product of a collectivity.

In Western cultures, from the birth of Greek *Logos*, interpretations of myths are multiple. *Logos* is understood to be the foundation for philosophy and the sciences. It attempts to comprehend myths in their individual form and even tries to eliminate them as they are judged to be fruits of the imagination and, therefore, false. Interpretations are mostly linked to philosophy and, more recently, to historical-philological investigations, cultural anthropology, sociology, history of religions, psychoanalysis, and the phenomenology of religion.

From the modern philosophical perspective, myth is born from the anxiety that stems from standing before God (G.B. Vico), from the infancy of humanity (C.G. Heyne), from anguish (Herder), or from the symbolic expression of the ideal (G.F. Schelling). Cultural anthropology and sociology are closely related, and, according to E. Durkheim and J. Harrison, social facts and institutions are dramatized in rituals narrated by myths. For J. G. Frazer, myth allows us to understand early thought, which was later taken over by science. B. Malinowski considers myths as expressing social organization. Following the line of cultural anthropology, L. Levy-Bruhl sees myths as expressions of human inferiority that employ prelogical modalities proper to infantile or schizophrenic language, whereas C. Lévi-Strauss views myths as a communicative system to which a structural analysis may be applied. In the case of the latter, myths are words with respect to a system of fixed underlying structures constituted by codes.

From the historical perspective of comparative religion, G. Dumezil maintains that the religious system of a group of humans expresses itself on three different levels: the unconscious conceptual structure, myths that configure this structure, and rites that concretize it. There is a circularity that marks the relation between myth and rite.

Concerning psychoanalysis and depth psychology, S. Freud defines myths as deformed

dreams in which the desires of whole nations are realized, ancient dreams of a young humanity, whereas C. Jung develops a theory of archetypes. Here, myths, fables, and dreams use the same symbols and images because they are archetypes of the human psyche; they are constitutive of our genetic patrimony. An attempt to separate myth from religion was carried out by the “discovery” of language with the comparative grammar of Michel Foucault, the comparative mythologies of K.O. Mueller, and the anthropological school of A. Lang. For Mueller, who studies the epistemological status of myth through the genesis of language that develops in three phases, the birth of myth arises in the second phase. Here, anthropomorphic representations are substituted for the direct relation between sound and object, giving birth to linguistic metaphors; words possess more or less wide semantic fields, and this allows myths to appear. For Lang, myth is a larger product of the human mind that is based on a wild metaphysics.

In general, the interpretation of myth as a prelogical form, dream state, or as wild is distinguished from an interpretation of myth as *Logos*, which views the former as the product of an infantile mentality that is not able to understand myth’s independent essential value. This has many consequences for culture, especially in the West. Western culture, proclaiming itself to have surpassed myth through *Logos*, declares itself superior in terms of its cultural expressions that are still connected with myth.

It is for this reason that a reading of myth that makes evident its characteristics and allows it to live in its specificity is more convincing. In particular, I refer to the reading given by the phenomenology of religion, whose main proponent is G. van der Leeuw, according to whom myth is the repeated declaration of a powerful event. Here, a declaration means repetition, and, therefore, being connected to ritual, it is a celebration in words.

The mythical word, then, is different from the concept because it does not abstract from life; rather, it gives form to life, calling and allowing it to surge forward. In this sense, it is not an explanation of reality; it has a poetic value, that

is, it constructs life while giving it a truth value. This is understood, above all, in relation to time. Time’s temporal flow is arrested in myth. Repetition occurs outside of time and is guaranteed by the suspension of time itself. Moreover, the impossibility of separating myth from the sacred is witnessed by the permanence of such an attitude as conveyed in more complex religious expressions, for example, the liturgy of the Roman Catholic mass, which reintroduces at every occasion the powerful event of the saving death of Christ, even in a context that is globally understood as not mythical.

Following the approach of the phenomenology of religion, one can mine further the genesis of myth. It can be interpreted as the particular expression of the presence of the sacred and religious, whose content is connected to that dimension that Husserl calls phenomenological “hyletics.” This refers to the centrality of bodily movements and psychic relations, which are understood as instruments through which the sacred configures itself. These very instruments express themselves through words, tales, and rituals, ultimately separating themselves from the sacred (A. Ales Bello). Undoubtedly, myths disclose by hiding the face of the sacred or divine power. They are the manifestation of hierophanies, as M. Eliade has demonstrated.

That myth does not exhaust itself in the archaic age of Western culture and that it continues to live in the religious dimension is witnessed by, for example, the ancient Egyptian myth of Isis, which continues to live on in the Christian era. This myth probably refers to the archaic divinity, who is known as the God Mother or Great Mother. We find traces of her through archaeological finds in all parts of the world. She later appears under the guise of many other female divinities. Think of the multiplicity of divinities constitutive of the Hindu pantheon that represent the diverse functions of the goddess, both good and bad. At the same time, in recorded history, the goddess takes on the name of Isis and, from time to time, is linked to other female divinities, even to other concepts of the female divine. We find traces of this in lands that border the Mediterranean and even in distant

places like Britain. But what we find in the historical period bears witness to the fact that there is a separation between the cult of those faithful to the myth and the theoretical interpretation of this myth.

This is very clear in Plutarch and Apuleius as they treat the myth of Isis with great care, but they seek to rationalize it. In fact, Plutarch maintains that the myth is the reflection of a superior truth, and he considers Isis as the expression of a unique rationality with a unique provenance that utilizes philosophical categories proposed by Plato, ultimately allowing the name of the goddess to become identical with knowledge itself, *isia*. Apuleius understands the religious message more directly as he speaks about an initiation into the cult of the goddess. In every case, the initiation has knowledge of the ultimate religious truth as its end, and all of this occurs with the understanding of he or she who lives in the dimension of *Logos*.

Events linked to the myth of Isis can be considered emblematic of the change of the Western mentality from *mythos* to *Logos*.

We can delineate two levels of myth. First, there is the sacral religious in which myth continues to have a specific sense, even despite notable changes throughout the ages that are designated by an archaic mentality – changes of which we can only catch a glimpse. Second, there is the philosophical level. Here, myth is subjected to that investigation that we continue to enact in different forms. As we have seen, the birth of a multiplicity of disciplines, which in the West have progressively detached themselves from the great trunk that we call philosophy, has created a situation where interpretations are presented in various ways, ultimately destroying the very sense of myth at the moment in which it empties itself of the meaning of the sacred that characterizes it. The vision of the world generated by myth, in fact, was a vision in which diverse forms of knowledge were not rendered distinct; rather, only knowledge had a profoundly religious connotation.

The process of desacralization, which typifies certain sectors of twentieth-century culture, justifies the contemporary use of the term myth to

indicate an ideology or a utopia as an ingredient of a collective lived experience of a social and political character that arouses the collective imagination, creating, for example, through cinema the phenomenon of the diva. There is a reversal, then, of the very same temporal perspective. This is why myth today has a projective value for the future: undoubtedly, it maintains, even from far away, links to a desacralized “power.” Here, we are dealing with visions of the world different from those in which myth was originally constituted, and it is only by considering it as a “vision of the world” that it is possible to maintain the same term for diverse contents.

Cross-References

- [Cultural Studies](#)
- [Imagination](#)
- [Magic](#)
- [Mysticism](#)
- [Phenomenology](#)
- [Religion, History of](#)

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Myths

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In everyday parlance, in popular culture, “myths” denote fictional stories, fanciful or silly stories, stories that are *not* true. “Myth” is used

pejoratively. In religious and biblical studies, narratives that are identified as myths or as “mythic” are those that religious communities value as *most* true. Alan W Watts, historian and philosopher of religion, offered this useful definition: “Myths are a complex of stories – some fact, some fiction – that, for various reasons, humans regard as demonstrations of the inner meaning of the universe and of their own existence” (*Myth and Religion*, 1996, *opus posthumous*).

Nag Hammadi Library

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Not so much an actual “library” but a collection of intact, ancient Gnostic texts – translated early on from Greek into Coptic – that were discovered in Egypt in 1947. Their discovery and subsequent translation revolutionized the scholarly understanding of Gnosticism during the Hellenistic period.

Names of God

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In the Jewish tradition, names of God are either conceptual or proper. In ancient literature, the latter is more frequent, but the original significance of such names is often not easy to determine. The choice of one name over another generally depends on its significance. R. J. Z. Werblowsky and G. Wigoder note that according to most biblical scholars, the two most important biblical names of God are YHVH (Tetragrammaton) and Elohim. Of the two names, YHVH

(consisting of the letters yod heh, vav, heh) is the most frequent. According to rabbinic sages, this is the essential name of God. It appears that this name is connected with the phrase “ehyeh asher ehyeh” (“I shall be what I shall be”) (Ex. 3:14) (Werblowsky and Wigoder 1997). According to a number of Jewish philosophers including Moses Maimonides, this expression denotes eternal existence. This holiest of names was never pronounced except once a year by the high priest in the Holy of Holies on Yom Kippur. According to rabbinic tradition, once or twice in 7 years the sages entrusted to their disciples the pronunciation of the Tetragrammaton. The original pronunciation of YHVH is now unknown: when pronounced it is substituted by the name Adonai (my Lord), a term which was used from the second century BCE. The combination in the Hebrew Bible of the consonants – yod, hey, vav, hey – and the vocalization for Adonai resulted in the pronunciation of YHVH as Jehovah. Other names of God in the Bible are Adonai (Lord), El (Strong), Shaddai (Almighty), Elyon (Most High), Yah (a shorter form of YHVH), and Ehyeh (I shall be). The name Elohim is also used to refer to heathen Gods (Ex. 20:3) and human judges (Ex. 22.7).

There are over 90 names for God in rabbinic literature. The most frequent are Ha-Makom (The Place), Shamayim (Heaven), Ha-Kadosh Baruch Hu (The Holy One, blessed be He), Ribbono Shel Olam (Master of the Universe), Shekhinah (Divine Presence), Avinu (Our Father), Malkenu (Our King), and Gevurah (Power). Medieval

Jewish philosophers used a range of other names for God including First Cause, Prime Being, Cause of Causes, Beginning of Beginnings, Creator, and Ha-Shem Yitbarakh (The Name, blessed be He) (Jacobs 1968). In kabbalistic sources, the term En Sof (Infinite) is used to refer to God as he is in himself. The Sefirot (divine emanations) are names for various aspects of the Divine: (1) Keter (Crown), (2) Hokhmah (Wisdom), (3) Binah (Understanding), (4) Hesed (Lovingkindness), (5) Gevurah (Power), (6) Tiferet (Beauty), (7) Netzah (Victory), (8) Hod (Splendor), (9) Yesod (Foundation), and (10) Malkhut (Kingship). The Holy One, blessed be He denotes the male principle in the Deity; the Shekhinah refers to the female principle. There are also three more esoteric names of God in kabbalistic sources: the 22-letter name, the 42-letter name, and the 72-letter name (Jacobs 1968). In modern times, some Orthodox Jews refer to the divine by the name Ha-Shem (literally, “the Name”). It is also not uncommon for Orthodox Jews to spell the word God as G-d; this practice is based on rabbinic teaching about the need for reverence for God. In non-Orthodox movements, this practice is rarely followed.

Cross-References

- [Creation in Judaism](#)
- [Judaism: an Overview](#)
- [Kabbalah in Judaism](#)
- [Names of God](#)
- [Theology in Judaism](#)

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Narrative

- [Narrative Psychology](#)
- [Theater](#)

Narrative Nonfiction

- [Creative Writing](#)

Narrative Psychology

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Related Terms

[Narrative](#)

Description

Narrative psychology is the comprehensive designation for narrative approaches in a variety of research areas in psychology, such as personality psychology, developmental psychology, social psychology, health psychology, and organizational psychology. The basic idea is that

human beings make sense of their world and their selves above all through ► [narrative](#), developing and organizing knowledge, memories, intentions, life histories, and personal identities in narrative patterns. As a subdiscipline, narrative psychology started in the 1980s to recapture the originating impulse of the so-called cognitive revolution in the 1950s, which addresses how people construct meaning (Bruner 1986), but where the cognitive revolution originally tried restoring mind to human science, narrative psychologists stress “narrative” as the adequate concept for analyzing human organization of action and experience over time and in space. In this context, narrative is understood as a meaningful temporal configuration of states and events. The organizing theme of this kind of meaningful structure is usually called the ► [plot](#). The concept of narrative is thus not limited to the result of narration or an act of verbalization in storytelling but is perceived as an inherent structure of human action and experience. The narratory principle that human beings perceive, think, remember, feel, imagine, act, and make moral choices according to narrative structures lends itself to a variety of research perspectives, in which “narrative” functions as a root metaphor for the construction and adoption of analytical perspectives and scientific models and methods (Sarbin 1986).

One focus of research in narrative psychology is on narrative as a cognitive structure that culminates in recent research on narrative intelligence and cognitive narratology (Herman 2003). This approach relates to cognitive psychology research on mental structures, such as story schemata, story grammars, narrative superstructures, or event-situation structures. In addition, Jerome Bruner’s distinction between the paradigmatic and the narrative modes of thought, both based on different operating principles, has been especially influential (Bruner 1986). Whereas the former aims at abstraction and generalization by transcending particularities and formulating a well-structured argument, the latter re-situates the abstract and the general in temporal and local contexts to embrace the concrete and the specific by formulating a good ► [story](#). This research on narrative as a basic cognitive endowment has

demonstrated in a number of research projects that narrative is a highly adaptable mode of cognitive and communicative practice, supporting a variety of problem-solving activities – even within different types of scientific research.

The perspective on memory processes as active reconstructions of the past and the identification of special kinds of memories organized as narratives, such as episodic memories and autobiographical memories, facilitated another well-known research focus, namely, the narrative approach in personality psychology, which derives from the story-based psychoanalytic and humanistic traditions in personality psychology and clinical psychology. One important development in this context is Dan P. McAdams’s life story model of identity, which asserts that people living in modern societies function as their own biographers and provide their lives with unity and purpose by constructing from adolescence onward internalized and evolving narratives of the self, complete stories with particular narrative tones and forms (such as comedy, romance, tragedy, satire), images, ideological settings, (nuclear) scenes, more or less archetypal characters, themes, and familiar plot lines (such as the redemptive self) (McAdams 2001; Narrative 2006). All storied approaches understand the construction of identity as a psychosocial project, and recent developments focus on a more pragmatic concept of story, implying a storyteller and an audience and thus explicitly addressing issues of context. They try to understand the construction of identity as a long-term autobiographical project and as a socially situated enterprise. Researchers who have emphasized the importance of the performance of “small stories” and of everyday conversational storytelling in ordinary social interactions for constructing identities have shifted their focus to narrative in the context of its telling and to the fact that stories are also collective or collaborative productions and social interactions within a particular sociocultural context (Narrative 2006). Meanwhile, narrative psychologists are becoming increasingly interested in the complex relation between narrative form and content, narrative performance, referential content, and sociocultural contexts of

storytelling. Recent research questions also concern the relationship between cultural narratives, group narratives, and personal “small” and “big” narratives, especially in the context of intergroup and international conflicts (Hammack 2008). Generally, narrative studies have inspired a new integrative framework in personality psychology, as well as transdisciplinarity in research on identity (Narrative 2006; Hammack 2008).

In addition, narrative practices have been adopted in various professional fields, such as in therapy, counselling, and mediation. In psychotherapy, for example, we find two different applications of the narrative: on the one hand, there are attempts to incorporate the concept in psychological models of the therapy change process, and on the other hand, there is the concept of a post-psychological narrative therapy, in which the concept of changes in psychological processes is replaced by the notion of changes in performed narratives linked to changes in social relationships (Narrative 2006).

Self-Identification

Science

Narrative psychology self-identifies as a human science and maintains that psychological description, understanding, and explanation of the human realm of meaning require concepts and methods from the social sciences and the humanities. Some (narrative) psychologists criticize the rigid distinction between the sciences and the humanities as dysfunctional for research in psychology, arguing that narrative studies have the potential to reconcile quantitative and qualitative methodologies.

Characteristics

Narrative psychology is distinctive among the other subdisciplines in psychology by virtue of its special focus on the concept and study of narrative and its special affinity with narratology and dramaturgical and literary discourses. It does not pertain to the traditional subdisciplines

of psychology denoting a particular field of research, such as social psychology, personality psychology, and developmental psychology, although it does pertain to the subdisciplines identified by a particular (meta) theoretical perspective, such as behaviorism, cognitive psychology, biological psychology, cultural psychology, and social constructionism. These distinctions rely on fairly heterogeneous criteria for classifying subdisciplines in psychology, and we could also argue that narrative psychology overlaps partially with some of the other subdisciplines.

Relevance to Science and Religion

Narrative psychology in general has no special affinities with this area. But narrative approaches in the subfield of psychology of religion address the narrative structure of the varieties of religious experiences, religious experiences and practices as enacted narratives, religious narratives as performances (e.g., conversion narratives), narratives as resources for and representations of individual or even collective religious experiences and practices, and religion as part of individual and collective identity constructions. They do not address ontological or epistemological issues with regard to scientific or religious world views. Narrative psychology can also contribute to this field by analyzing the variety of collective and individual narratives explicitly or implicitly included in debates relevant to this area.

Sources of Authority

The sources of authority for this subdiscipline can be traced back to Aristotle's *Poetics*, which included an outline of classical concepts, such as conceptualization of the dramatic forms of tragedy and comedy as a mimesis of human action; construction of a plot as the sense of the story, as the synthesis of its different parts; and the purge of emotions (catharsis) as the psychological effect of these narrative forms (Aristotle 1968). But psychologists' explicit recognition of stories as relevant to their discipline since about

the 1980s relates to a development that emerged only in the mid-1960s, in which narrative has become a central concern in a wide range of disciplinary fields and research contexts. This cross-disciplinary narrative turn is exemplified by Mitchell's edited volume *On Narrative* (1981), featuring seminal contributions from scholars such as Hayden White, Roy Schafer, Frank Kermode, Victor Turner, and Paul Ricoeur (Mitchell 1981). The work of Charles Taylor, Alasdair MacIntyre, and Arthur Danto about narrative sources of the self, a virtue ethics linked to the narrability of human life and narrative explanations in historiography, has had a major impact on narrative psychology as well (Sarbin 1986; Polkinghorne 1988). This influence is demonstrated in authoritative publications from the 1980s, such as the volume *Narrative Psychology: The Storied Nature of Human Conduct* edited by Theodore R. Sarbin (Sarbin 1986) and including contributions, for example, by Kenneth and Mary Gergen, James Mancuso, Karl Scheibe, Donald Spence, Elliot Mishler and the editor; several publications by Jerome Bruner, for example, *Actual Minds, Possible Worlds* (1986); and Donald Polkinghorne's (Polkinghorne 1988) *Narrative Knowing and the Human Sciences* (Sarbin 1986; Bruner 1986; Polkinghorne 1988). All these authors have argued convincingly that human beings live with stories or exist narratively and that narratives are in one way or another constitutive of human reality. They paved the way for basic research on narrative as a mode of thought and knowledge, the development of narrative competence, the classification of different genres of personal narratives, and the structural elements and functions of narratives in the context of human experience and action.

Ethical Principles

As researchers in psychology, narrative psychologists are guided by the ethical principles that different academic and professional psychological associations have formulated based on the usual ethical guidelines for research involving human subjects. In addition, narrative research

on personal narratives has a certain affinity with an Aristotelian contextual-relational conception of ethics, depicting morality as a medium of moral negotiation in terms of mutual understanding, recognition, and responsibility. Articulation of the different concepts of a good life connected to the varieties of narrative configurations of identity is thus seen as a necessary precondition for ethical deliberations, judgments, and agreements. And some narrative research is explicitly aimed at giving voices to (marginalized) people to tell their life stories and at making explicit their view of a good life embedded in their stories, in some cases as a testimony. Stories are generally valued as a medium for ethical reflection. They are appreciated as a resource of moral knowledge related to different historical, cultural, social, and individual contexts and as a fund of articulated values connected to morally relevant life experiences sensitizing people to the responsibilities and challenges of a moral life.

Key Values

Most research in narrative psychology is related to three key values: empowering individuals to have a good life, accepting and sustaining a plurality of life forms, and enhancing mutual understanding between individuals, groups, communities, life forms, (sub) cultures, etc.

Conceptualization

Nature/World

On the one hand, nature is contrasted with culture and conceptualized as all dimensions of human existence and the world not addressed within narrative or cultural psychology. In keeping with this conceptualization, our world is roughly divided into a natural sphere and a human, cultural sphere. The former is more likely to be structured in the paradigmatic mode of logic and science and the latter in the narrative mode of experience and story (Bruner 1986).

On the other hand, narrative psychologists have also distinguished between the human experience

of nature as part of the human world and the everyday lives of people and nature as a concept defined in and for natural science research. Questions such as how people construct meaning in nature through narratives, how they enjoy or fear nature, and how they perceive, experience, and represent natural objects and processes, etc., are part of the narrative study of folk psychology.

Human Being

In narrative psychology, human beings are conceived as beings caught up in stories. Some narrative psychologists insist that human existence is already structured by narrativity, whereas others see human beings at least primarily as tellers of and listeners to stories. The multiplicity of stories and the multiplicity of meaning in narratives reflect human possibilities and the fact that humans' storied lives may inherently be as polyphonic and self-contradictory as stories and their interpretations.

Life and Death

At least in Europe and North America, the (folk) concept of human life is intimately linked to the concept of narration, as we speak of the story of a life to characterize the interval between birth and death. Narrative psychology is connected to this concept and addresses life as meaningful human life evolving diachronically between birth and death. The meanings of life (and death) are related to stories in multiple ways, and narrative psychologists conceptualize, analyze, and interpret these relationships between life as led and life as told, between life and story, and within the conceptual horizon of notions such as life history, life story, (auto) biography, self-narrative, and narrative identity.

Reality

The relationship between stories and reality, especially the relationship between stories and the reality of human experiences, is of great interest to narrative psychologists. Most narrative psychologists argue that the narrative form not only represents but also constitutes social reality and that the reality of human experience has a narrative structure. According to this approach,

reality cannot be conceptualized as a closed material system. Rather, meaning and language are believed to belong to the order of reality. Narratives influence reality as much as they are influenced by reality. The greatest master plots (e.g., the stories of Oedipus, Medea, Cain and Abel, Pygmalion, Cinderella,) are narrativized over and over in literature, art, and even music and have inspired stories, images, spectacles, movies, and other cultural artifacts because they engage desires, fears, and conflicts that seem to be a permanent part of our circumstances as human beings (in the context of Western culture). And these desires, fears, and conflicts are constantly socially shaped and inspired by the cultural and personal stories about them.

Human Knowledge

Much of our knowledge about our everyday, social, and personal life consists of stories, and it is only through narrative that we know ourselves as actors who operate over time.

Truth

Research in narrative psychology can best be related to a consensus model of truth, according to which "truth" depends on uncompelled rational consensus as the result of a dialogue of competent (research) partners, in which specific claims have been critically reviewed according to certain criteria. Additional considerations include the possible evaluation of stories, for example, the distinction between "narrative truth" and "historical truth" in psychotherapy (Polkinghorne 1988; Sarbin 1986). This distinction makes it possible to evaluate a life story as true because it enables someone to live with it (narrative truth) or because it represents life history and facts of the life course adequately (historical truth). Other suggestions are to replace the notion of truth with other criteria for evaluating stories, with criteria such as coherence, complexity, plausibility, verisimilitude, lifelikeness, etc. With regard to "events" or "lives," there is always a plurality of acceptable stories that could be told about them, depending on the contexts, points of view, or interests of the storytellers and the audiences of these stories. Nevertheless, the

notion of truth reminds narrative researchers not to overlook completely the “reference” question (which is relevant at least in some cases) about the relation between particular events, experiences, or lives and particular stories about them: In what manner or to what extent do they represent, reconstruct, or reveal these events, experiences, and lives and how or to what extent do they disguise, distort, or destroy them?

Perception

Wherever we look in this world, we seek to grasp what we see not just in space but also in time, and we are able to do this in the narrative mode. Experiments conducted back in the 1940s have demonstrated how the narratory principle organizes human perception. In these experiments, people were asked to observe geometrical figures in motion and to describe what they saw. The descriptions revealed that people told stories, assigned meaning to the movements of these figures, and described them in narrative terms including activities, intentions, and emotions of humanlike protagonists (Sarbin 1986).

Time

Relying on a distinction between chronological or measured time and human time or experienced time, narrative psychology stresses the close link between narrativity and our experience of time. It is via narrative that we experience time as meaningful, and it is this meaningful experience of time that provides the basic structure of our narratives. As Paul Ricoeur has outlined, the act of the plot (the emplotment or narrativization) distills a meaningful temporal whole from an otherwise chronological sequence of unrelated episodes (Polkinghorne 1988). In other words, the act of plotting elicits a pattern from a succession that at the level of human actions or human consciousness synthesizes attention to the present with expectations for the future and memories of the past. In addition, narrative opens the experience of history beyond one's personal existence. It is especially via narratives that we relate to the lives of former generations, realize the finite nature of our own existence in the face of death, and care for future generations.

Consciousness

In narrative psychology, there are different approaches to consciousness. On the one hand, the concept of consciousness is acknowledged, and narrative may be understood as a primary act of mind or a mode of consciousness. Narrative may also be understood as connecting two landscapes to each other: a landscape of action and a landscape of consciousness entailing what actors perceive, know, think, and feel or do not perceive, know, etc. The combination of these two landscapes requires special narrative inquiry and analysis (Bruner 1986). On the other hand, narrative inquiry is also understood as an alternative to the phenomenological studies of consciousness situating our knowledge, thoughts, and feelings in the realm of practices, activities, and speech actions. This approach replaces the analysis of consciousness with that of narratives as symbolic forms, performances, and practices (Narrative 2006).

Rationality/Reason

Narrative rationality and narrative reasoning are rather popular notions within narrative psychology. Some aspects of human motivation, emotion, or morality may best or may even only be expressed or identified in stories. Storytelling may therefore also be used as a special form of reasoning. We can explain or understand an action by telling a story about it; a good story can be as persuasive and solid as purely formal and logical argumentation. We explain how a particular event became possible by narrating the events leading up to its occurrence. A narrative explanation may also show how the event figures in an intelligible series of events. Narrative reasoning usually does not support predictions but relies instead upon retrodiction to indicate how the present is a possible consequence of the past. It relates more to practical wisdom than to formal intelligence. The wisdom of the biblical King Solomon, for instance, is expressed in stories, and storytelling is very important in mystical movements such as Hasidism.

Mystery

This concept is rarely important within the terminology of narrative psychology. Sometimes, however, stories are understood as a tool to demystify

life and to shape order with regard to one's life experiences. We can also understand mystery as the result of a story and argue that mysteries are narratively produced by explicitly or implicitly failing to meet readers' or listeners' expectations of the normalizing function of narratives, for example, with regard to our expectations of causal order or with regard to the anticipation of closure in conflict resolution or elucidation in response to questions (Abbott 2002).

Relevant Themes

A relevant issue is a concept of experience that is not a synonym for consciousness. Some narrative psychologists prefer an understanding of experience as the act of living through an event or events. Challenging a clear-cut distinction between experience and representation, they focus on the narrative structure of human experiences and discuss adequate methodological concepts to describe, to interpret, or to explain this kind of experiences. Questions arise with regard to the compatibility of different perspectives (e.g., first-person perspective and third-person perspective) and different levels of analysis (from brain activities to socio-cultural contexts). These issues are also involved in debates over the possible links between religion and experience with a special focus on the (social) scientific explanation of particular types of experiences sometimes considered religious, mystical, or spiritual. The question of reductionism has played a pivotal role in these debates. Narrative approaches in psychology of religion valorize cultural and individual diversity and criticize the idea of a common core experience distinguishable from the divergent culturally determined expressions of that core.

Cross-References

- [Cognitive Psychology](#)
- [Experience](#)
- [Memory](#)
- [Personality Psychology](#)
- [Religious Experiences](#)

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Native American Church

- [Native American Religions](#)

Native American Religions

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Related Terms

[Native American church](#); [Native American spirituality](#)

Description

Any statements about Native American religions must begin with a disclaimer: The religious practices of the indigenous peoples of North America are remarkably varied and have undergone profound changes since contact with

European civilizations. The extent of European colonization upon indigenous American ways of life, thought, and ritual practice are so profound as to render a discontinuity between life before European colonization and life afterward. One thing is clear though, effects on population were vast; it has been estimated that fewer than 10 % of indigenous Americans survived the first century of European presence. This rampant devastation and the perennial conflict that ensued have transformed indigenous American civilizations, the full extent of which it is impossible to assess (Martin 2001).

The summary that follows presents a few themes common among the many tribes of North America. It is a distillation of patterns often present in the hundreds of traditions, whose particularities have been transmitted across generations in distinct ancestral languages. These spiritual legacies represent the local histories and delicately balanced ecological relationships among people, animals, plants, places, and the values that sustain them (Deloria 2003).

As is true of all religions, especially indigenous ones, belief, ritual, and everyday practice are never as standardized as people might be led to believe by reading about them. For Native American religions, variation *is* the standard (Hultkrantz 1987). This variation can be attributed to three basic causes: first, institutional hierarchies, where they exist, are typically weak – there is no Pope in Rome who makes infallible statements *ex cathedra*; second, for the majority of their history, these practices have been based in an exclusively oral tradition – no Bible, Torah, or Qur'an could be consulted to determine a precedent or adjudicate disputes about subtly different beliefs and practices; and third, the ritual specialist depends on his or her own observations and revelations in the elaboration of ritual. These three factors tend to produce religions that are pluralistic and inclusive in nature.

Borrowing from other traditions, responsive to contemporary situations, and expressed in idiosyncratic voices, Native American religions engender a dynamic sensibility that would seem to be at

odds with the conservatism and mutually exclusive character of European faiths. Whether it is due to or in spite of this flexibility, Native American religions demonstrate long-term patterns of practice that are confirmed in the accounts of foreign observers who have recorded similar myths and rituals in different communities over long periods of time (Paper 2007).

Native American religions are composed of oral traditions which could be labeled as sciences in the sense of specialized bodies of knowledge. For instance, myths often encode a robust set of important details regarding tribal history, kinship structures, food production techniques, and features of the terrain. The highly practical and the mythological have always been fused in Native American religions. Moreover, these traditions promote a desire to carefully observe the natural world and all its creatures. Special knowledge as well as information of relevance to present concerns may be found in weather changes, bird songs, and animal sightings. A more restricted definition of science as a form of data collection and hypothesis testing constrained by particular theories and methods does not apply to the kinds of knowledge and ► [revelation](#) typically present in Native American religions. But a deep respect for specialized knowledge and wisdom is seen in these traditions. There is often a guild-like secrecy to promote respect for and protection of such knowledge. In Native American communities religious knowledge often coexists with but is irreducible to scientific knowledge, as is the case in a number of cultures. Many Native Americans are college educated, so scientific knowledge is well represented in tribal settings both on and off established reservations.

Key features present in many Native American religions include the importance of dance and song in ritual performance, a reverence for particular plants, animals, places, and things, the ritual use of tobacco, the importance of the four directions (and fourness in general), respect for and prayers to deceased elders, a reliance on religious experiences rather than faith or the espousal of doctrines, and the use of sweat lodges for purposes of healing and knowledge (Paper 2007). Interestingly, healing

and knowledge are often considered the same thing in these traditions so that medicine can be both healing substance as well as healing power imparted through ► [revelation](#). Other features common to Native American religions, though less appealing, include the appropriation of Native American symbols and rituals by outsiders and the multiplication of self-appointed guides who espouse knowledge of indigenous rituals and often charge high fees to perform them for nonnatives (Paper 2007; Geertz 1994). Perhaps, the most common pattern to be found across these many traditions involves the inextricability of religion from all other aspects of life. A dichotomy such as “science and religion” makes little sense here, as do most other ontological divisions. Ritual, values, practical actions, and knowledge are tied together into a whole such that dichotomies between the natural and the supernatural, man and nature, or the sacred and the profane do not fit well in these indigenous frameworks (Hallowell 2002).

For many Native American groups, authority resides in kinship arrangements so that tribal rule, access to land, and knowledge required for cultivation, healing, and hunting resides in particular families or clans (Geertz 1994). Each tribe may have ritual specialists whose powers to heal and to communicate with divine powers affords them a reputation, and a subsequent demand for their services, that travels beyond local borders. A common title for such specialists has been medicine man though the term shaman has begun to dominate much of the literature. Neither term is satisfactory; the more generic “ritual specialist” is slightly preferable. Both terms were created by outsiders as single labels that typically reduce a wide variety of official and unofficial roles performed by healers, prayer makers, musicians, dancers, and any number of others. However, since these terms are useful enough that even many practitioners use them when speaking about their own traditions, it is fair to use them with the understanding that they always simplify a more complex set of social arrangements and practical expertise.

One of the problems of using single terms (such as Medicine Man or Shaman) is that it

gives the impression that ritual specialists inhabit a singular role in their tribes (“the native priest”), which is not commonly the case. In fact, a more common pattern would suggest that numerous people in a tribe are privy to esoteric knowledge that permits them a specialized ritual role within their communities. Common knowledge might dictate that one should visit a certain person for the treatment of wounds, a different person for intestinal distress, another for hunting success, someone else for the undoing of curses, and so on. The knowledge that ritual specialists receive may be taught by others or it may be learned by ► [revelation](#), imparted through dreams or during ritual fasts. Additionally, it is through the performance of elaborate rituals that many people experience religious insights of importance to themselves and their communities. In short, direct experience through ► [revelation](#) is the most common source of authority in Native American religions.

However, it is often the case that consensus rules the day, here as elsewhere in tribal settings. If a person has a ► [revelation](#) of importance to the group, it is only effected on a group level if a consensus is reached about the meaning and significance of it. This is rather like the “summing up” of news and information in any group setting: perhaps one member of a group has heard from an outsider that a foreign army is headed in their direction. Such news will not typically cause the community to ready itself for invasion unless others have also confirmed this or decided it is prudent to make tentative preparations.

Native American religions emphasize such basic values as respect, obligation, and harmony. Whatever is received must be reciprocated in some fashion; many of the rituals are based on this principle. Family unity is central to the ethical principles of this tradition. From family unity, an ethic of respect and reciprocity ensues so that elaborate covenants and duties have come to exist between children and parents, humans and nature, individual and community, the living and the dead. This background of reciprocity leads to complex notions of equilibrium and harmony between all things that sustain life. Ideas

about kinship typically extend well beyond the family to include virtually every other entity involved in the set of life-giving relationships. Animals, plants, sources of water, features of the terrain, and the sun may be addressed and attended to ritually as kin relations. An omnipresent sociality exists between the person and many things in the human and nonhuman world. Clan, family, or personal obligations to particular kinship relations over others underlies the powers and knowledge that ritual specialists may possess.

The term animism has been used in the past as a categorical framework applied to many indigenous peoples. Animism is the idea that the entire world is “ensouled,” that is, each and every thing has a soul in the same way that a human being is thought to possess one. For the most part, this means that stones, plants, and places have human-like minds filled with knowledge and desires. In very blunt fashion, this is a reasonable generalization to apply to Native American religions but, as with such labels as medicine man and shaman, it is an outsider’s term that unfairly reduces much more complex realities. In a given tradition, some places and things may possess “spirits,” while others may not (Hallowell 2002). Moreover, some things may be ensouled for certain periods (like during a ritual), but not at other times. And while any number of things may be special in this way, some are differentially more important or powerful than others. Part of the knowledge that a ritual specialist possesses is being able to identify which things are animated and/or needful and which things are not. So while animism captures some of this in a general way, it should not be relied upon as reification applicable to all the particular practices and understandings within a tradition.

Context plays an important role in Native American religions so that the relative truth and importance of knowledge and practice can change in response to other revelations and may only apply in certain places. In a sense, only the local matters and there is little interest in the “universal.” However, this precedence of the local over the global, of “our people” rather

than “all people,” has shifted because of the modern realities that connect everyone as well as the increasing role that universalizing influences such as Christianity play in Native American religions. An originally Jewish tradition with scriptural roots that extend back more than 3,000 years, Christianity is particularly global which has led it to emphasize a universalizing metaphysics. Native Americans encountered Christianity almost as soon as they encountered European colonists but conversion has been slow. Over the centuries, Christian missionaries have attempted to convert Native Americans at the point of the sword and in the comfort of embrace. Whatever the particular dynamics, it is now common for Native American religions to include Christian ideas and practices (Martin 2001). Christ or Christ-like culture heroes may be recounted in seemingly old myths and it is perfectly normal for a Native American to perform a basically indigenous ritual and then go off to celebrate Catholic Mass.

Peyote religion, sometimes but not always practiced under the auspices of the ► [Native American Church](#) (one of several related denominations), also espouses a global rather than local perspective. The use of peyote (A psychotropic cactus, *Lophophora williamsii*) for ritual originally came from indigenous groups in Mexico but was adopted by Native American groups in the United States during the late nineteenth century (Hultkrantz 1987; Paper 2007). Peyotism has been supported by and supportive of ► [Pan-Indianism](#) since it spread rapidly across numerous reservations in the late nineteenth century and incorporated a variety of rituals and prayers from these different settings. Christian ideas and influences are often central to these practices.

Native American religions consistently demonstrate a deep respect for the ecological relationships in which they are involved. An enduring interest in the natural world has produced a sophisticated knowledge of plants, animals, and other phenomena. Native American religions have imparted uniquely ecological patterns into their practices: people, costumes, prayers,

objects, foods, and dances are carefully orchestrated at special times and places, for the performance of ritual.

Contemporary scientific knowledge and practices employ a metaphysical framework and epistemology often at odds with those of Native American religions. While science critically depends upon empirically derived evidence for the purposes of knowledge production, Native American religions differentially emphasize ► [revelation](#) as a means of the acquisition of knowledge. Nevertheless, systematic observation, the use of inductive logic, and the amassing of data apply equally well to many forms of science and Native American religions.

Cross-References

- [Belief](#)
- [Christianity](#)
- [Myths](#)
- [Revelation](#)
- [Ritual](#)
- [Soul](#)

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Native American Studies

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Related Terms

[Aboriginal studies](#); [American Indian studies](#); [Indigenous studies](#)

Description

The field of Native American Studies (NAS) emerged out of the intense political activism of the 1960s and 1970s, and the number of programs at US and Canadian universities has grown considerably over time. Since the emergence of NAS as a distinct study area, there have been ongoing discussions among *NAS* scholars about the nature of this field of study. Should *NAS* be a distinct department within colleges and universities, or is the strength of *NAS* in its strong interdisciplinary approach and ability to penetrate and critically engage many academic disciplines? Additionally, there is a strong sense of purpose in much *NAS* scholarship that intellectuals, both American Indian and non-Indian alike, should hold themselves accountable to the communities from whence they come and/or in which they work. Not only should *NAS* scholarship hold itself accountable (and be held accountable) to American Indian and First Nations communities, many scholars believe that *NAS* should be defined by a clear articulation of the enduring sovereignty and nation-to-nation political status of American Indian and First Nations communities and a clear expression of the inherent rights of and responsibilities of indigeness.

Various American Indian nations were the subject matter of study in ethnographic writings of early missionaries, such as the Jesuits and in the travelogues of European explorers. When

Native American Spirituality

- [Native American Religions](#)

anthropology emerged as a formal discipline in the nineteenth century, most indigenous cultures were studied, analyzed, and theorized about within anthropological discourse and its related disciplines. This body of literature about American Indian people was and largely remains a Western intellectual pursuit, applying the accepted methods and theories of anthropology proper and of the social sciences in general. Either the meta-values of the Western academy or the meta-values of one form of Western political ideology or another have largely dominated anthropology and the social sciences. That is simply to say that the humanities, as currently practiced in universities, are almost entirely a Western epistemological endeavor.

In contrast, NAS scholars operate from the understanding that emic perspectives are most appropriate when studying a particular cultural group. Emic reflects an insider's perspective, in contrast to the ostensibly objective and disinterested observer's perspective. Much of anthropology, sociology, and religious studies has occurred from an etic, that is, outsider's or exogenous perspective. In contrast, Native American Studies has advocated strongly for the validity, authority, and appropriateness of the emic perspective. In other words, one of the founding ideas behind NAS as a distinct field of study is that where the cultures, traditions, ceremonial lives, and histories of American Indian people are concerned the authority and expertise rests firmly with the people themselves. To nuance this a little bit further, there is no consensus that *only* American Indian people should write or speak about American Indians. In fact, even though the distinctive qualities of NAS come from the fact that its foundations are based squarely in American Indians speaking and writing for themselves and insisting on the appropriateness and value of doing so, there is much quality scholarship in NAS produced by non-Indian intellectuals.

The generation of American Indian intellectuals that created NAS provided a powerful voice within the academy for American Indian scholars to speak and write from a native perspective that has persisted and grown. NAS has also prompted

critical self-reflection by non-Indian academics in various academic fields: anthropology, history, English, political science, religious studies, and the humanities in general. This is a powerful development because as American Indian scholars have put forth a more and more powerful and compelling voice within the academy, all facets of the social sciences have been impacted. Powerful critiques have developed with a focus on gender, sexuality, two-spirit people, alternative spiritual conceptions of the world, the impact of missionization on indigenous communities, "kinship cycles of responsibility," deep structural differences between the world views and epistemes of Western and indigenous cultures, and assessments of the globalization of capital and its impact on indigenous communities.

There was an epistemological shift advanced by American Indian scholars and activists that insisted that the cultures and experiences of indigenous people should have both primary and secondary authority and value within the academy and society and large. Scholars and activists, such as Vine Deloria, Jr., Alfonso Ortiz, Beatrice Medicine, Elizabeth Cook-Lynn, Ines Talamantez, George "Tink" Tinker, and John Mohawk have argued that American Indian culture carriers and intellectuals can and should articulate their own peoples' perspectives and traditions to the larger society rather than being named, identified, and analyzed by non-Indian scholars. Though Vine Deloria, Jr., was certainly a grandfather of NAS in this regard, a fact acknowledged by many contemporary American Indian intellectuals, it is important not to forget the earlier generations of American Indian people that were a voice from both their own nations and of American Indians in general: Ella Deloria, Francis LaFleche, Charles Eastman, Luther Standing Bear, and many others.

NAS as a specialized area of study has largely grown as an interdisciplinary field, and there are now well over 100 degree programs, majors, minors, and certificate programs in NAS (includes American Indian Studies and Indigenous Studies programs) at US and Canadian universities. NAS has developed along three

important lines. First is the growth of literature about specific American Indian cultures written by people from those nations and communities. Second, critical discourse around issues either broadly or universally faced by indigenous communities: reassertion of national sovereignty by indigenous nations, the ongoing reality of colonialism as faced by American Indian people and their respective communities, studies of American Indian contributions to the development of both the United States and other settler nations, the history of missionization and cultural genocide faced by most indigenous peoples. Third is the articulation of those common, if not absolutely universal, characteristics of American Indian cultures and societies. This third line of development in NAS has led to important articulations of indigenouness or indigeneity and has provided important intellectual foundations for solidarity and resistance by people who self-identify as not only part of their own specific communities but as part of the broader "American Indian" community and sometimes described as a ► [Pan-Indian Movement](#).

NAS has offered a provocative and thoughtful contribution to the academy by articulating epistemological and philosophical systems that challenge some of the fundamental assumptions and mechanisms of the social sciences, the physical sciences, and the increasing hegemony of American economic, political, and cultural systems. Sometimes implicitly and often explicitly, NAS scholars have provided very timely and fundamental challenges to the status quo in demanding a fair consideration of traditional knowledge, holistic indigenous sociocultural systems, complex economic systems, and the distinct ritual and ceremonial systems of indigenous peoples. These challenges often have cut to the heart of key cultural differences regarding how human beings construct and organize their experiences and thoughts. In this sense, within the dialogue between science and religion, many *Native American Studies* scholars have challenged the fact that these areas of knowledge are considered distinct in the Western intellectual tradition. In many cases, critiques leveled by

Native American Studies scholars have not been simply a rejection of the empirical data of the Western academic traditions but rather of the inadequacy of contemplating information outside the context of the life of the community, the ongoing well-being of one's "relations" and outside the corpus of stories, and ritual and ceremonial life of the people. Scholars and linguists, including Albert White Hat, Sr., have pointed out that in most (if not all) American Indian nations, there is no word that properly translates as religion, which minimally suggests that hegemonic Western binaries of religious/secular, faith/knowledge, and religion/science do not prevail or even obtain in many indigenous societies and their knowledge traditions.

Among the more prominent journals devoted solely to NAS are *Wicazo Sa Review*, *The American Indian Quarterly*, and the *American Indian Culture and Research Journal*.

Cross-References

- [Ethnology](#)
- [European Studies](#)
- [Hopi Religion and Anthropology](#)
- [Native American Religions](#)
- [Worldview](#)

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Natural

- [Naturalism, Ontological and Methodological](#)

Natural Evil

- [Christian Cosmology](#)
- [Evil, Problem of](#)

Natural Language Processing

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Description

Natural Language Processing (NLP), also called Computational Linguistics, aims at developing computational methods and algorithms for understanding and generating human languages. There is a clear delimitation between the camp that deals with understanding of language, which is called Natural Language Understanding (NLU), and the camp that addresses issues with respect to generating or producing natural language, which is

called Natural Language Generation (NLG). The NLP field has been dominated by the NLU camp from its early beginnings in the 1950s until now, with little prospects of a more balanced representation in the near future between NLU and NLG camps. The dominance of the NLU camp can be explained by at least two factors. First, there has been a desire in the Computer Science domain to make computers understand human language. Second, language generation is perceived harder, from one perspective, than language understanding.

The NLP field can be divided into many subfields based on the many aspects of human languages. Morphological processing is the subfield studying how individual words are formed from the smallest units of meaning called morphemes. Lexical semantics is the subarea of NLP dealing with the meaning of individual words in isolation, that is, not in context such as in a sentence. The subfield of syntactic processing explores how words group together in larger constructs, such as phrases, and ultimately as entire sentences. Semantic processing deals primarily with capturing the meaning of individual sentences, while discourse processing looks at how sentences group together in larger chunks of language, called discourse, such as paragraphs and documents.

Due to the explosion of the World Wide Web during the past 2 decades and of electronic storage of documents on personal computers and various organizations' servers, there has been a lot of activity in the applications of NLP to solve various real-world problems. The best example is the web search application in which the task is to retrieve a ranked list of documents relevant to a user-specified query. Among other applications that need Natural Language Processing are Question Answering, Intelligent Tutoring Systems, Summarization, and Text Mining.

Self-identification

Science

Natural Language Processing is a science in which the many theories about how humans

process language or how language must be processed, in general, at different levels (morphological, syntactic, semantic, and discourse) are empirically tested. Outcomes of various models are compared with either human-expert judgments or with less subjective judgments, for instance, performance on a specific task.

Characteristics

Natural Language Processing focuses on developing methods and computational algorithms for understanding and generating language. No other discipline has these goals as its primary concern. Speech Processing is a different, although related, discipline. Speech Processing should not be confused with Natural Language Processing. The goal in Speech Processing is to map an audio representation of language into an electronic written representation, that is, text. As language is closely related to logic and reasoning, domain and world knowledge, and intelligence, Natural Language Processing benefits and helps the discipline of Artificial Intelligence to fulfill its goals of building intelligent entities.

Relevance to Science and Religion

There seems to be little interest in “Science and Religion” among computational linguists, that is, people working in the area of Natural Language Processing. Religious implications of the discoveries in the field of NLP are not systematically studied and published by the community at large.

Sources of Authority

A number of conferences and journals in this area are the authority that validates findings reported by researchers. A rigorous peer-review process enables a democratic-based authoritative regime in the field of Natural Language Processing.

Ethical Principles

Standard scientific evidence-based research seems to be the driving force in the field of Natural Language Processing. Theories validated experimentally through repeatable experiments are the appropriate processes to be successful. Authors are required to present their methods in such a way that someone else reading their report could reproduce the experiments and results.

Key Values

The key values are investigative spirit, creative minds, honesty, pushing the limits of our current understanding of how humans understand and produce language, and how language is connected to other parts of the human mind and our perception of the world.

Conceptualization

Nature/World

Language is a communication means that is used to communicate/share knowledge about the world for the ultimate purpose of better acting in the world. There is no implicit assumption about the world in the Natural Language Processing community. Language is viewed as the vehicle that could be used to share any view of the world as perceived by the speaker, that is, producer of the language.

Human Being

Humans are viewed as rational beings, who produce language with a purpose/goal.

Life and Death

There is no particular view with respect to life and death that is debated in the Natural Language Processing community.

Reality

Language understanding and generation is highly dependent on world knowledge. Spatial and

temporal laws are used to find the correct interpretation of human language utterances.

Knowledge

It is the body of concepts and relationships among concepts that could be used to arrive to a correct interpretation of an utterance that uses these concepts. Correctness is defined as a verifiable true fact.

Truth

Truth is a body of facts consistent with reality. An event is true with respect to reality if it can be shown experimentally that it does conform to the facts in reality. The experiment can be repeated as many times as one wishes and must always lead to a result consistent with reality. That is, the fact should always produce other aspects of reality which are directly measurable as proof of the truth of the fact being studied.

Perception

All measurements/experiments in Natural Language Processing are limited by their nature. That is, the set of all possible sentences humans could produce is theoretically infinite. Any theory that is being tested will never have access to the whole set of human language sentences to fully validate the theory.

Time

Time is the always increasing dimension of the world we live in. Implicitly, when humans generate language there is a chronological sequence in which a word at the beginning of a sentence has been clearly generated before a word at the end of a sentence. This implicit chronological order of words in a sentence is different from the time dimension of the reality the sentences are describing. That means that a fragment of language could describe a story that has happened at another time, in the past or future, with respect to the time the speaker generated that language fragment.

Consciousness

Language and mind are tightly connected. The interplay between language and

consciousness is not of a primary concern at this moment in the field of Natural Language Processing. The related field of Psycholinguistics may study that relationship more actively.

Rationality/Reason

Logic and Reasoning are closely connected to human language. There is much research that looks at how language and reasoning interact. Making inferences on knowledge encoded in natural language is a hot topic in Natural Language Processing.

Mystery

Natural Language Processing is a quite technical field focusing on understanding the obvious, as opposed to mysterious, aspect of language. However, there is work on metaphor, humor, sentiment analysis, and other more mysterious aspects of human language.

Relevant Themes

The field of Natural Language Processing has grown significantly in the applications aspects of it. There are research groups in various fields with an interest in Natural Language Processing without really doing basic research in this area. The following is a list of such fields that are paying more and more attention to NLP: educational technologies/intelligent tutoring systems, biotechnology, finance and economics, intelligence community, software engineering, and medicine.

Cross-References

- ▶ [Algorithms, Computer](#)
- ▶ [Artificial Intelligence, General](#)
- ▶ [Cognitive Psychology](#)
- ▶ [Computer Science in Human Learning](#)
- ▶ [Ontology](#)
- ▶ [Psycholinguistics](#)
- ▶ [Semantics](#)
- ▶ [Speech](#)

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Natural Religion

► Deism

Natural Sciences in Judaism

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The familiarity of names such as Freud, Einstein, and Feynman is evidence that since the latter half of the nineteenth century Jews have been at the forefront of scientific advancement. But do the extraordinary achievements of individual Jews reflect anything of the value placed by the Jewish *religion* on enquiry into the nature of the physical world? Is there any *organic* connection between Jewish thought and scientific discovery?

In looking back through time we must be aware that the concept of “natural science” as understood today is a product of the modern era; only relatively recently have the sciences, as organized observational disciplines, separated on the one hand from philosophy and on the other from religion or magic.

We must also make clear what we understand by “Judaism,” since the forms of Judaism encountered today are not identical with the religion of ancient Israel as depicted in the Bible. The “classical” period of formation of Judaism is that of the sages, or rabbis, whose views are recorded in the Talmud, a compilation of teachings from roughly the first to the sixth

century; this tradition was further developed in the Middle Ages and underlies most modern interpretations of Judaism.

Depending on how “religion” is understood, it could be misleading to categorize “► [Torah](#),” the Jewish tradition, as a religion, since it encompasses far more than “spiritual” issues. Most forms of contemporary Judaism accord special status to halakha, usually translated as “law,” but overlapping with ethics and morality; in many periods what we now call “natural science” has been understood as knowledge of God’s creation and therefore intrinsic to the religious tradition. In this entry we review the evolution of the relationship between Jewish tradition and natural science, noting different areas in which they have interfaced.

Though various personalities have from time to time, or within specific sects, been regarded as authoritative, there is nobody or individual today with overriding authority in the Jewish religion. Bible, Talmud, and medieval authorities such as Moses Maimonides (1138–1204) are regarded with respect, but not necessarily as determinative; consequently, there can be no definitive statement of the Jewish position on natural science.

Bible and Natural Science

While this entry is primarily concerned with rabbinic attitudes to science, a brief glance at the Bible (“Old Testament”) will supply a necessary background. The Hebrew scriptures, in contrast with Christian and later Jewish sources, do not on the whole support a dualism of body and spirit, and certainly do not disparage the material world. In the opening chapter of Genesis nature – that is, the material world – is affirmed as God’s creation, therefore good; this attitude is fully borne out in hymns such as Psalms 104 and 148.

The Bible generally takes for granted that the world was designed and created by God, and that it is run by God who every now and then intervenes directly to make sure that His purposes, for instance, redeeming the Israelites

from Egypt, are fulfilled. The underlying assumption is that phenomena and events in the world are the result of design. This assumption harmonized well enough with Aristotelian science, which was teleological, but has been increasingly questioned by philosophers since Descartes, and is no longer a useful scientific hypothesis (which is not to say that it is false). The concept of an intervening God ready to suspend natural law to save His people runs counter not only to mechanistic science but scarcely less so to the probabilistic science of the twentieth century; from quite a different angle it was undermined also by reflection on the Holocaust.

The Bible's hostility to magic and witchcraft (e.g., Deuteronomy 18:10) does not necessarily denote denial of the reality and efficacy of supernatural processes. The account of Creation in Genesis 1 omits all reference to demons and other nonnatural beings; this certainly denies their significance and perhaps denies their existence, though the existence of both angels and demons is acknowledged elsewhere in scripture.

The Bible expresses appreciation of the order and beauty of the natural world and of the power and wisdom of its creator. Job, with numerous illuminating references to natural phenomena, is primarily descriptive, as in Chap. 28 on mining, and Chaps. 38–41 where God overwhelms Job with awesome descriptions of everything from the crocodile to the Pleiades. Other biblical passages bear evidence of systematic thought about nature, including attempts to classify and evaluate phenomena and their relationships (Feliks 1981). Genesis 1, for instance, sets out a well-ordered, hierarchical scheme of creation; a carefully devised classification of the natural order underlies the ordered lists of birds, beasts, and sundry creatures in Leviticus 11 and Deuteronomy 18; likewise, there is a systematic description of “leprosy” in Leviticus 13 which can only be the result of reflection on the results of careful and extended observation of skin lesions.

The relationship between science and religion in the Bible is not a relationship of distinct disciplines, for the Bible does not clearly separate science and religion; all knowledge is presumed to come from God.

The Talmudic Period

Since the late nineteenth century, several studies have been made of natural science, especially medicine, and of mathematics in the Talmud and later rabbinic writings (Feldman 1931); more recent scholarship has modified these pioneering accounts in the light of new ideas on the formation and interpretation of both classical and rabbinic texts.

The rabbis of the Talmudic period treat natural science as ancillary to religious purposes. They believed that scripture was both inerrant and comprehensive, in that it contained all knowledge and was the source of all truth, so they insisted that knowledge of created things was divinely revealed, and that other nations had “borrowed” it from the Jews. The third-century Palestinian Rabbi Yohanan interpreted the verse “For this is your wisdom and understanding in the eyes of the nations” (Deuteronomy 4:6) with reference to Jewish pre-eminence in astronomical calculation (BT *Shabbat* 75a); medical remedies were said to be recorded in the book of cures concealed by Hezekiah, King of Judah, hence of “Jewish” origin; while “facts” of nature are frequently read into biblical verses (Lieberman 1950).

In fact, the rabbis' observations on nature are rarely original and not always sound; Jewish physicians, of whom little is known until after the close of the Talmud, followed Galen rather than “rabbinic” medicine (Lieber 1984). In the early modern period cosmology proved embarrassing to those who wished to defend rabbinic tradition. Other elements of rabbinic natural science were not known to be erroneous until more recently. For instance, lice were said not to ‘be fruitful and multiply’, implying that they were generated spontaneously from sweat or dirt; fleas, on the other hand, were fruitful and multiplied (BT *Shabbat* 107b). Such opinions were in keeping with the science of the time – spontaneous generation was not discredited until the time of Pasteur – but since they are embedded in texts carrying religious authority they generated conflict between science and religion.

The third century Babylonian teacher Shmuel had a reputation for eye salves (BT *Shabbat* 108b), and asserted that he knew remedies for all bad

eating habits except three (BT *Bava Metzi'a* 113b); he declared: "The paths of heaven are as familiar to me as the streets of Nehardea" (BT *Berakhot* 58b). As he left no pharmacopoeia, no star atlas, nor a map of Nehardea, it is impossible for us to assess these claims. His calculation of the *tekufa* – the average period between solstice and equinox, or precisely a quarter of the solar year – is 91 days and 7½ h (BT *Eruvin* 56a); this coincides with the length of the Julian year and is inaccurate, hence the Jewish festivals now occur on average almost 2 weeks later in the year than they should. A more accurate figure, of 91 days 7 h 28 min 51.34 s, was attributed by Jewish scholars from about the tenth century to Shmuel's contemporary Adda bar Ahavah; this value is close to that given by Hipparchus in the second century BCE, but it is not mentioned in the Talmud, and the link with Adda bar Ahavah seems spurious.

The 19-year cycle on which the Jewish liturgical calendar is now fixed, effectively harmonizes the solar and lunar calendars. Outside rabbinic literature, it is known as the Metonic cycle, after the fifth century BCE Greek astronomer Meton who calculated it; the Babylonians had been following this cycle from at least 500 BCE, but it is not mentioned in the Talmud.

The Babylonian Talmud contains several collections of remedies introduced by the third century teacher Abbaye with the words "my mother told me" – an attribution to be taken not at its face value but as editorial semantics for "popular tradition." Some of the remedies are common sense, as for instance to turn the seam of a baby's swaddling cloth outward so as not to injure him (BT *Shabbat* 134a); others concern the formulae and repetition of spells (BT *Shabbat* 66b); many are to do with diet (BT *Ketubot* 10b) or the correct use of plants and herbs. Numerous Hebrew amulets and incantation bowls from the first to fifth centuries have been recovered and studied by archaeologists; many of them were written by non-Jews evidently hoping to capture the efficacy of the "Jewish magic" which was held in high repute in late antiquity (Naveh and Shaked 1998).

Demons, possession, and the evil eye – the first rare and the latter two absent from the

Hebrew scriptures – figure commonly in rabbinic literature (Schäfer 1990; Schiffman and Swartz 1992; Trachtenberg 1939).

Julius Preuss (1861–1913) (1978) pioneered the discussion of Talmudic anatomy and physiology. The Talmud lists the parts of the body in connection with laws of ritual purity (Mishna *Oholot* 1:8), and enumerates defects which would render priests or sacrificial animals unacceptable for Temple service (Mishna *Bekhorot* 6 and 7), or render an animal or bird impermissible for consumption (Mishna *Hullin* 3); such knowledge of physiology as it preserves has to do with matters such as childbirth and sexual relations which are regulated by the law. The Talmud is concerned not with the art of medicine per se, but with the *halakha*, or law, and has preserved only those elements of medical science that are needed for correct interpretation and application of the law.

The Middle Ages

The subordination of science to *halakha* was challenged by a number of mediaeval Jewish philosophers, foremost among them Bahya ibn Pakuda (eleventh century Spain), who adopted the Biblical concept of nature as testifying to the greatness of God as creator and stressed that the study of nature per se led to faith in its infinitely wise Maker (*Duties of the Heart* Vol. 1: 2:1–6). Maimonides similarly derived a duty to study natural science from the command to love God, the creator of nature. Science, that is, was no longer ancillary to religious law, but an end in itself, part of the contemplation on the divine mystery which to Maimonides was the ultimate human felicity; *halakha* was but a propaedeutic to this higher study. He observed, moreover, that the astronomy of the rabbis was neither accurate nor authoritative, since mathematics was not fully developed in their time and their statements on these topics did not derive from prophetic revelation. His son, Abraham Maimonides, articulated the position even more clearly:

It does not at all follow that because we bow to the authority of the sages of the Talmud in all that appertains to the interpretation of the Torah in its

principles and details, we must accept unquestionably all their dicta on scientific matters, such as medicine, physics, and astronomy . . . We ought to be quite prepared to find that some of their statements coming within the purview of science, are not borne out by science of our times. (*Kifaya al-Abadi*)

In an outspoken letter he wrote in 1195 to the rabbis of Montpellier, Provence, Maimonides denounced astrology as a pseudoscience, claiming that he had carried out empirical tests on various astrological theories; he had already formulated a more general rejection of pseudosciences in his code of law, the *Mishneh Torah*:

And all these matters (sc. astrology, necromancy etc.) are falsehood and deceit, by means of which idolatrous priests in ancient times misled the people of the nations to follow them. It is not fitting that (the people of) Israel, who are wise and learned, should be attracted by such nonsense or entertain the possibility that there is any benefit in it. (Laws of Idolatry 11:6)

Medieval cosmologists speculated whether the universe was created in time, or whether it was co-eternal with its creator. Both Saadia (882–942) (*Book of Beliefs and Opinions* Part One) and Maimonides (*Guide for the Perplexed* 2:13 f.) devoted major sections of their principal philosophical works to establishing the former. Maimonides endorses belief in creation in time since reason does not contradict it and it is the plain sense of scripture; had reason led him to believe that the universe was eternal he would have reinterpreted scripture accordingly (*Guide* 2:16 and 2:25).

Jews contributed to the transmission of Arabic-language science to scholastic Europe, and hence to the Renaissance, by means of their translations and commentaries in Hebrew or Latin of the Arabic translations, commentaries, and compilations of Ptolemy's *Almagest* and of other scientific works (Steinschneider 1893). They also engaged in independent astronomical research and observation. The "Alphonsine Tables" were prepared in Toledo for King Alfonso X of León and Castile under the direction of the Jewish astronomers Yehuda ben Moshe haCohen and Isaac ibn Sa'id, the latter a keen observer of lunar eclipses; completed in 1252,

they were based on the geocentric Ptolemaic theory, and enabled astronomers to calculate eclipses and the positions of the planets for any given moment; they were an important source of information for Copernicus, whose own work superseded them in the 1550s.

In 1310, Isaac ben Joseph Israeli composed *Yesod Olam*, a study of astronomy and cosmography, incorporating an original method for calculating the parallax of the moon. Gersonides (Levi ben Gershon, or Ralbag) (1288–1344), in his philosophical treatise *Milhamot Hashem* ("Wars of the Lord"), influential through its (partial) Latin translation, explains in detail (a) his discovery, or improvement, of the cross-staff, a device for measuring angles and spherical distances, which became known in Europe as *baculus Jacobi* (Jacob's staff); and (b) his method of passing a light ray from a star through a small aperture in a darkened chamber on to a board – perhaps a novel use of the *camera obscura*, with which Roger Bacon had recently experimented; his observations led him to question some of the basic assumptions of the Ptolemaic system.

The Spanish-Jewish philosopher Hasdai Crescas (1340–1410) was another pioneer of the scientific revolution, associated with the same movement as Nicole Bonet, Thomas Bradwardine, and Nicole Oresme (Harvey (1998), 3). In *Or Hashem* ("The Light of the Lord") (1410) he concedes the eternity of the world, and elevates natural causality at the expense of human free will; more significantly from a scientific point of view, he rejects Aristotle's proofs of the impossibility of an infinite magnitude, an infinite place, or a vacuum, his definitions of time and place, and the contention that natural motion is a consequence of the four elements seeking their proper places. The most revolutionary aspect of Crescas' natural philosophy is his assertion that the heavens and earth are subject to the same system of natural law (Wolfson 1929, 118–121). Crescas was read by Pico della Mirandola and directly influenced Spinoza; some of his ideas are similar to those for which Giordano Bruno was burned at the stake.

Jewish inventors of astronomical instruments in the later Middle Ages include Jacob ben

Machir, who invented an improved quadrant (an angle-measuring device); Isaac ben Solomon ben Zaddik al Hadib, who invented a new instrument which was a combination of astrolabe and quadrant; Jacob (Bonet) de Lattes (fifteenth to sixteenth centuries) designed a device in the shape of a ring for measuring the height of the sun and the stars; further refinements of the astrolabe were made by Abraham Zacuto (1452–1514) (Cooperman 1983).

The earliest known medical works written by a Jew are the Arabic treatises of Isaac Israeli (c855–955). The *Book of Asaph* or *Book of Healing*, of which several versions exist, is cited in some form perhaps as early as the tenth century, but Asaph ha-Rofé (Asaph the physician), the supposed author, to whom a version of the Hippocratic oath subsequently in use by Jewish physicians is attributed, cannot be identified. This book (manuscripts vary), wrote Richard Gottheil in his article on Asaph in the 1905 *Jewish Encyclopedia*, contains “treatises on the Persian months, physiology, embryology, the four periods of man’s life, the four winds (*sc.* humours), diseases of various organs, hygiene, medicinal plants, medical calendar, the practise of medicine, as well as an antidotarium, urinology, aphorisms, and the Hippocratic oath”; it draws not on the Talmud but on “the books of the wise men of India” and a “book of the ancients”; it ascribes the origin of medicine to Shem, son of Noah, who received it from angels. The contents show dependence on Galen, Hippocrates, and Dioscorides, indicating that the practice of Jewish physicians was modeled not on rabbinic sources but on “scientific” medicine (Melzer 1973). Opinions vary as to the originality of Jewish contributions to medicine, but there is no doubt that Jews played a significant role in the transfer of ancient Greek medical knowledge, together with later Islamic insights, to the West during the Renaissance.

If it is not God’s will to heal us, then by utilizing the art of medicine to heal ourselves are we not thwarting his will? Some Karaites (a Jewish sect who rejected the rabbinic tradition) objected on religious grounds to the practice of medicine. Likewise, Nahmanides (1194–1270) held that God would protect from sickness any

individual who served him in complete faith, and that ideally the sick person should turn to repentance, not to doctors, even though the Torah granted “permission for the doctor to heal” (*Commentary* on Leviticus 26:11). However, the predominant Jewish view is that the practice of medicine is not only permissible but virtuous. Joseph Karo (1488–1575), in his *Shulhan Arukh*, the most influential Code of Jewish Law, states, “. . . [to heal] is a positive obligation, tantamount to the saving of life, and one who avoids doing it sheds blood, even though there is someone else available to [effect the cure], since the patient does not respond equally to every doctor”; one may practice medicine only if duly authorized by a Jewish religious court. Even those unable to perform medical or nursing services are obliged to visit the sick and to pray for their welfare; and intercessions are made publicly in the Synagogue (*Yore Deah* 236:1; 235:10).

By being subsumed within the *mitzvot*, or divine commandments, the practice of medicine becomes part of the spirituality of Judaism. Nevertheless, the specific remedies used by the physician are not determined by the religious tradition itself, but by the independent science of medicine.

Natural Science in the Early Modern Period

André Néher (1986) has shown the extent to which Jews such as David Gans were in direct contact with Kepler and other leading scientific minds of the sixteenth century. Ephraim Kupfer argued that there was a strong current of rationalist culture and philosophical activity among German Jews in the late fourteenth and early fifteenth centuries, and that this stimulated similar interests among Polish Jews in the late sixteenth century. David Ruderman rightly observes, however, that the distinction between physics and metaphysics was a new feature of sixteenth-century Jewish thought, reflecting an emergent consensus in Christian thought on the relationship between science and faith (Ruderman 1995, Chapter 2).

On May 24, 1543, on his death bed, Nicholas Copernicus received the first printed copy of his

De revolutionibus orbium coelestium, completed 13 years earlier, in which he demonstrated the mathematical elegance of calculating heavenly motions on the assumption that the Earth orbited the Sun. To what extent did Copernicus' revival of Aristarchus' heliocentric conception of the universe disturb traditional Jewish thought? Certainly, it was some time before the Copernican theory gained acceptance; as late as 1616 the Inquisition condemned Copernicus' book, and Galileo was tried in 1632. As knowledge of it spread, two problems presented themselves. The obvious one was that, in purely mathematical terms, it contradicted the Ptolemaic theory, which by this period had been incorporated into Jewish as well as Christian theology.

However, what was in the long run far more serious was that it implied, as Crescas had suggested, that the stars and other "heavenly" bodies constituted *one physical system* with the Earth; the heavens were dethroned – in Max Weber's term, "disenchanted." The whole mediaeval fabric of the "chain of being" leading down from the One, through the heavenly spheres, to the Earth and its lowly inhabitants, collapsed. No longer did it make sense to speak of a God who lived, literally, in the sky, or of "eternal life" situated in the heavenly realm.

Conservatives such as Maharal (Judah Loew ben Bezalel: 1525–1609) – one of the earliest to refer to Copernicus in a Hebrew work – remained faithful to rabbinic, that is Ptolemaic, cosmology; he nevertheless vehemently attacks Maimonides' contention that the spheres are intelligent beings (second Preface to *Gevurot Hashem*), thus perhaps yielding to the pressure for "disenchantment." In the same passage he expounds his "double truth" theory that the plane of spiritual reality, though generally synchronized with that of physical reality, occasionally departs from it, as in miracles such as the Sun standing still for Joshua; the "true," spiritual Sun stopped, but the "mere" physical Sun continued on its course.

Maharal's disciple David Gans (1541–1613) was a colleague, or at least acquaintance, of both Tycho Brahe (1546–1601) and Kepler (1571–1630). In *Nehmad ve-Na'im* (1613) Gans offered the first Hebrew exposition of the

Copernican system; like Kepler himself he rejected its substantive implications, regarding it only as an elegant mathematical device, and thereby avoiding any clash with religious tradition.

The Cretian polymath Joseph Solomon Delmedigo (1591–1655), a pupil of Galileo, was the first Hebrew writer to use logarithms; in his *Elim* he expounds the works of al-Battani and Copernicus, apparently endorsing the latter. Tobias ben Moses Cohen, known as Tuviyyah ha-Rofé (1652–1729), "the physician," in his *Ma'aseh Tuviyyah* (Venice, 1707–1708), reviews the heliocentric view but rejects it, principally on religious and traditional grounds, denouncing Copernicus as the "first-born of Satan."

Among the descendants of the *converso* Jews (forced converts to Christianity) who remained in Spain after 1492 and Portugal after 1497 were many who achieved eminence in medicine; most notable was the anatomist Amatus Lusitanus (1511–1567), celebrated for his work on *materia medica* and for his discovery of the function of the heart valves.

Ruderman (1995, 276–285) specifies two areas which constitute a "specifically *converso* contribution to scientific discourse both within the Jewish community and beyond it":

1. Francisco Sanchez (1551–1623), whose *Quod nihil scitur* (Lyons, 1581) exhibits a constructive scepticism which, critical of Aristotle, emphasizes the need for experiment.
2. Isaac La Peyrère (1596–1676) and Baruch (Benedict) Spinoza (1632–1677) exemplify the application of scientific techniques to biblical study; Richard Popkin (1987) has argued that this, even more than Copernican cosmology, undermined the theological foundations of Judaism and Christianity.

Science and Religion in the Modern Period

Since the seventeenth century science has conflicted with religious tradition in three ways:

- (a) Numerous specific instances have arisen of scientific results contradicting statements made by religious authorities.

- (b) The requirement that theory be supported by reproducible experimental evidence has not only cast doubt on earlier statements on nature by religious authorities, but has shaken confidence in the traditional religious method of deriving information about the world from traditional texts.
- (c) The teleology which characterized the Aristotelian understanding of nature and conveniently supported the “argument from design” has been abandoned.

The broad result of these conflicts within Judaism has been a denominational split. The Reform branch has accepted the scientific revolution in principle; Orthodox traditionalists range from outright denial of scientific results to a variety of accommodations and reinterpretations designed to safeguard the integrity of the traditional doctrine of the divine origin of the Torah.

Descartes (1596–1650) held that all change and movement in the physical world were to be explained in purely mechanical terms; Spinoza (1634–1677) scathingly dismissed the idea of final causes in nature as a superstition, a figment of the human imagination (*Ethics*, Appendix to Part 1); and David Hume (1711–1776) reduced causation to mere “association of ideas” (*Enquiry Concerning Human Understanding*, Section III). Teleology, as a scientific hypothesis, was dead.

Organic evolution, proposed by Charles Darwin in his *Origin of Species* (1859), posed three challenges to the traditional understanding of the Biblical Creation story:

- (a) It reinforced the claim, made already before Darwin and contrary to the Bible, that there were human beings long before the 6,000 years ago that Adam and Eve were supposed to have been created.
- (b) It denied a special act of creation of humankind, asserting the continuity of life forms and the heredity of *Homo sapiens* from more primitive species of animal.
- (c) It posited a process – natural selection – by which human beings, as well as other creatures, could come to exist without having been specifically planned. No longer was it necessary to posit a Designer who had planned each detail of the design.

The last of these was at the same time the most fundamental challenge to faith and the weakest part of the theory. For Darwin had no plausible explanation of how variation occurred, or indeed of the reproductive process itself. Only a century later, once the structure and function of DNA were unraveled, was a coherent model available for a self-replicating molecule able to carry the information needed for the formation of a new individual organism; minor, accidental variations in the genetic code could account for the evolution of distinct new species. The idea of human beings or any other creatures being “designed” was finally rendered superfluous.

In the nineteenth and early twentieth centuries, some Orthodox Jewish thinkers felt they could accommodate evolution within a traditional scheme. Even before the *Origin of Species* was published, Israel Lipschutz (1782–1860) had noted the parallel between the evolution of species and Rabbi Abbahu’s (third century) statement (*Midrash Bereshit Rabba* 9:2) that “The Holy One, blessed be he, repeatedly created worlds and destroyed them until he made this one” (*D’rush Or ha-Hayyim*). Rav Kook (1865–1935) observed that Kabbalah recognizes an ongoing process of redemption, a completion of creation, analogous to evolution (*Orot ha-Qodesh*, No’s 559 and 565). J. H. Hertz (1872–1946), Chief Rabbi of the (then) British Empire, appended to his 1936 commentary on Genesis a note in which he asserts:

... there is, therefore, nothing inherently un-Jewish in the evolutionary conception of the origin and growth of forms of existence from the simple to the complex, and from the lowest to the highest. The Biblical account itself gives expression to the same general truth of gradual ascent from amorphous chaos to order ... insisting, however, that each stage is no product of chance, but is an act of Divine will, realizing the Divine purpose, and receiving the seal of the Divine approval ... (Hertz’ emphasis)

While these and others grasped the idea of evolution as progress, they failed to understand that “progress” of this kind does not require design. They addressed the minor question of how a progression of life, even one extended far beyond the few thousand years allowed by

scripture, can be reconciled with tradition, but not the major theological issue, namely, Why is God needed, not simply as the “ground of being,” but as Author and Guide of specific events?

Medieval philosophers were troubled by the theory, attributed to Aristotle, that the universe was eternal, not created. Until the latter part of the twentieth century scientific cosmology remained wedded to the assumption that the universe had no beginning or end, or at least none that could be subjected to any empirical test. By the 1960s, however, the “Big Bang” theory had become dominant. Jewish thinkers such as Aron Barth (1968), like many Christian theologians, welcomed this as confirmation of Genesis; it acknowledged a point of origin, and it was a small step to identify this “singularity” with divine creation. But alternative cosmologies are available, Genesis specifies that the *Earth* was created (with the heavens) at the beginning, and there is no evident correspondence between the 6 days of creation in Genesis and the 13.7 billion years of modern cosmology, or the 5 billion years of Earth history, with regard to either periods of time or order of events; attempts to reconcile Big Bang cosmology with Genesis 1 engender radical, often implausible, reinterpretations of the text (Aviezer 1990; Lamm 1990; Roth 1966).

Yeshayahu Leibowitz (1903–94), who from 1961 was professor of organic and biochemistry and neurophysiology at the Hebrew University, Jerusalem, was among those who have maintained that science and religion do not conflict since they occupy totally distinct domains. Judaism, according to Leibowitz, is a religious and historical phenomenon which is characterized by a recognition of the duty to serve God according to the *halakha* (law); there is no such thing as Jewish philosophy, theology, mysticism, or science, therefore, there is no problem of the relationship between religion and science (Leibowitz 1992). J. B. Soloveitchik (1903–1993) likewise attempted to bypass the conflict with science by reducing Torah to *halakha*: even the creation story is for him not cosmogony or metaphysics but *halakha* – the *halakha* that we should engage in the creative

activity of Torah. But he does acknowledge that Torah addresses itself to natural phenomena; Torah and nature do not occupy distinct domains; however, the Man of Religion, the Man of Science, and the Man of Halakha, each bring a different set of a priori concepts with which to confront the world. Each looks at the same tree, or sunset; where the Man of Religion responds with awe, and the Man of Science by measuring in accordance with his a priori laws, the Man of Halakha confronts the tree or the sunset with the laws of the Torah, and decides what blessing to pronounce, whether the time has come for evening prayer, and so on.

What these and similar thinkers have in common (and in this they differ little from their Christian counterparts) is the assumption that the potential conflict between religion and science is with regard to the existence of God and the origin of the universe; they all agree that there is no conflict between science, which is essentially descriptive, and religion insofar as it is prescriptive. As Samuelson (1994, 261) puts it, echoing Hume, “The critical point is that right moral behaviour cannot be determined from empirical nature.”

But many philosophers have claimed connections between nature and morals, and in any case Torah covers far more than moral behavior. Moreover, as we have seen, exponents of Jewish religion in earlier periods routinely made descriptive claims about the universe that were incorrect; we cannot lightly assume that these are irrelevant to the concerns of religion. The problem is highlighted when we address the interface between natural science and *halakha*. For instance, can a *halakha* be changed if it transpires that it was based on erroneous scientific understanding? A striking example of this occurs in connection with blood typing. The Talmud unequivocally states that blood is “from the mother”:

There are three partners in [the generation of] a person, the Holy One, blessed, be He, his father, and his mother. His father generates the seed of whiteness, out of which [are formed] bones, sinews, nails, the [soft matter of the] brain in his head, and the white of the eye. His mother generates the red seed, out of which [are formed] skin,

flesh and hair, blood, and the dark part of the eye. The Holy One, blessed, be He, puts in him *ruah* (wind, spirit) and *neshama* (breath, soul) and facial appearance, and the seeing of the eye, the hearing of the ear, the speech of the mouth, the movement of the legs, and discernment and understanding. When his time comes to depart from the world, the Holy One, blessed, be He, takes His portion, and leaves before his mother and father their portion. (BT *Nidda* 31a, Munich manuscript)

A Sefardi Chief Rabbi of Israel, Ben-Zion Uzziel (1880–1953), ruled on this basis that blood typing could not be used as a means of ascertaining paternity, since “any scientific examination is nullified by this trustworthy tradition of our Sages all of whose words were spoken by divine inspiration ...” (*Sha’arei Uzziel* vol.2, 40:18). Sefari Jews’ mediaeval forbears lived in the Iberian peninsula. Ashkenazi are Jews of Northern European descent. His Ashkenazi colleague, Chief Rabbi Herzog, strongly differed, and wrote to a colleague in 1954:

... How unfortunate it is that while science is progressively conquering worlds and discovering all sorts of secrets, although it too errs at times, we bury our heads in the sand like that well-known bird and look no further with regard to scientific matters that concern our Holy Torah ... (Frimer 1991, 42–44)

Since the days of Uzziel and Herzog much progress has been made in the application of *halakha* to problems raised by new medical technology; Feldman (1974), Feldman and Rosner (1984), Rosner (1986) and Rosner and Bleich (1991) have reviewed this progress, which may be followed in dedicated journals such as the Hebrew *Assia* and English *Jewish Medical Ethics* (both websites inoperative at the time of writing) published by the Dr Falk Schlesinger Institute for Medical-Halakhic Research at the Shaare Zedek Medical Center, Jerusalem (www.medethics.org.il). Progress is also summarized in professional guidelines such as the *Compendium on Medical Ethics* issued at intervals by the Federation of Jewish Philanthropies of New York.

Another area of interface between Jewish tradition and science is that of conservation and environmental protection (Solomon 1992;

Solomon 1994). The fundamental duty of caring for the environment is rooted in the goodness of the created world (Genesis 1:31), in the commandment to Adam to work on the garden of Eden and look after it (Genesis 2:15), and through rabbinic elaboration of biblical rules such as the prohibition of destroying productive trees (Deuteronomy 20:19) and the requirement to rest the land in the sabbatical year (Leviticus 25:4). It has been expressed not only by theologians, but through public statements such as the “Jewish Statement on Nature” adopted by the Board of Deputies of British Jews in 1990, and by the activities of dedicated organizations such as the Noah project; a long list of American Jewish environmental organizations is available online (<http://jrf.org/files/Jewish%20Environmental%20Organizations.pdf>).

Conclusion

To the question posed at the beginning of this essay, “Is there any *organic* connection between Jewish thought and scientific discovery?” we answer affirmatively. The Talmud itself demands, if in an ancillary role, answers to astronomical and biological questions, and does not expect to obtain those answers by poring over scriptural texts, even if allusions are sometimes sought in the precise wording of scripture. Moreover, “Jewish thought” encompasses more than the Talmud, ranging from biblical awe at God’s creation, to the philosophies of the Middle Ages, to excitement at the new philosophies and scientific conceptions at the onset of modernity, to contemporary concern about conservation of the environment, all religious concerns which generate interest in the way the natural world works.

The precise forms in which the normal human inquisitiveness of Jews has been channeled have been influenced by social and economic pressures as well as tradition, but we should not doubt that the love of learning and enquiry encouraged within Jewish tradition have stimulated scientific enquiry by Jews, and the

positive attitude of the Hebrew scriptures to the natural world has fostered a respect for nature and concern for its preservation.

Cross-References

- [Astrology](#)
- [Astronomy in Judaism](#)
- [Bioethics in Judaism](#)
- [Creation in Judaism](#)
- [Ecology in Judaism](#)
- [Evolution](#)
- [Mathematics in Judaism](#)
- [Physics in Judaism](#)
- [Psychology in Judaism](#)
- [Science and Kabbalah](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Natural Selection

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The Idea of Natural Selection as a Principle for Adaptation

The theory of natural selection, developed independently by C. Darwin and A. R. Wallace, was first publically presented by a joint reading of two separate papers at the July 1, 1858, session of the *Linnean Society of London*. Soon after these two papers were printed in the 3rd volume of the *Proceedings of the Society*, which appeared August 1858 (Hodge 1992). Later the theory of evolution by natural selection was developed in two major works by Darwin: *The Origin of Species* (1st ed., 1859; 6th ed., 1872) and *The Descent of Man* (1871) and it was treated extensively by Wallace in his *Darwinism* (1889). The theory of evolution through natural selection is based on four observations that lead to one conclusion: (1) there is intraspecific variation in the majority of characters, (2) the biological (reproductive) success of an individual is linked to the suite of characters he possesses, (3) much variation is inherited by descent, and (4) since organisms of the population of a species produce more offspring than environment can sustain, competition for limited resources leads to a struggle for existence (Futuyma 1998). Therefore, the inevitable conclusion is that species evolve as a result of differential reproduction of different genotypes in a population (Endler 1992).

Some Epistemological Questions

Natural selection, or the differential reproduction of genotypes in a population, is both cause and effect (Ridley 2004). From a phenomenological point of view, natural selection is an effect: it is the result of the interaction between phenotypically expressed genetic variation and variation in ecological factors directly acting on individuals;

these environmental factors alter the probability of individual survival or fecundity (Williams 1992; Futuyma 1998; Ridley 2004). Basically, every time a population passes from one generation to the next, a spontaneous process of selection occurs. Once selection has occurred, the genotypic composition of the new population has become different from the genotypic composition of the starting population. While at a phenomenological level, natural selection can be seen as an effect, at the theoretical level, i.e., the explication of evolutionary processes, natural selection is an etiological, causal factor of evolution from one generation to the next (microevolution).

Natural Selection and Adaptation

Natural selection is a nonrandom difference in reproductive output among replicating entities, first of all individual organisms (but sometimes also ► [genes](#), and perhaps species), due to differences in survival in a specific environment (Williams 1992). Natural selection leads to an increase in the proportion of beneficial (for an individual), heritable characteristics within a population from one generation to the next. Natural selection is one of the basic mechanisms of the evolutionary change (other recognized causes of evolution of a population are genetic drift, mutation, ► [gene flow](#), and inbreeding) (Futuyma 1998; Ridley 2004), and it is the main process responsible for the production of genetic evolutionary adaptation (Williams 1966; Futuyma 1998; Ridley 2004). Tied to the idea of natural selection is the concept of fitness. The fitness of an organism (overall ability to survive and reproduce) is based on many aspects of the organism, which means that the mechanism of natural selection can act on a wide range of characters, heritable traits, from morphology to behavior (Ridley 2004). The fitness of a genotype can be measured and corresponds to the number of offspring of that type that reach adulthood. The fitness differences among individuals are differences in the propensity to survive and reproduce (Williams 1966).

Ultimately, there is evolution only through selection against variable, heritable characters linked to fitness. Without variability, selection could not occur.

Main Properties of Natural Selection

- (a) *The link with random causes.* The selection mechanism is powered by random causes. In the end, selection depends on genetic variability and the ultimate source of variation is the random mutation of genetic material (Futuyma 1998; Ridley 2004).
- (b) *Simplicity.* Through a very straightforward procedure it is considered to be possible to produce extremely complicated and complex structures and processes, provided, however, that the procedure is repeated a great many number of times, hundreds of millions of times (Futuyma 1998; Ridley 2004).
- (c) *Universality.* The procedure of natural selection is independent of the type of material support. The logic, the rules followed in implementing the procedures, does not vary with the material nature of genes or with the type of organism. The mechanism of natural selection is only one and it is valid for all organisms (Futuyma 1998; Ridley 2004).
- (d) *Automaticity.* The mechanism goes into action whenever certain conditions are in effect (Futuyma 1998; Ridley 2004). Some of these conditions relate to the population, others to the interaction between other organisms and the environment. In any case, the mechanism always rewards individuals (or genetic organizations) that exhibit the best performance under given circumstance. The process of natural selection can explain adaptation to natural conditions without having to resort to teleological explanations (Williams 1966; Futuyma 1998). To explain biological evolution it is not necessary to consider any causes outside of nature. There is no need to invoke supernatural forces because adaptive evolution is the result of an automatic selective process that operates always and continuously.
- (e) *The here and now.* Natural selection is an “opportunistic” agent in that it springs, as a process, from a spatially and temporally restricted interaction; natural selection cannot act prospectively, i.e., providing for a future environmental scene, or for any future needs of the species (Williams 1992). Every environmental action on the individual produces selective effects only applicable to the present time. In practice, the “select” and “success” can be challenged in every generation. In other words, in biological evolution there is no space for the idea of a project.
- (f) *Non-signification.* Selection is not a process designed to produce particular types of species (e.g., our species) in place of certain other species (Williams 1966). In other words, natural selection is not a mechanism subject to a project (Williams 1992; Futuyma 1998; Ridley 2004). All this is summarized in the simple, popular statement; *selection is blind to the future.*

The Effectiveness of Natural Selection

The effectiveness of the differential reproduction of genotypes as a result of Darwinian evolution has been repeatedly demonstrated by observations in nature and laboratory experiments conducted on many different types of organisms: bacteria, plants, and animals (including our species) (Futuyma 1998; Ridley 2004). The mechanism of natural selection is pervasive and it presumably has acted since the appearance of the earliest forms of living beings.

Cross-References

- [Altruism](#)
- [Biological Anthropology and Human Ethology](#)
- [Biological Hierarchies](#)
- [Biology](#)
- [Biology of Religion](#)
- [Creationism](#)
- [Epistemology, Evolutionary](#)

- [Evolution](#)
- [Evolution, Convergent](#)
- [Intelligent Design](#)

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Natural Selection of Behavior

- [Evolutionary Psychology](#)

Natural Theology

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Related Terms

[Fundamental theology](#); [Metaphysical theology](#);
[Philosophical theology](#); [Rational theology](#);
[Theological metaphysics](#)

Description

Natural theology, as traditionally understood, seeks arguments for the existence of God on

grounds external to revelation; it also explores questions about the nature of God and the relationship between God and the world. In medieval Christian thought, natural theology was argued deductively in terms of ontological reasoning – either on *a priori* grounds of logic, notably by Anselm of Canterbury in the eleventh century or on *a posteriori* cosmological and teleological grounds, as in the Five Ways argument of Thomas Aquinas in the thirteenth century. Then, with the rise of modern science, natural theology tended to develop inductively during the seventeenth and eighteenth centuries in terms of “argument from design” – that is, from the evidence of the superb ordering of nature’s life-forms. The latter was comprehensively described by William Paley in his celebrated *Natural Theology: or, Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* (1802).

In due course, the deductive arguments were shown by Kant and Hume to be philosophically inadequate, and Hume, in particular, provided substantial objections to the design argument, which was further weakened by the advent of Darwin’s theory of evolution (1859). Strong pressure also came from the authoritative and initially uncompromising view of the leading Protestant theologian of the early 1900s, Karl Barth, who viewed the metaphysical nature of natural theology as inimical to the theology of revelation. A further attack arose from the logical positivism (or logical empiricism) of early and mid-twentieth century philosophy with its narrow criterion of verifiability as the way to determine the validity of any truth claim. This made metaphysical ideas unfashionable, particularly those of natural theology.

However, a new-style natural theology (NNT) is emerging from the science-and-theology discourse of the past three decades. It aims to formulate a widely embracing account of our multileveled evolutionary world, on the assumption that it is the work of a beneficent creator. This project stands alongside the present-day work of philosophers of religion who seek further development of old-style natural theology, along philosophical and scientific lines. Richard Swinburne, notably, argues that the existence of God is

more probable than the nonexistence of God by estimating a probability rating for each argument and pointing to the consequent cumulative rating.

The science-and-theology discourse itself has been conducted for the most part with Christian belief in mind, but with other religions increasingly involved. To a large extent it was provoked by one of the great scientific discoveries of the twentieth century, namely, that the universe itself has a history – that of a 13.7-billion-year process of expansion and cooling, together with the formation of a vast number of solar systems, at least one of which has given rise to an astonishing variety of life.

From consideration of the expanding universe as seemingly fine-tuned for life to emerge (see ► [Anthropic Principles](#)), the discussion moved to the area of biological evolution and the biological foundation of *Homo sapiens*. It then focused on questions of human personhood and powers of cognition, especially the capacity for language, symbolic understanding, and, hence, culture. This in turn raised epistemological questions, that is, questions about the nature and process of human knowing. Alongside these topics, the question of the nature and locus of divine action in the world has been addressed in great detail.

Throughout the discourse, the interaction between science and theology has ranged widely, from the aggressive broadsides of ► [scientism](#) and ► [creationism](#), through dualistic claims of non-engaging coexistence to a quest for consonance between the two areas of inquiry. And it is in the exploring of such consonance that NNT finds space for development.

As systematic theologian John Macquarrie put it in the 1970s, NNT would maintain continuity with the old form of natural theology in that it would continue to perform the same basic function of “providing a bridge between our everyday thinking and experience and the matters about which the theologian talks: it will relate religious discourse to all the other areas of discourse” (Macquarrie 1977, p. 57).

One of its leading proponents, John Polkinghorne (1991:51), writes: “I believe that we are living at a time of revival of natural theology, more modest in its tone than its

predecessors of earlier centuries. It speaks of insight rather than demonstration. Its aim is not the classic goal of proving the existence of God. Rather, it seeks to show theism as providing a coherent and deeply intellectually satisfying understanding of the total way things are” – through integration of insights from the sciences, the arts, ethics, and Christian theology itself.

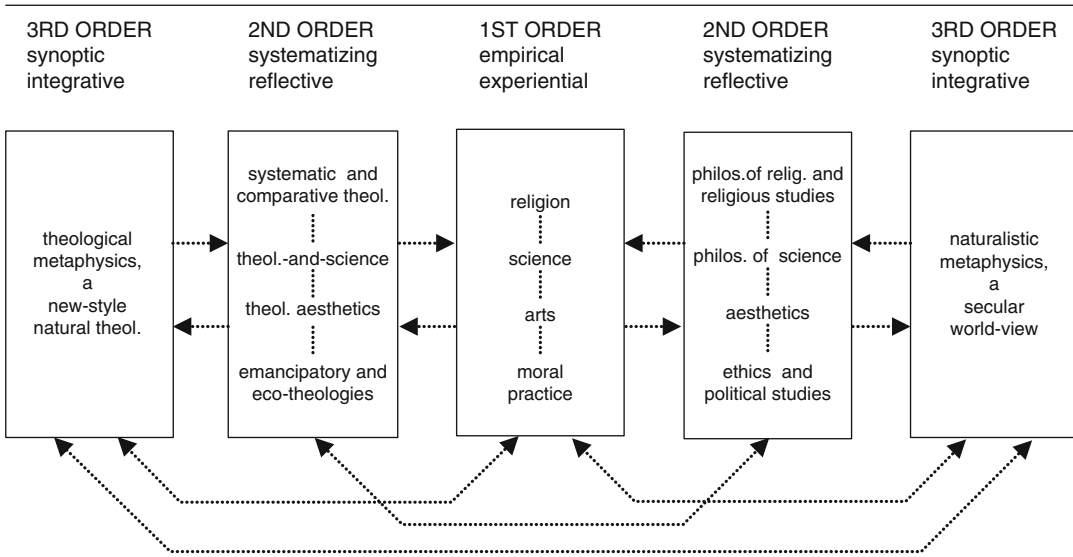
Alister McGrath (2008:19) adopts a similar integrative approach. On the basis of a Christian doctrine of creation, combined with ideas from the natural and human sciences, he develops an account of the nature and meaning of human *being* within a world created to show forth the great qualities of truth, goodness, and beauty.

Keith Ward (2003:602–5), on the other hand, places natural theology in a broad theistic setting that is not linked specifically to Christian tradition. But he, too, looks for a wide-ranging engagement with the world, describing it as the attempt to show how science, history, morality, and the arts are so related that a total integrating vision of the place of humanity in the universe may be formulated – an attempt that will be “more of an imaginative art than an inferential or deductive science”.

The term *natural theology* is sometimes linked to the term *theology of nature*, but they have different meanings. The latter refers to a more narrowly and ethically focused project concerning the significance of the world of nature, while the former ranges widely and is more philosophically oriented as it seeks to develop an integrative account of the entire sweep of reality – in other words, a ► [theological metaphysics](#). And it is usually with Christian thought in mind that such a theological metaphysics is named “natural theology.”

NNT seeks to describe, in narrative form, creation’s “struggle upwards through matter, life, thought, history and culture” (Christopher Mooney 1991:319) – aiming thereby to address questions about the origin, meaning, and purpose of it all. And if it is to do justice to the full range of human personhood within this broad context, it needs to link Christian belief about the creation not only to the natural and human sciences but also to the humanities – not only to the realm of

Natural Theology, Table 1 Place of NNT in western thought



A layout of broad areas of western thought, drawn from discussion with Niels Henrik Gregersen, John Polkinghorne and Keith Ward. The two outermost boxes represent extremes of a range of integrative approaches that includes 'theistic naturalism' and 'process theology'.

logic and reason but also to the realm of aesthetics and the imagination. Indeed, NNT may be thought of as a twofold bridging activity: internally creating a grand-narrative framework in terms of theology's reflections on the religious, scientific, aesthetic, and moral dimensions of human thought and understanding and externally linking this framework to the general discourse of academy and society.

Jürgen Moltmann (1985:58–9) refers to these two roles as an internal hermeneutical function of intellectually underpinning the Christian faith and an external educative function of relating key theological ideas to more general discourse. But he adds a third: an [eschatological](#) function of anticipating “the knowledge of God in glory” – in other words, providing metaphorical insight into the nature of this world as “parable of the world to come.” The eschatological dimension is a fundamental aspect of Trinitarian theology, even if discounted by those who hold to a more philosophically based theism. It provides NNT with the key metaphysical idea, clearly

speculative but profoundly explanatory, that this amazing, beloved, costly, and deeply interrelated world constitutes the raw material for a new creation yet to be realized.

The table below shows a way of representing the place of NNT in western thought (Table 1). Whereas systematic theology strives for coherence within the broad scope of theology itself, NNT aims, in this scheme, not only to provide an internally unifying perspective but also to extend that coherence externally, through the engagement between theology and the intellectual world at large. The connecting lines and arrows show something of the overlap and interplay among these areas of thought.

The interdisciplinary nature of natural theology has raised questions about its identity vis-à-vis the fields of science and theology. Its relationship with each has often been uneasy. So, too, has been its relationship with philosophy. It deals with meta-physical questions (see the beginning of section “[Conceptualization](#)” below) and makes use of philosophical language and concepts – but it does

so within a theological framework and thus stands in contrast to the more empirical, naturalistic perspective of much western philosophy. And for the theologian, it is the metaphysical aspect that may seem to intrude into the narrative basis of the Christian faith. Indeed, many contemporary theologians treat the prospect of a metaphysical dimension to theological thought with considerable reserve, or even suspicion.

Any such metaphysical scheme needs to develop from some organizing idea or theme about the nature and purpose of God as creator. The point of departure may be either the experientially based, richly detailed theism of one of the monotheistic religions on the one hand, or a more restricted and abstract theism characteristic of philosophy on the other – and it is philosophical theism, in its various forms, that is commonly adopted within science-and-theology. However, many find greater explanatory power in well-winnowed Christian thought, especially ► [Christianology](#), when dealing with questions about horrendous suffering and ultimate meaning.

Working from the latter perspective, NNT is in the process of establishing itself. Its concern is to form a theological grand narrative that harmonizes the generalities of science with the particularities of Christian tradition. In terms of the final burst of Dietrich Bonhoeffer's theological thinking (in 1944), the challenge is then to express the key concepts of the Christian gospel (creation, fall, atonement, repentance, faith, the new life, the last things) within such an NNT synthesis, using fresh metaphysics and expressing it all in the language and ideas of the modern world (Bethge 1975:150). And in the present global context, there exists a further challenge: to remain open to religious insight in all its variety, and thereby open to continual testing and reinterpretation of the narrative.

As an organizing idea, NNT could choose, for example, George Ellis's (1994:1–14) axiomatic statement that, operating within the grain of the divinely instituted laws of nature, “God so creates and sustains the universe as to make possible high-level loving and sacrificial action by freely acting self-conscious individuals” – an idea that would immediately place stringent requirements

on the whole unimaginably complex and costly creation process.

But however it is structured, NNT is faced with the creative task of drawing together insights from all four areas of reflective theological analysis listed in the table below. The interplay between theology and science over recent decades has been lively and remains important. But input from the other three areas of engagement would surely make for a well-grounded natural theology – a theological worldview to set against the varieties of fundamentalist thought, secular and religious, and to leaven discussion with the world at large, whether dealing with key issues in public life or the big questions of human existence.

Self-identification

Science

NNT does not identify itself as a science in the sense of theory-based empirical inquiry about the world. Instead, it embraces the findings and insights of the sciences and humanities in order to place them in an integrative theological framework of understanding.

Religion

This theological framework acts as a meeting ground for science-religion discussion. As such, it is not a religion but aims to help those with theistic (usually Christian) belief develop self-understanding and intellectual confidence for their role in a multicultural, multifaith world.

Characteristics

NNT acts as a bridge between theology and key insights of the sciences and humanities. It does so by virtue of its integrating role of placing the meta-questions about human existence and destiny within a metaphysical framework. In this way, it plays a sense-making role that depends strongly on the organizing (foundational) idea from which it operates. An example of such an idea is given in the second last paragraph of

section “**Description**”. A more theologically based statement would perhaps refer to questions of divine-human relationship and its ultimate purpose. In either case, it is this general bridging-integrative concern that is the distinctive feature of NNT. Its justification will lie in the extent to which it provides an intelligible and persuasive account of reality in its variety of aspects.

Relevance to Science and Religion

NNT is concerned with the entire sweep of science-and-religion discourse, offering criteria of assessment, both theological and philosophical, and opening up space for the use of metaphysical ideas in the discourse, especially (a) the notion of other levels of reality than the merely physical and (b) concepts such as ► **spirit**, ► **economy**, and sociality that may be invoked as key aspects of the created order.

The relevance of the new natural theology as part of science-and-religion:

- (a) *In teaching*: NNT can help teachers of religion/theology take into account the scientific world picture, thus offering a richer understanding of the nature, meaning, purpose, and destiny of this evolving world. And, in emphasizing the epistemic limits of scientific inquiry, NNT can suggest to scientists a wider framework of understanding for their world-picture. In both ways, it can be used to counter the fundamentalist claims of scientism and creationism.
- (b) *In careers*: NNT is an open-ended, world-affirming enterprise that encourages engagement across social and intellectual boundaries. It may therefore be significant for politicians involved in clashes of cultures and religions and for the clergy of major faith traditions in the task of preparing their laity for the challenges of multicultural society.
- (c) *In an academic setting*: By virtue of its interdisciplinary nature, NNT can raise awareness of epistemological criteria and the discipline-specific nature of rationality. As a metaphysically based, scientifically

aware theologically serious academic endeavor, NNT is well placed to promote interdisciplinary engagement and to highlight the crucial multi-perspective nature of the quest for truth. Here it stands in a mutually critical relationship with the liberal, empirical, naturalistic thinking that is common in much tertiary-level thinking.

- (d) *In society*: In its bridging role, NNT can assist theology in its participation in many of society’s debates about politics, law, economics, the media, education, medicine, and family life. “Where is high-quality, theologically informed attention being paid to such matters?” asks David Ford (1999:18), adding that such debate requires collaboration across disciplines, faith, communities, and nations. NNT seems well placed to participate in such discussion.

Sources of Authority

Macquarrie, J. (1977). *Principles of Christian theology*. London: SCM.

A much-used text that discusses the makeup of a new-style natural theology.

Polkinghorne, J. (2008). *Theology in the context of science*. London: SPCK.

Polkinghorne, J. (2000). *Faith, science & understanding*. London: SPCK.

Polkinghorne, J. (1998). *Belief in God in an age of science*. Newhaven: Yale University Press.

The first of these three shows the need for a science-style, bottom-up approach in framing theological discourse. The next brings scientific and theological expertise to the reappraisal of several key topics. The third advocates the broadening of natural theology to include the arts and treats epistemic issues in detail.

McGrath, A. (2008). *The open secret: A new vision for natural theology*. Oxford: Blackwell.

McGrath, A. (2009). *A fine-tuned universe: The quest for God in science and theology*. Louisville: Westminster John Knox Press.

Together with a comprehensive framework for a new Christian natural theology, drawing upon

Augustinian tradition (re the Fall etc.) and offering the vision of a world created to show forth the great qualities of truth, goodness, and beauty.

Root, H. (1962). *Beginning all over again*. In *Soundings*. Cambridge: Cambridge University Press.

A compelling argument for a natural theology that will help theologians to engage the mind and imagination of the poet or novelist or dramatist or film producer.

Monti, A. (2003). *A natural theology of the arts*. Aldershot: Ashgate.

A well-structured development of the notion that it is the “real presence” of God that underlies great works of art, using ideas from science and theology

Ward, K. (1982). *Rational theology & the creativity of god*. Oxford: Blackwell.

Ward, K. (2008). *The big questions in science & religion*. West Conshohocken: Templeton Foundation Press.

Ward, K. (2003). Natural theology. In *Encyclopedia of science & religion*. New York: Macmillan.

A combination of theological and scientific ideas marked by philosophical precision and expertise in comparative theology.

Ellis, G. (1993). *Before the beginning*. London: Bowerdean/Boyers.

A cosmologist's account of the universe as designed to give expression to the good.

Swinburne, R. (2004). *The existence of God* (2nd ed.). New York: Oxford University Press and a simplified version, (1996). *Is there a god?*. Oxford/New York: Oxford University Press.

A key contemporary philosophy-based account using logic and science to argue the likelihood that a god exists – one who would desire the existence of humankind and, controversially, even the costly soul making involved.

MacDonald, S. (1998). Natural theology. In *The Routledge encyclopedia of philosophy*. London: Routledge.

A lucid entry, centered on philosophical assessment and categorization.

Craig, W. L., & Moreland, J. P. (Eds.) (2009). *The Blackwell companion to natural theology*. Oxford: Blackwell.

In-depth arguments for the existence of God by a team of Christian philosophers, written largely from a theologically conservative perspective.

Ethical Principles

Commitment to the search for truth, however manifested; open-mindedness vis-à-vis the search for understanding in and through other faiths and traditions; humility about the nature and scope of human knowledge; and an inclusive approach in the task of formulating a grand narrative of the world's unfolding.

Key Values

Truth, goodness, and beauty, as manifested in (a) the creation, (b) human living and creativity, and (c) the work of NNT itself. The quality of *to kalon* (the good/beautiful/just right) (Kittel and Friedrich 1985:402–5) is a mark of fruitful theories in physics; it should surely be reflected in all disciplines, including NNT.

Conceptualization

Conceptualizing such terms involves a largely metaphysical mode of thought, that is, it is concerned primarily with matters of ontology, but also with epistemology and axiology – that is, with the multi-leveled nature of reality, with the nature and manner of human knowing, and with ultimate questions about values and meaning. NNT seeks to address concepts such as those listed above (in section “[Key Values](#)”) through the construction of an ordered and consistent picture of the world as a metaphysical framework of understanding concerning God, humanity, and the cosmos in relation to one another.

Nature/World

Within such a framework, NNT would locate nature (the physical universe) at the first level in a series of levels of reality (see section “[Reality](#)” below). Considering nature as a whole, we may note that human beings have emerged as part of a vast, multi-faceted evolutionary process that operates on cosmic, terrestrial, and biological scales. This evolutionary history has been punctuated by moments of emergent novelty, notably the transition from inanimate to animate entities and the first appearance of consciousness. These key stages were followed by the development of self-consciousness and, in due course, the entire range of human cognitive faculties. Altogether it is a process marked by a fine balance of contingency and necessity and seems superbly designed for life of great complexity. From a theological point of view, the underlying rationality of nature may be seen as a reflection of the rationality of its creator, and its meaning and purpose can be summed up in the phrase “world in the making,” the raw material for a new creation yet to be realized.

Human Being

NNT places the concept of human personhood within the widest possible context, seeing it as central in the forming of a credible account of reality – and as the main subject matter held in common by theology and science. NNT acknowledges and affirms the emergence of *Homo sapiens* within the processes of biological evolution while standing against the reductive idea of a human being as no more than a physical mechanism. Indeed, from this biological foundation, there has developed a human brain/mind complex of remarkable capacity for self-consciousness and a range of other cognitive faculties, including the ability to think abstractly and to project its thinking far into the future and into the past. These have led to the emergence of human culture in all its richness – the feature that most distinguishes human beings from the other hominids. The social context enables individual members to flourish through language and art, enhanced by the transmissible nature of culture

from generation to generation. On the theological side, NNT must take account of the higher elements of human personhood associated with the capacity to love sacrificially, respond to moral challenges, perceive meaning and beauty, and to believe and hope in God.

Life and Death

Again, NNT places life/death within the context of the entire evolutionary process, which cannot run its course without natural selection which, in turn, cannot take effect without limitation of life-span. In the case of human life and death, theologians who affirm NNT would reject the contrasting reason for death espoused in the Augustinian tradition of Christian thought, namely, that death is the consequence of a primordial sinful act. The creation theology associated with St. Irenaeus (who lived about two centuries before St. Augustine) is more in tune with the scientific picture and, in this respect, more congenial to NNT. It suggests that human nature, marked as it is by a sense of finitude and alienation, is simply at the early stage of a path toward fullness of being-in-relationship. And insofar as NNT develops within Trinitarian theology, it would look expectantly to an eschatological future that develops from the divine act of resurrection – that is, from the transformation of the entire creation.

Reality

Science and theology are often seen as complementary ways of seeking understanding of the world, involving mental models of reality. These disciplines are engaged in inferring reality from the way their models and theories make sense of great swathes of physical data on the one hand and great swathes of spiritual experience on the other – and, indeed, from the explanatory power displayed by such models and theories. And the very power of the human mind to think abstractly, in terms of models and theories, constitutes part of reality. This facility enables the mind to explore the notion of a hierarchy of levels of existence. George Ellis (2002:1–27) postulates the following set of

levels: (a) the physical world of energy and matter; (b) the contents of human minds; (c) the set of *possible* physical and biological forms (our world being a subset); (d) a platonic realm of abstract realities such as mathematical forms, physical laws, powerful symbols, etc.; (e) the set of values, meanings, and purposes underlying the created order; and (f) the fundamental metalevel of the being of God. These may all be considered to be aspects of reality insofar as they take effect in the realm of the physical.

Knowledge

It is widely held that there is a critical-realist relationship between the knower and that which is known – that the known is real, but the knowledge of it is less than perfect because of the finitude and limited perspective of the knower. Intellectual knowledge is acquired through a range of rational modes of knowing, varying from the mathematical in physics to the metaphorical in the humanities. The way of knowing depends on the nature of the subject matter, and all modes of knowing involve, in varying degrees, the interplay of perception, reason, emotion, intuition, and imagination. These cognitive faculties are engaged in the search to know the way things are, thereby contributing to a coherent understanding of the world. Such inquiry, with its formulation of models and theories, invariably requires acts of personal assessment, subject to aesthetic criteria such as simplicity, coherence, and explanatory power. This personal aspect, according to Michael Polanyi, involves the use of “tacit knowledge,” that is, background knowledge that resides in any scientific, cultural, or religious tradition and is learned through apprenticeship in the tradition (Monti 2003:17–22). It is knowledge that cannot be altogether explicitly expressed (“we know more than we can tell”) but is nonetheless relied upon in the exercise of the imagination as it focuses on and apprehends the sometimes surprising disclosure and intrinsic claim of the subject matter.

Truth

There are different kinds of truth – for example, the truth of a mathematical statement, the truth of

a news item, and the (existential) truth of a person’s commitment to a task or cause. These are different kinds, but they all reveal something of the way things really are. Hence the Greek word for truth, *aletheia*, which refers to that which is unveiled. It is widely accepted that the search for truth is what intellectual inquiry is about, despite postmodern skepticism about the validity of the very concept of truth. And it is generally understood that human knowledge is not absolute but rather, in varying degrees, provisional, approximate, corrigible, and incomplete. Nevertheless, scientists do lay claim to increasing verisimilitude (similarity to what is actually the case) between their theoretical models and the reality they describe, as is well exemplified in the growing understanding of the physical nature of light over the past three centuries. Theologians, too, see a progressive accumulation of insight into the nature and character of God as shown in the biblical account of the history of Israel – a development which, from the point of view of the Christian church, continues through the New Testament writings and far beyond. Both science and theology are concerned with epistemic integrity. This implies the need for rigorous assessment of their truth claims – in terms of internal coherence of a scientific theory or a theological doctrine and, especially in the case of theology, external coherence vis-à-vis knowledge from other disciplines.

Perception

Central to the development of human cognition is the determination to see and interpret patterns within the data received. The ever-present search to know and understand involves perceiving a pattern – and the human brain is superbly made for this task, whether in everyday quests for explanation or in response to the larger existential questions. It is a task that involves perception in collaboration with the exercise of reason, emotion, intuition, and creative imagination. The task of developing natural theology itself is a matter of perception in the first place – of beginning to see the possibilities of a reinvigorated NNT. Alister McGrath (2008:3)

describes the task as one of discernment, of viewing the world through the spectacles provided by Christian theology as a whole – to which we may add John V. Taylor's (1972:19) remark that the spirit of God enables us "not by making us supernaturally strong but by opening our eyes." Then, as the late English poet Kathleen Raine put it, we may see the beauty that is "the real aspect of things when seen aright (in the right way) and with the eyes of love" (Mayne 1995:139).

Time

The relationship between God and time is highly relevant to NNT and the science-and-religion discussion. It is conceived in two contrasting ways, as pictured from a God's-eye viewpoint. On the one hand, God is said to be outside time and therefore to hold an atemporal view of the creation, seeing it as a "block universe" in which all cosmic history is present to God "at once." On the other hand, from what is perhaps a more common NNT viewpoint, God is said to be all the greater if the being of God is characterized by *both* eternity and temporality – eternal with respect to consistency of character but temporal in experiencing the creation as it actually is in its openness to the future. Furthermore, if the natural world is a system of systems that is inherently indeterminate (not rigidly clockwork-like) in its unfolding – an admittedly contested idea concerning the exactness of description of material systems in terms of the equations of chaos theory – its future is genuinely open, that is, not calculable, even in principle, even by God. This would then open the way unambiguously to the costly gift of human free will from a graciously self-limiting creator.

Consciousness

This is the inward aspect of mind/brain operation, perhaps the most important development in cosmic history as the universe began to produce minds that could think about it. How the subjectively felt inward dimension of thinking relates to the objectively researched, outward dimension of neural process is, and will probably continue to be, largely unknown territory. The emergence of

Homo sapiens at least 160,000 years ago was marked by a substantial increase in powers of cognition, including self-awareness. Paleoanthropologist Stephen Mithen (1996) offers a tentative but compelling account of the prehistory of cognition in which the hominid brain/mind advances from a configuration of three separate modal intelligences (concerned respectively with social, technical, and natural-world intelligence) to a state of full "cognitive fluidity." This phrase implies not merely greater complexity but also flexibility and dynamic interaction between the different parts of the brain, making for greatly enhanced cognitive ability. With this finesse came high levels of creativity in toolmaking, social organization, and symbolic representation, leading ultimately to culture in all its richness.

Rationality/Reason

These are related concepts, but rationality is more than reason. First, that which constitutes the rationality of a particular body or item of thought does not reside simply in its logic structure, but in the pattern and meaning perceived through the interplay of reason, emotion, and intuition under the umbrella of creative imagination (as mentioned above in the subsection on "[Knowledge](#)"). Second, rationality in each discipline is constrained internally by the nature of the subject matter itself and externally by the need for coherence with the insights and knowledge of other disciplines. Third, it is a mistake to see faith and reason as antithetical. Faith merits the claim to be rational insofar as it is the response to an accumulation of well-tried interpretation of evidence – and, as such, it is the ground on which much of the enterprise of theology is built, as it pursues a dialogue between evidence and interpretation.

Mystery

This is related to the finitude and limited perspective of human thought. Human knowledge is partial and incomplete, leading us to speak of that which transcends it as "mystery." In everyday use, the term implies something hidden or

secret or, perhaps, yet to be revealed. At a deeper level, there exists the sense of wonder and mystery at the limits of our knowledge of the natural world. As physicist Victor Weisskopf (1979) remarked, “Our knowledge is an island in the infinite ocean of the unknown” – the unknown that includes the mystery of the meaning and destiny of the universe, given the prospect of its eventual heat death. But it is in theology that the concept of mystery is at its deepest level, especially in Christology with its attempt to understand the divine/human nature of Christ. In a letter to fellow pastors, Dietrich Bonhoeffer referred to this “holy mystery which is a concept that theology has the duty to guard.” He goes on to warn of the mistake of thinking that it is “the task of theology to unravel God’s mystery, to bring it down to the flat, ordinary human wisdom of experience and reason. It is the task of theology to preserve God’s wonder as wonder, to understand, to defend, to glorify God’s mystery as mystery.”

Relevant Themes

The significant contributions that NNT can make to the science-and-religion discourse may be summarized as follows: (a) affirming the widely ecumenical spirit of the discourse, (b) being open to new ideas and concern for philosophical precision, and (c) complementing these qualities with the theological insight of a well-winnowed religious tradition. If full weight is given to the latter, it can surely enrich science and religion in tertiary-level settings and contribute to serious study and debate in society at large, especially with respect to religious education in schools, interfaith engagement, and the issue of global warming. Alongside these contributions, there exists the task for which NNT is especially fitted: the forming of a non-totalizing vision of the world that enhances hope for the future, celebrates society in all its diversity and particularity, and offers a convincing theodicy, however limited, in the face of acute suffering and unjustness.

Cross-References

- [Epistemology](#)
- [Eschatology](#)
- [Evolution](#)
- [Imagination](#)
- [Systematic Theology](#)
- [Truth](#)
- [Worldview](#)

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Naturalism

- [Naturalism, Ontological and Methodological](#)

Naturalism, Ontological and Methodological

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Related Terms

[Method](#); [Natural](#); [Naturalism](#); [Nature](#); [Ontology](#)

Description

The notion of naturalism extends through multifarious fields of research and has given rise to a very broad, and emotionally loaded, debate over the last two decades. Contrary to most other philosophical notions, this particular notion is not only of concern to philosophers but is widely discussed and analyzed in almost every academic discipline. In recent years recent years, it has even reached outside the defined borders of the university and has provoked an intense debate in the general public. This debate is not limited to the philosophical definition of the notion but is teeming with personal, educational, and religious implications. One reason for the broad, and often vague, use of the notion of naturalism could be that even within the strict borders of academic philosophy, the notion has not enjoyed any unanimously accepted definition, nor is it particularly clear what being a naturalist actually means. This entry will deal with two general types of naturalism that go under the names ontological naturalism and methodological naturalism. There are other types and subtypes of naturalism (religious, scientific, epistemological, causal, etc.), but ontological and methodological naturalisms are, without doubt, the types of naturalism most debated in contemporary philosophy and, furthermore, those with most significant implications for the relation between science and religion. Despite the complex and vague nature of the notion of naturalism, it is nevertheless possible to begin with a minimal outline of what is

generally accepted as the basic premise that all who call themselves naturalists must subscribe to.

Traditionally, since the scientific revolution in the sixteenth century, naturalism characterizes a variety of philosophical positions that notwithstanding their many differences, all have one thing in common, namely, the exclusion of any form of supernatural entities or agents in the explanation of the spatiotemporal world. Contrary to earlier forms of naturalism, which were quite broad when it came to what was included as natural, contemporary naturalism has become more restrictive, although perhaps not more clear, about what counts as a natural process or entity and thus what can be readily dismissed as supernatural. The default position of any contemporary naturalist explanation is that everything (e.g., the universe, organic life, and human nature) can be satisfactorily explained exclusively in terms of processes and entities amenable to the methods and laws established by the natural sciences. If a given problem cannot be explained within this framework, only two answers remain viable: either the natural sciences will be able to explain the problem in the future (when the theoretical and technological development reaches a higher degree of maturity), or the problem simply falls outside the naturalistic framework and can thus be explained away as an inefficacious epiphenomenon or a subjective illusion. In order to understand the self-confidence of contemporary naturalism and the philosophical problems that the vagueness of its actual content and scope entails, a very short survey of the history of the notion over the last 50 years may be in place.

The question about human nature has always been in the foreground of discussions about naturalism. For millennia, philosophy (and until the nineteenth century, theology as well) has enjoyed a prerogative when it came to explaining and understanding human nature. This situation changed drastically in the second half of the twentieth century. The birth of ► [cognitive science](#) in the 1950s and the discovery of the structure of DNA in the same years elicited a strong faith in the ability of the natural sciences to unravel the cognitive capacities of the human mind. Both scientists and philosophers began to question the alleged superiority of

philosophy with regard to understanding human nature. If human ► [cognition](#) and behavior could be explained by certain genetic structures and the biological constitution of the brain, why then should the complexity of human nature be out of reach for the natural sciences? However, the most damaging attack on the legitimacy of an independent philosophical method came from inside philosophy itself in the form of the work of the American philosopher Willard van Orman Quine (1908–2000). Quine's critique of the analytic/synthetic distinction and traditional a priori truths together with his naturalization of epistemology severely undermined the idea of the superiority of philosophical analysis and strongly emphasized the continuity between philosophy and the empirical sciences (van Orman Quine 1951).

Since the 1950s, the natural sciences have continued to gain ground in the discussion of human nature, both in academic circles and in the larger public, and, since the 1980s, particularly ► [neuroscience](#) and ► [evolutionary psychology](#) have proposed new, scientifically based syntheses that seek to explain everything human, from cognition and social interaction to ethical norms and aesthetic values. This rapid development has had important bearings on the philosophical conception of naturalism. Today, many philosophers would claim that they are naturalists. However, the meaning of the notion naturalism has changed drastically. Whereas, in the first half of the twentieth century, naturalism referred to an inquiry that respected the nature of the physical world *and* the complexity of human nature (human reason, feeling, action, and existence), naturalism today is often understood as a position that seeks to explain human nature, and everything else, by means of the methods of the natural sciences or at least by types of investigations modeled on the kind of experimental research done in the natural sciences. This development and use of the notion of naturalism have produced an intense debate among philosophers about the scientific validity of the notion. The rest of this entry will present two generally accepted philosophical attempts to define the notion, namely, as (1) ontological naturalism and (2) methodological naturalism, and will indicate some of the problems involved in each of these

definitions. By way of conclusion, the entry will briefly consider some of the implications which the philosophical struggle with ontological and methodological naturalism has for the relation between science and religion.

Ontological Naturalism

This type of naturalism (also named metaphysical naturalism) postulates that the only genuine entities and processes in the world are those whose existence can be accounted for by acceptable scientific explanations. Nature is what we assess by means of scientific investigation, and natural things are those which can be explained by the natural sciences. For an investigation to qualify as scientific, it must respect, and produce its explanations in accordance with, the basic assumptions of ► [physics](#) and ► [biology](#). The natural world is basically physical and is governed by physical laws. Natural life is constituted of elements explained by physics and organized in accordance with the principles uncovered by biology. Although it is not generally required that biological mechanisms should be explained with direct reference to physical elements, particles, or waves, physics is still considered to express the ultimate structure of reality and is taken as the model according to which the other sciences, including biology, should be conceived and developed. The ontological primacy of physical entities (no matter what is or will be considered to be the ultimate constituent/factor of such entities) is the cornerstone of ontological naturalism.

Defined in this way, ontological naturalism comes close to, and is sometimes indistinct from, philosophical notions (or positions) such as ► [materialism](#) and ► [physicalism](#). But whereas all three conjoin in rejecting supernatural entities, there are important differences to be noticed among them. Materialism (Churchland 1984), which is the oldest of the three, asserts that everything which exists is material. This position, however, ran into serious difficulties with the explanatory success of modern physics in the beginning of the twentieth century. Contrary to Newtonian physics, modern ► [quantum](#)

mechanics argues that subatomic physical particles work in ways that do not admit of any previously conceived determination of their physical effect on a macrophysical level (cause and effect in the world as it appears to the unaided eye of the observer). Quantum mechanics introduces a principle of uncertainty in our understanding of the physical constitution of the world. It is therefore incorrect, according to some contemporary interpretations of quantum mechanics, to refer to the ultimate constituents of reality by material and spatial determinations in connection to what we experience in the spatiotemporal world. There exist several interpretations of quantum mechanics that vary drastically with respect to how quantum mechanics complicates traditional physical conceptions of ► **space**, ► **matter**, and ► **time**. But it is safe to say that most interpretations stress the undetermined nature of physical systems, that is, there is more to the physical universe than uncovered by traditional macrophysics. This element of uncertainty has induced many philosophers to adopt a position more in trend with modern physics, namely, physicalism. Physicalism (Melnyk 2003) posits that everything that exists is physical despite disagreement as to what ultimately constitutes physics. Physicalism is not identical with ontological naturalism, because whereas every physicalist must be committed to ontological naturalism, not all ontological naturalists are necessarily physicalists. An ontological naturalist may accept that the ultimate structure of reality is indeed physical without agreeing that physics is the only viable disclosure of reality. An ontological naturalist may hold a pluralist conception of science in which biological or chemical explanations of, for example, the circulatory system or sulfur are not reducible to physical explanations. Thus, materialism and physicalism are restrictive versions of the more general view of the nature of reality defined by ontological naturalism.

What is, then, the actual content of ontological naturalism? The concept does not imply much about the nature that it advocates and does so merely through the very general characterization mentioned above: only entities that can be

explained by acceptable scientific explanations exist. Although, contrary to physicalism, naturalism makes room for a pluralist conception of scientific explanation, it remains firm on the claim that only entities that can be empirically verified are considered to possess reality. Everything that lies beyond empirical assessment is not granted existence, or at least, the existence of such impalpable phenomena remains suspiciously problematic in the eyes of the ontological naturalist. The emphasis on empirical assessment hinges on the circumstance that all variations of ontological naturalism subscribe to the so-called doctrine of causal closure. This doctrine states that all physical effects can be accounted for and, in principle, explained by basic physical causes. Since apparently nonphysical entities (e.g., mental states, colors, aesthetic, and moral values) bring about a de facto physical change in the world (e.g., a person behaves in a specific way because of some moral values and not others), these entities must, in some way or another, be explained by physical causes. Hence, any mental, moral, or biological causes must themselves be physical. The causal closure doctrine does not admit of *sui generis*, spontaneous nonphysical causes in an entirely physical universe. Although the causal closure doctrine may seem a very strong and apparently clear definition of ontological naturalism, it is not immune to objections. On the contrary, several problems arise when ontological naturalism is defined in this way. What counts as physical and what not? How do we explain, in terms of basic physical causes, apparently nonphysical entities such as mental states and aesthetic values that actually bring about a physical effect in the world? Furthermore, it is problematic that the lack of substantive positive content is often overshadowed by the emphatic negative characteristic that it shares with both materialism and physicalism: the rejection of all versions, kinds, and shapes of supernaturalism. Supernatural entities are here understood as those which cannot be explained by means of acceptable scientific methods of verification. Since these entities cannot be assessed scientifically, they are not an acceptable part of what

ontological naturalism understands as nature, that is, they cannot be recognized as existing and are thus defined as supernatural (beyond, or above, nature). This leaves us with a definition of ontological naturalism that says, positively, very little about the content and scope of the notion, but has a very strong profile of what it is not. Obviously, such generic arguments for ontological naturalism have met with much criticism. This section will close with two considerable problems that are often brought up in this criticism.

The Nature of Supernatural Entities

As we have seen, much of what defines ontological naturalism is the emphatic rejection of supernaturalism. An ontological naturalist does not allow for the presence or influence of supernatural entities, phenomena, or forces in her or his conception of nature and of what is considered natural. But in this way, the definition of ontological naturalism depends on the definition of supernaturalism, and this might not be as simple as it appears to be at first glance. In philosophy, supernaturalism is often immediately identified with theism and Cartesian dualism. Both doctrines assert the existence of something outside the realm of material nature, that is, immaterial entities that somehow interact with the material world. It is, however, of no avail simply to identify supernatural entities with immaterial entities, since there are plenty of immaterial entities that are readily accepted in a naturalistic conception of nature, such as numbers, concepts, values, ideas, forces, and energy waves. On the other hand, if supernaturalism is only conceived as talk about gods, souls, angels, and miracles, the notion does not yield much help in defining the content of ontological naturalism, since most philosophers have already abandoned such entities and phenomena more than a century ago. Therefore, the use of supernaturalism as the counterpart to ontological naturalism does not elucidate or explain the content of the notion itself. On the contrary, the difficulty of explaining what supernaturalism actually amounts to points to another problem in the current definition of ontological naturalism, namely, the explanation of human experience.

Human Experience and Reductionism

Another difficult problem that haunts ontological naturalism is the nature of the human [► mind](#). Somehow, human consciousness has to fit into the picture of the natural world disclosed and explained by means of the natural sciences alone. This is not an easy thing to do. How do we account for impalpable mental phenomena, such as numbers, concepts, voluntary action, color perception, or values, on empirically experimental terms? An idea of a nice meal cannot be registered, or the intensity of a moral value measured, by any generally accepted scientific standards available today. Many naturalistic attempts to circumvent the problematic existence of such phenomena have been produced throughout the years (behaviorism, epiphenomenalism, emergentism, eliminative materialism, etc.), and new proposals continue to surface. One feature, however, characterizes most of them (with the exception of emergentism): they take a reductive stance toward mental phenomena (de Caro & Macarthur 2004). Mental phenomena do not exist, or at least, they do not possess the same kind of reality as physical phenomena and entities such as a tree or a mailbox. Physical entities have an ontological priority over mental states in the sense that the former can be assessed and explained scientifically while the understanding of the latter rests on subjective and introspective accounts. Thus, depending on the degree of reductionism, mental states are considered as an illusory subjective fiction, as insignificant by-products of physical mechanisms, or as a second-degree reality with some, although inessential, bearing on the first-degree physical reality. In order to explain the experiential reality of mental states, these states are reduced to the biological substrate that underlies and sustains the manifestation of human experience. Our [► mental states](#) are not as real and efficient as they seem, but are the product of the autonomous biological functions of our highly complex brain. The rapid development of neuroscience during the last two decades has fueled the self-confidence of such reductive approaches. According to some neuroscientists (Gazzaniga 2008), neuroscience will soon be able to show how the biological mechanism of the brain

controls our thoughts and behavior, and the myth of the subjective nature of human action and mind will finally be proven false. The problem about this thesis is, however, that no reductive account has ever come even close to explaining why or how mental states seem to play such an important role in human life and behavior, not to speak of justifying the claim that this role is an illusion. The assumption that mental states possess a lower degree of reality, or in even stronger terms, that they are a subjective illusion, results in a picture of the natural world that is so far from what we know about the world in which we live and act that it can hardly qualify as a legitimate scientific approach. Humans experience color and dream about golden mountains; they think about justice and the taste of butter on warm bread, and their actions are performed in accordance with impalpable values such as good and evil. Thus, as long as ontological naturalism cannot explain why or how this is actually the case, or better, how or why this should be considered an illusion, it is not, according to the critics, a valid argument simply to assert that such things do not exist.

Methodological Naturalism

This type of naturalism concerns the nature of philosophical practice rather than the ontological status of reality. In order to obtain scientific status, philosophical practice must respect and conform to the methodological standards of empirical scientific research. This naturalistic approach does not entail metaphysical or ontological claims about the nature of reality. Such questions are considered irrelevant to, and out of reach of, any specific scientific investigation. Science is normally characterized by local and well-documented areas of research, and therefore, science does not concern itself with general and abstruse questions such as the nature of values, the meaning of life, free will, or the efficacious status of mental states. Although scientific methods may be variegated, they are all committed to some basic assumptions. Among such are empirical assessment, observation, objective measurement and verification, independence of the subject and its values (here

it must be noted that most interpretations of quantum mechanics deny any such independence), explainable results, and stable environmental factors. Now, methodological naturalists view philosophy and science as pursuing the same aims and as engaged in cognate enterprises by means of the same methods. Even though some methodological naturalists allow for slight differences between science and philosophy, the main idea is that philosophy cannot diverge from scientific methodology without compromising its own credibility. Philosophy must be continuous with the empirical sciences in order to produce a legitimate contribution to the scientific understanding of reality. Otherwise, it remains an outdated curiosity with no relation to a contemporary worldview. One way to secure the scientific validity of philosophy is to naturalize epistemology. As mentioned above, the philosopher W. O. Quine made perhaps the most important contribution to this debate in the mid-twentieth century. He argued for the rejection of analytical truth, that is, propositions with self-evident and a priori meaning that does not require empirical verification, such as "all bachelors are unmarried" or "triangles have three sides." Using elaborate conceptual analyses, Quine argued that there is no such thing as analytical propositions. Every propositional truth must eventually be demonstrated empirically, that is, every claim or hypothesis must be verified by means of the empirical sciences. On this view, "old-fashioned" philosophical analysis, such as conceptual analysis and logical deduction, is not sufficient for establishing valid claims and arguments. Philosophy needs to accept, and to model its analyses upon, a scientific methodology with regard to every kind of inquiry, be that questions about the world, human knowledge, or ethical norms. The naturalized epistemology proposed by methodological naturalism entails a serious repositioning of philosophy and philosophical analysis. Traditional philosophers such as Plato, Aristotle, Spinoza, or Kant are considered of little value to contemporary scientific debate, since their methods and arguments rest on an outdated metaphysical vision of the world. Furthermore, contemporary philosophy is reduced to a mere tool for the clarification of concepts and arguments.

Positive claims about the nature of the human mind or the constitution of nature have to find their verification in the empirical sciences and not by means of philosophical analysis. Thus, the basic claim of methodological naturalism is that philosophical methods must be continuous, perhaps even identical, with the methods of the empirical sciences. This definition of philosophical practice has, of course, been heavily criticized by various philosophers. One of the most influential contemporary arguments in this criticism is the one directed against the idea of science as a unified and internally coherent whole (Dupré 2001).

The Unity of Science

The argument for methodological naturalism hinges on the idea of a general scientific methodology common to all the natural sciences. For a belief to be warranted, it must be verified by means of such a methodology. But is it possible to speak about one generally accepted scientific methodology? Can the multitude of different natural sciences be subsumed under one generally unified methodological approach? The critics of methodological naturalism believe not, and they claim that this unity of science is an unsubstantiated myth. In order to establish such a methodology, the empirical sciences must form an internally coherent whole with no essential tension or mutual contradiction. Such a unity of science seems to imply an ultimate point of reference for all empirical sciences, which is commonly found in physics. No scientific hypothesis must be in contradiction with currently accepted physical laws and mechanisms. This, however, is not the case with, to take an example, contemporary biology. There is no established physical correlation between different levels of biological explanation of living organisms. We cannot, for example, explain the development of an organism or determine its place and status in the natural world by investigating the molecular level of the individual genes that constitute that organism. The structure and function of the fully grown organism is determined by a complex interaction between several genes and heterogeneous environmental factors. In order to explain and classify different species, the

biologist must rely on methods that may be incompatible with or irreducible to the methods of physics, such as personal judgment, intuition, and subjective perception (e.g., of the colored pattern in the wings of a butterfly). The same goes for ► [anthropology](#) and empirical psychology. To understand and explain human behavior requires methods radically different from those involved in explaining the function of, for example, the bladder. The different empirical sciences provide alternative methodological approaches to nature, and, by virtue of their different methodologies, they contribute to the general growth of scientific knowledge. Thus, in the eye of the critics, if methodological naturalism presupposes a unified scientific methodology, it is based on an ideological unity that does not reflect the actual nature and progress of scientific knowledge.

The notion of naturalism, therefore, still remains an open question in contemporary philosophy. Ontological (metaphysical) and methodological naturalism dominate this debate and elicit an intense discussion about the nature, status, and even legitimacy of philosophy among the empirical sciences. Some, including both philosophers and empirical scientists, believe that legitimate philosophical work must perform its analyses on the ontological foundation (of the world and the human mind) disclosed by the natural sciences and, moreover, that it must conform to the methodology of those sciences. Others maintain that such an uncritical acceptance of the superior status of the empirical sciences impoverishes, and eventually damages, philosophical arguments and methodology. Furthermore, the use of philosophy becomes limited, and philosophical analyses are reduced to fortifying certain scientific claims about the world, human nature, and proper scientific research instead of questioning the validity of such claims. In this way, the question of ontological and methodological naturalism stands out as one of the most radical and difficult issues in contemporary philosophy.

However, the notion of naturalism also plays a central role in contemporary research on the relation between science and religion. This entry concludes with a brief survey of the notion of naturalism in this field of research.

Naturalism and Religion

As we have seen, questions about religion and supernatural entities and phenomena have not been part of the philosophical debate about the concept of naturalism since the close of the nineteenth century. Such questions were handed over to theologians and philosophers of religion, who did not, for the most part, aspire to partake in this debate. Naturalism and religion did not seem to have much in common, and their paths only seldom crossed. This situation has changed drastically in recent years. Atheists and religious believers have exchanged some heavy blows in the form of both academic and more popular publications, debates in various media, and serious educational discussion. In particular, matters such as evolutionism versus creationism, brain versus soul, and, more generally, scientific versus religious meaning have dominated the debate. But whereas many believe naturalism and religion to be antagonists, some, both from within religion and the natural sciences, attempt to argue for a more integrative view known as religious naturalism. Religious naturalism can be considered an independent type of naturalism. Despite the fact that many contemporary religious naturalists find precursors to their position in the history of both modern philosophy (e.g., Spinoza) and ancient philosophy (e.g., the Stoics and the Skeptics), the term did not play a well-defined role in the debate between religion and science until about 1990 (Stone 2008). There are several varieties of religious naturalism, but this outline of the notion limits itself to some overarching features shared by all these varieties. Religious naturalists accept the fundamental view of both ontological and methodological naturalism, namely, that there exists no supernatural realm distinct from nature as we know it through the empirical sciences. Nevertheless, they argue that religious beliefs, experiences, and attitudes are a legitimate part of physical nature. Religion can be explained as a natural phenomenon on a par with other natural phenomena without any reference to supernatural beings or forces. All efficient causes are natural causes that can be

explained within a naturalistic framework. Physical nature as we know it is abundant in meaning and purpose and can therefore yield a depth and a meaning analogous to traditional religious experiences such as sacredness, peace, and wonder (Goodenough 1998). Contrary to common prejudices, a religious worldview is not necessarily antagonistic to a scientific worldview. The two may be complementary. Whereas the natural sciences uncover and expand our knowledge about physical nature (the universe, Earth, living organisms, and our own biological constitution), religion opens up an explanatory path into our spiritual world (meaning, values, love, feeling, ideas, dreams, and ethical standards) without compromising the laws of the physical world. The divine is not something distinct from this world and governed by supernatural laws and force. Religious naturalism complements science in the sense that it considers the complex whole of nature and the results that the physical whole produce. Science may help religion understand the nature of the divine and the nature of religious experiences and beliefs. Furthermore, science alone does not exhaust the meaning of nature. Many religious naturalists argue for an emergentist account of physical reality, where ► [consciousness](#), experience, and meaning are considered as the effects of various physical mechanisms, but cannot be reduced to these mechanisms; in short, there are more to physical phenomena than merely the sum of their parts and forces (Clayton and Davies 2006). The aim of religious naturalism is, then, to explore, explain, and legitimate the meaning of religion and religious experience in accordance with the insights gained by the natural sciences.

Notwithstanding the effort to integrate science and religion, religious naturalism is often criticized of not being naturalism at all. Naturalistic-minded philosophers do not see the need for religion and religious explanations, no matter how naturalized, in order to explain meaning or ethics in human life. Ontological naturalism without religion is just as capable of providing a coherent account of human feelings, joy, sadness, and ethical behavior. To introduce the idea

of religion in naturalism is, on this critical account, just to confuse the concept of naturalism and to open a way for superstition and unscientific arguments. On the contrary, religion and faith are not a complement to scientific explanations of nature and human life but simply expressions of an old-fashioned approach to life that needs to be examined in terms of a strict ontological naturalism (Dennett 2006). In spite of this critique, religious naturalism is continuing to develop as an alternative, more integrative, approach to the question about religion and religious experience in a naturalistic worldview disclosed and explained by the methods of the empirical sciences. The philosophical problems inherent in ontological and methodological naturalism are central to the future development of religious naturalism. Questions about the relation between phenomenal experience and physiological nature of the brain and the nature of reality and concepts such as transcendence, immanence, natural, and supernatural rely on proper clarification of the ontological and methodological status of naturalism.

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Nature

- [Naturalism, Ontological and Methodological](#)

Near-Death Experiences

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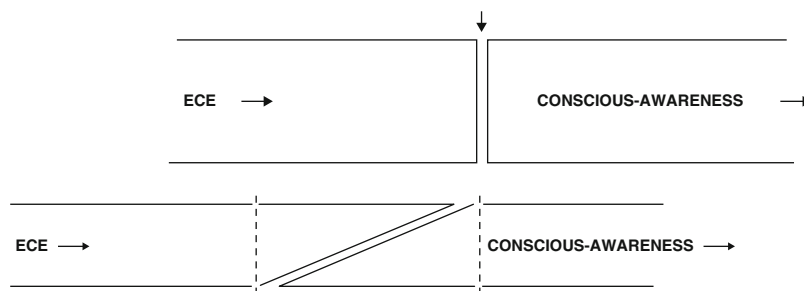
Description

Near-death experiences (NDE) and out-of-body experiences (OBE) describe a spectrum of subjective perceptions of an apparent dissociation between mind and body, usually resulting from extreme medical, death-threatening situations. They give rise to a “vision” of the self that is seemingly free of physical bounds.

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Thinking About Life Beyond Death

Life terminates in death, a realization setting humankind apart from animals. There can be no doubt that our bodies eventually decay and become dust. But the prospect of what lies beyond death is intriguing to many. Traditionally, an existence beyond the grave has been articulated by the three Abrahamic faiths. Additionally, “new age spirituality” has come to offer an inventory of practices from aromatherapy to Zen thereby offering enlightenment to person, soul, or spirit. Third, the phenomenology of extracorporeal experiences (ECE), a term encompassing NDE and OBE, has attained popular notoriety. Although some ECE follow bereavement, depression, or severe loneliness, the majority, as noted above, result from acute medical crises which substantially embarrass brain function.



Near-Death Experiences, Fig. 1 For many subjects (*upper* schematic diagram) their extracorporeal experiences (ECE) terminate abruptly as full conscious awareness (*descending arrow*) resumes. For others, ECE rapidly taper, now being invaded by environmental percepts

(needle-prick or face-mask applied within hospital setting, etc.). However, as conscious awareness is quickly resumed, these latter intrusions are memorized and available for recall (lower diagram, area between vertical dotted lines)

This excerpt is typical:

I closed my eyes [and] never saw what happened when the car left the road... [it] seemed like eternity. Then... I was detached from my body... I was seeing my life flash before me... [then] a tunnel and a light glowing invitingly... I was encouraged to enter it. I was peaceful... I knew the answer to every mystery. Then... sudden confusion. I had to go back... I was upset, scared, thought of my family... earthly life. I was travelling... I regained my body... and felt tremendous pain. I believe I died: there is life after death... a truly wonderful "Heaven."

Many people therefore conclude that ECE phenomenology is confirmatory of another world, even "Heaven," as this victim herself believed. However, the particular word usage should not be overlooked: *near* death, not *actual* death. This entry examines the probity of several published ECE reports and asks whether these recollections truly demonstrate the existence of a veridical world beyond the known universe or whether they merely reflect aberrant brain functioning.

Logical and Empirical Analyses of ECE

The overriding difficulty about ECE is their personal subjectivity and thus how to get a firm handle on them. In a recent book (Marsh 2010), a reading of >700 transcripts offered a meta-analysis of canonical sources to

emphasize one crucially important insight – ECE terminates as conscious awareness returns (Fig. 1):

[I was]... in a crypt... waiting for my parents... Suddenly it was all gone – it ended abruptly... I felt tremendous pain and made a decision...

Or: The thing I remember most is a falling... I was coming down real fast and then hit... I woke up with a jolt.

These two "returns" occupied the moments immediately before resumption of conscious awareness. Neither person actually returned to corporeality, but their brains did regain full conscious awareness: that is the difference. As Kenneth Ring pertinently observed, "*Once the individual has returned, painfully or otherwise to his body, the... experience is over.*" He also queried: "*.... how exactly does one accomplish this return?*" – that is, reunite with body. But the question is what *needs* reuniting to body. Maybe nothing – only reawakening of the brain to full conscious awareness, a realization immediately dispelling one persisting mystery.

Secondly, having nailed how ECE terminates, duration is assessed by word counting, a technique employed by dream researchers in roughly assessing dream length. Counts for ECE reveal a duration lasting minutes – or even seconds – before conscious awareness is reestablished.

Thirdly, since it has been inferred that ECE occur rapidly as brains reawaken, the occurrence

of *memory* becomes explicable. Dead or dying brains cannot establish memories. If ECE occurred with moribund brains, as widely alleged, there could be no memories to permit recall. In sleep, memory is inhibited (hence the difficulty in dream recall) except for those intensely short, vivid dreams that occur on waking, so-called hypnopompic dream-awakenings which, phenomenologically, are virtually identical to ECE.

Fourthly, the conclusion inevitably arises that ECE are not vague journeys to an “ill-defined” somewhere, consequent upon mind, soul, or consciousness escaping a moribund or even dead brain, as asserted by writers critically reviewed (Marsh 2010). A strong claim that ECE reflect *brains recovering* from antecedent metabolic insult is therefore possible, manifested by subjects regaining full conscious awareness with memory for the event. Metabolic insult refers to common clinical emergencies (80%) such as cardiac arrest or severe hemorrhage, resulting in a prolonged period of very low-blood pressure impairing brain function.

Supporting Empirical Data

The logical progression outlined above asserts that ECE are transient events originating during those last frenzied moments of insult, when brains begin working properly, and subjects become fully conscious. There are firm, supportive empirical data which corroborate the foregoing assertions.

First, evidence comes from suicide survivors from the Golden Gate Bridge, San Francisco – an event lasting ~10 s. The (tidal) height to the walkway varies 250–260 ft, and for subjects of average weight, the fall takes ~4 s, the terminal velocity on entry being ~75 mph, survival depending on a head- or feet-first approach. Twenty subjects have been unsuccessful (of ~1,200 jumpers) since the Bridge opened in 1937 (Seiden 1968). Some could not remember entering the water, suggesting they were unconscious from impact: obviously they had to recover consciousness quickly to avoid drowning or freezing to death from cold immersion.

Second, from studies of military pilots losing consciousness during training sorties. Under laboratory conditions (Forster and Winnery 1988), they are centrifuged to unconsciousness while being heavily monitored. When subjects lose consciousness, centrifugation is stopped: recovery to full conscious awareness takes ~30–40 s.

Third, from laboratory-controlled observations on subjects deliberately making themselves unconscious – known medically as the “fainting lark” (Lempert et al. 1994). Again the follow-up period is relatively short, ~30 s.

What is so revealing is that during the recovery phase from each category of assault, subjects underwent transcendent episodes involving beautiful, vividly colored surroundings, saw deceased relatives, were deliriously happy, and enjoyed such highly emotive feelings that they were reluctant to “return to earth.”

These data present a series of varied reawakenings, but *from a preceding state of subconscious awareness* and over *measured time frames* (maximally 40 s), during which the phenomenology experienced hardly differs from ECE. When later interviewed, suicide subjects recounted evocative episodes of being in the light and at peace. The military investigators remarked that “*within such a very short period*,” pilots’ brains conjured up and remembered beautiful panoramic scenes. Clearly, mnemonic function returns very quickly as subjects’ brains recover from unconsciousness, despite post-centrifugation confusion.

Therefore, it can be concluded that the brain is extremely capable of manufacturing illusory states of a supposedly other-worldly realm, generated and acutely *remembered, recalled* over a very *short* measured time-frame, and arising from preceding states of reduced or absent conscious awareness. The phenomenology undergone is virtually identical and all of a piece with ECE. Four additional items need to be considered:

First, similar phenomenology is experienced while falling asleep, so-called hypnagogic hallucinations.

Second, the awakenings described are not associated with the fear of dying (and in the case of

suicidal persons, death presumably is the aim) unlike those undergoing cardiac arrest, during which one's innermost thoughts and fears of dying may be recalled from preexisting memory stores, hence coloring the phenomenology experienced.

Third, the reawakenings (above) are physiological, whereas the reawakenings from ECE would most certainly be abnormal, since the brain is recovering from a prolonged period of low (or even temporarily absent) blood pressure and perfusion. Moreover, given that most ECE follow a cardiac arrest, many subjects with advanced age would be suffering from well-established arterial atheroma. The bizarreness of ECE reportage could substantially reflect the fact that some brain areas or centers are beginning to function in the temporary absence of other controlling neural mechanisms and influences and subject to a reduced blood flow due to cerebrovascular disease.

The emerging conclusions are rational, logical, and supported by firm, empirical evidence, thereby avoiding fanciful, even desperate, speculative wonderings – if not wanderings.

Fourth, it is necessary to note that all retrospective reportage is loaded and bedeviled by erroneous perceptions and claims, often “manufactured” or “filled in” by the brain, and aligned to what sounds intelligible. This point is extremely valid, given that some subjects were reporting on occurrences several years or even decades previously.

Interrogating the Semantic Content and Quality of ECE Narrative

The empirical/logical analysis of ECE reportings, as outlined above, upholds their certain neurophysiological basis. However, other interrogational approaches can be employed critically to evaluate the type of language used and scenarios described, thus to determine whether the afterworld, eternity, or heaven had, in fact, been sampled during ECE. The semantic content of ECE reportage has never before been employed in this

manner: the following published excerpts are fairly typical.

First, a subject met his deceased father “...*dressed just like he used to be in grey trousers and a cardigan. He hadn't changed a bit. We chatted quite naturally and he joked. ...*”

The next subject explained, “*I found myself in front of a nice prefabricated building – the front door was open and mother was visible inside.*” Continuing, she notes that having brought some nice dress-making material, her mother put it on the table and prepared to cut it with scissors. The horrified daughter realized that her mother lacked dress-making skills. But her mother replied that since arriving, she was now being *taught* to be a seamstress. Then having been refused entry to the house, the daughter dejectedly returns home [presumably to earth].

A third woman agonized, “*I'm not staying here – [my husband] can't cope and I've left a pile of shirts to be ironed and he doesn't know how to do them.*”

This kind of material meant could hardly be regarded as serious, or to portray sensibly the supposed life beyond the earthly domain – wherever located. The matter recollected is geocentered, intensely anthropomorphic, and just plainly banal and as silly as dream contents. Second, it might be asked whether mind-dualists could accept these examples to uphold their claims that mind or consciousness can exist, presumably in a world of *sensible activity*, away from their underlying cerebral substrate. Third, similar sentiments apply to given descriptions of Jesus. Given His many appearances to several subjects at different times, we should expect to have accumulated a very accurate, uniform account of his appearance. However, descriptions vary and certainly do not reflect His true resurrectional majesty.

Here are typical reports,

I can see that form now – it had blond-gold hair ...and a beard – very light and a moustache [and] a white garment on – there was a red spot here [points to Sacred Heart on gown] – and a chalice in his hand.

And, “*He was tall – had a white robe on – his face was beautiful – his skin was glowing and absolutely flawless.*”

Again, “*She [mother] had a long sparkling gown on [as] did Christ – he had long hair – long beard.*”

Or, “*...there was Christ with a very white robe – he had jet black hair – very short black beard – teeth extremely white – eyes blue, very blue.*”

There is no necessity for informed literary criticism to detect the very boringly, this-worldly detail portrayed: in fact, just more dreamlike bizarreness and banality. In other words, nothing new has been revealed, only data acquired from previous earthbound experience – pictures remembered from Sunday school, childhood books, Hollywood, the media, fine art, and so on. Unfortunately, there is nothing novel, transcendent, heavenly – not even revelatory! – about these descriptions which seem to be utterly meaningless and valueless. Yet, these are the kind of descriptions which the canonical authors of ECE excitedly portray, even enthuse over and are seemingly taken in by. Moreover, it is very unlikely that this kind of material would convince an indifferent, skeptical public of the slightest possibility of an existence beyond known physical parameters.

Four additional points demand detailed, critical evaluation:

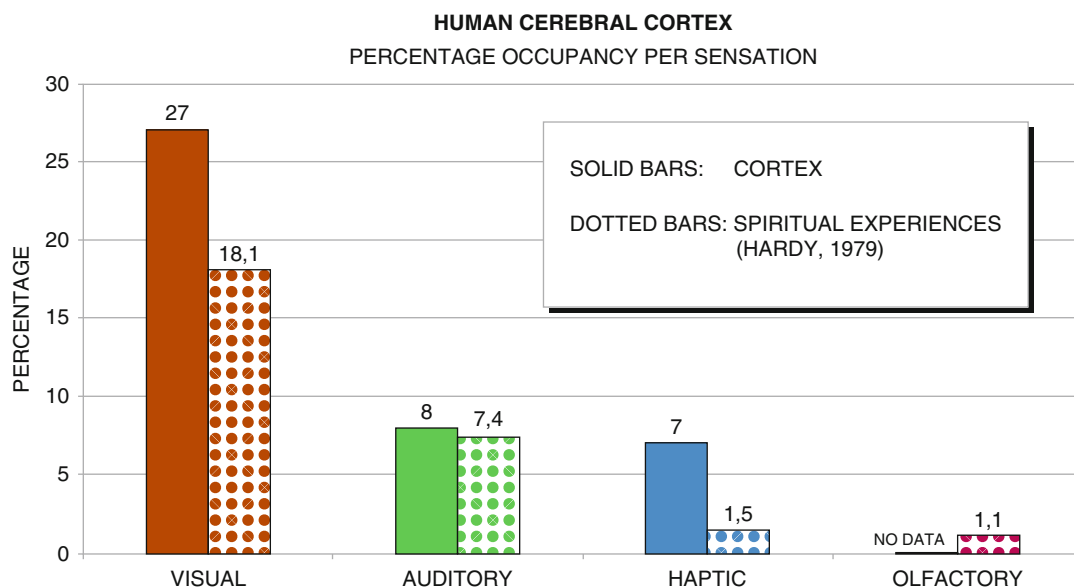
First: ECE accounts are nonidentical, nonuniform, and hence personally idiosyncratic. Such widespread idiosyncrasy is reflected in the canonical writings of several authors (see Marsh 2010) concerning the perception of the so-called “[L]ight”: 16% (Ring); 39% (Grey); 28% (Sabom); 43% (Greyson); 56% (Lindley); and 72% (Fenwick & Fenwick). Those vast differences are a little more widely distributed than one standard deviation – or two. Perhaps it should also be asked – maybe a little hesitantly – why the “other-world” is so *obstinately unequal* to those who apparently sample it. Were ECE to have anything to do with biblical outcomes, especially pertinent to the Kingdom of God, one might possibly expect everyone there to be equal: that is clearly not the case.

Second: ECE accounts are culturally determined – historically and geographically. Drychthelm’s journey recorded by the Venerable Bede in

Medieval England, ~800 CE, recalls Hell’s prescribed frozen wastes and sulfurous burnings as punishments for errant souls, while Heaven, just down the road (yes! literally within walking distance) boasts pleasant music, beautiful flowers, wonderful perfumes, and lovely people clothed in white garments enjoying a thoroughly well-organized events program. For modern Polynesians, Heaven comprises boats, cars, and other such commodities (Counts 1983). Those historic and geographic portrayals contrast sharply with the anodyne, soft loci of beautiful vistas, lovely flowers, and scented environments apparently sampled by modern Americans and British. Surely, such culturally determined reports must reflect on processes directly emanating from the brain since, as noted above, ECE arise most likely from injured brains during their return to full conscious awareness.

In parenthesis, we could profitably detour to consider some of the late Professor Alister Hardy’s data relating to his pursuit of a biological account of God. Hardy, who had been professor of Zoology at Oxford, saw religious experiences as ancient, even evolutionary, traits, and sources of great transcendental discovery and outreach, received and evoked through word, music, or painting – even science. Hardy anticipated moves from their purely observational reportings toward a scientific underwriting of these experiential typologies. As Evolutionary Theory had grown from the observations of Wallace and Darwin and Molecular Genetics from Mendel’s monastic peas so likewise, a “biology of God” could ultimately be realized, based on reported religious behavior and experiences – however ineffable. Hardy also recognized that a brain is necessary.

In “*The Spiritual Nature of Man*,” Hardy’s analysis of ~3,000 submitted accounts of alleged divine encounters (Hardy 1979) is extremely intriguing (see his Table II, p. 146) since it is unclear (a) why females predominate ~2:1 and (b) why their experiences peak a decade earlier than men, indicating a bimodal distribution. Furthermore, if the percentages for Hardy’s sensory-based “divine” experiences (visual, auditory, or tactile) are plotted graphically, they correspond



Near-Death Experiences, Fig. 2 The solid bars (*left hand*) represent percentage occupancies within the human cerebral cortex for the afferent functions subserving vision, hearing, touch (haptic), and smell (olfactory). The dotted bars (*right hand*) depict the

percentages from Hardy's book (1979, p. 26) of the frequencies of sensory perceptions experienced by 3,000 subjects as religious. These latter experiential data closely resemble the physiology of the normal brain

exactly to the percentage anatomical distribution of those sensory modalities within the cerebral cortex (Fig. 2).

In other words, for this large number of subjects, their experiential sensory perceptions of the divine exactly matched their physiological distribution across the brain. If these "spiritual" experiences were asserted to be completely external to, or even independent of brain physiology – that is, originating from outside, some difference might have been expected. It seemingly follows that the afferent sensory characteristics of "spiritual" life are similar, if not identical, to earthly experiences. On the other hand, the striking correspondence of Hardy's data to the anatomical cortical features of the brain suggests, perhaps, that for these cases, ECE do arise directly from the brain as the more likely explanation. It is a pity that such detailed data as presented by Hardy are entirely lacking in more recent canonical accounts of other-worldly phenomenology.

Third: it is clear that two or more experiences undergone by the same person are rarely identical. That is another grave problem confronting

those "experts" who assert that ECE are truly other-worldly events. This exemplifies another inconsistency in reporting, as with the variable descriptions of "Heaven" and of "Jesus."

Fourth: it is important to be aware of concurrent reception of *other-worldly* fantasy and *this-worldly* action – such as the sound of voices around the bedside, a painful injection, or the suffocating sensation of an oxygen mask applied to nose and mouth (Fig. 1). It is unlikely that a "dead" person inhabiting a so-called other realm (as others continue to assert) could simultaneously experience the commerce of this-worldly action. This dual type of conscious experience is not, of course, exclusive to *waking* ECE subjects: it occurs in lucid dreaming, auras with temporal lobe epilepsy, and drug taking.

The Out-of-Body Component

Much ECE phenomenology involves apparent motion: flying, ascending, floating, spinning,

and falling or bumping back into one's body: dreams likewise. This is referable to the "vestibular system," a complex brain organization creating a virtual image within conscious awareness of body shape (egocentric) and of its relationship to the immediate environment (paracentric space). This virtual image of the external environment is created through the amalgamation of multiple sensory inputs to the posterior parietal lobule (parietal lobe of brain). The common illusion of floating beneath the ceiling represents misperceptions of body position and a false projection of conscious awareness (Blanke and Mohr 2005). These misperceptions are short range within paracentric space and never extend to the horizon. Neurophysiological investigation has demonstrated the origins of OBE, experiences of a "tunnel," and of spiraling forwards or upwards into a light. Yet the tunnel illusion is shrouded in mystical overtones! However, for one meta-analysis (Drab 1981), only 10 % OBE reports referred to a tunnel caused in these cases by severe cardiopulmonary collapse. Tunnels are by no means a common accompaniment of OBE and hence certainly not to be regarded as possessing or implying some extraordinary "other-worldly" portent. It is especially noteworthy that as "laboratory fainters" regained conscious awareness, 8 % experienced tunnels and 16 % underwent OBE.

Subjects sometimes have reported on things or events impossible to have been witnessed from their resuscitative viewpoint, thus encouraging associations of OBE with "mystical" or "telepathic" qualities. Unfortunately, all such accounts lack hard and critical empirical data obtained and recorded through independent third-party surveillance *during the time of the resuscitation itself*. As far as is known, no writer has compared levels of increasing conscious awareness as measured, for example, with a BIS or equivalent machine (as sometimes used by anesthetists to gauge levels of surgical anesthesia), with the events later narrated by the subject and extrapolated backwards from the moment when full conscious awareness reemerged.

Testimony from OBE subjects is often patently false, as with Pam Reynolds. Reynolds

published worldwide her now famous account of being out of her body – through which she gained tremendous notoriety. Her account should be a "gold mine" for consciousness dualists. We know two facts: that she was anesthetized for more than 6 h (from her surgical notes) and her verbatim account totals ~725 words (as given 25 years later to Dr. Sabom: verbatim account reproduced in Marsh 2010).

The OBE (325 words) occurred while her head was being opened and although she declared that she was apparently "*sitting on the neurosurgeon's shoulders with heightened visual acuity*," Reynolds was absolutely wrong in her failure to notice that (a) her head was turned to her left and held there by strong mechanical brace, (b) it had not been completely shaved, (c) although viewing the operation from the surgeon's shoulders, she was unable to state *where* the bone saw was used although she heard it whirring, and (d) the use of the bone saw and femoral vein cannulation were concurrent: she alleged they were consecutive. Clearly, she was not out of her body on that fateful morning! Neither did the neurosurgeon report that an odd pair of female legs was dangling over his chest as he performed the craniotomy.

During her NDE (300 words), she was apparently fed "*sparkly stuff*" by her relatives: later, following her grandmother's refusal to take her back into the tunnel, she jumped into a swimming pool with her uncle – at the same time painfully reoccupying her body which felt like ice-cold water! But most curiously, as a result of that immersion, she was not dripping wet on immediately regaining consciousness in her bed, an occasion not apparently noticed by others – so far.

Most critically, we must demand where her mind/consciousness actually were during the 6+ h period of anesthetic unconsciousness and why she could not account for their activities while they were absent from her body, given that the sparse 725-word report offered contained remembered cerebral events which could not have lasted more than 5 min in real time. Moreover, the events comprising her extracorporeal experiences were wrong, unlikely, or even distinctly improbable. Surely a mind or

consciousness freed from physical (cerebral) constraints should be able to do better than that! So the critical question arises: what was her brain doing when it was supposedly outside her body for that long, blank period lasting approximately 6 h or more?

Unfortunately, it seems that Reynold's case provides neither exemplary proof for mind-dualists nor for "other-world" fantasists.

In another telling example, a young girl "imagined" going through a "momentary" period of external heart massage. In reality, her chest had to be opened to allow internal cardiac massage by a thoracic surgeon, a process requiring "several hours" to secure her life.

Again, no subject has ever successfully reported on marked cards placed near the ceiling of resuscitation units or lights or cupboards. Unfortunately, these attempts by hopeful investigators have failed dismally. It could be that subjects never were out of their bodies and therefore did not have the least chance of floating upwards to sample the experimental goods placed for them in high places. That is better explanation than Fenwick's rather weak response that subjects were far more intrigued by the complexities of their own resuscitations than to bother looking at specifically placed objects. Clearly, until we have some decent, properly collected data, contentious issues of this kind will always sadly persist to cloud and frustrate authentic understandings.

Nevertheless, the neurological basis of OBE occurring with NDE or other various non-death-related circumstances seems not to be in doubt: at least, that is one outcome to be sure of.

The Spiritual Contours of NDE Phenomenology

Beyond the rapid and vivid reawakenings to conscious awareness, the banal semantic content of the reportings given, and vestibular-generated motor accompaniments (OBE), ECE can be evaluated from the spiritual perspective. Classical

spiritual encounters have been articulated classically by William James and more recently by the American philosopher, William P Alston (Alston 1993), as follows:

One day when I was at prayer... I saw... or was conscious of... Christ at my side... I saw nothing with my eyes (S Teresa of Avila).

Or, "God surrounds me like the physical atmosphere. He is closer to me than my own breath. In him, literally, I live, move, and have my being."

And from S Richard of Victor

God sheds his sweetness... not his brightness... his beauty is not seen. He is surrounded by darkness... he does not appear in the light... [but] in the fire... the fire warms rather than illumines.

These quiet, almost evasive introspective reflections of divine encounter contrast markedly with typical ECE reportage which is considerably cruder:

I could see my mother and Christ saying, "Come home" and waving their hands at me. She [wore] a long sparkling silver gown and so did Christ – long hair, long beard – they were both smiling.

Or, "I heard his voice say 'Go back!.' I said 'Why me, Lord?' and whoever spoke said my work on earth wasn't over yet... all I heard was his voice: it was loud, thundering, just like a clap of thunder coming out of nowhere" [sic].

And, "I [was] in some type of building... pervaded by this beautiful light. Many people about me were milling about. I saw my parents... 'We've been waiting for you' – it was telepathic communication. I arrived at a place... I can only describe it as heaven... I felt enlightened and cleansed. In heaven, there is light, peace, music, beauty, and joyful activity, but above all, love."

These intensely anthropomorphic, geocentered reports recall Dr. Raymond Moody who so pertinently (but unwittingly) encapsulated the stark gulf between ECE experiences and classical accounts of divine disclosure: "Again and again, my ECE subjects have described to me a panoramic, wrap-around, full-colour, three-dimensional vision of the events of their lives..."

That last quotation sums up the position very well. Given such "spiritual" properties of ECE reports, one could hardly credit them with any serious divine import or revelatory content.

Overview and Revisionary Approach to NDE Phenomenology

This account of ECE is probably unique, markedly unlike the usual material served up for readers on this subject, and thus unexpected. Yet, given the approaches used – empirical, logical, semantic, neurophysiological, and theological, it is possible to conclude that ECE are manifestations of bizarre cerebration by brains emerging from fairly severe metabolic insults while regaining functional conscious awareness.

On those grounds, one could reject the views widely expressed by many authors and seemingly believed by their readership, specifically regarding the concept of “core” and “depth” ECE. ECE are quintessentially idiosyncratic brain-derived phenomena, reflective of individuals within their historic, geographic, or cultural settings:

1. There is no core or “*thanato-mimetic sequence*.” That is, no expected, invariant, consecutive experiential blueprint. Neither is there a death. Each ECE firmly emphasizes its intrinsic personal nature.
2. “Depth” is a mistaken confusion about ECE duration. The presumed length of an experience implies nothing about “depth” or “mystical significance” but simply reflects how many phenomenological bits and pieces constructed anew or sampled from its memory vaults are elaborated by each brain as it rapidly returns to normal working. From these new and original insights, an entirely new classification comprising **early-phase** and **late-phase** components (Table 1) can be envisaged:

The early phase largely involves vestibular components of floating, accelerating, traversing solid objects, or spiraling through a dark “tunnel” into “light,” indicating return of full visual cortical competence and ultimately of full conscious awareness.

The late phase comprises a sharp reluctance to cross any further solid barriers: thus, subjects signally refuse to journey beyond silly little obstructions (which they had no difficult traversing during the early outward phase) – bridges,

meadows, or garden fences. More importantly, there is a firm compelling moral compulsion to return to earthly duties and responsibilities, suggesting a final, “top-down” influence from the now recovering or functionally reconnected prefrontal cerebral cortex. Bumping back into the body sees the subject regaining a full sense of gravity (feeling very heavy and no longer weightless), somaesthesia (bodily pain, especially if the ECE results from accidental injury), and the reestablishment of full conscious awareness.

There can hardly be any surprise that ECE have never been the vehicles of revelatory insights into the other-worldly heavenly abode, what Jesus looks like, or as mirrors to the classical utterances of divine disclosure. It is clear that our ignorance about the contours of this supposed other-world continues, while the propositions offered herein are open to further neurological investigation.

The most intriguing aspect of ECE phenomenology is why so few subjects have them (~15 %). Furthermore, it is only this group, compared with many others who clinically come very near to death, who are changed in later life once having undergone ECE. It is hardly good enough to suggest that these people are touched by divine grace – albeit post-ECE subjects view life differently and enjoy greater rapport and loving relationships with members of their own families or other people. The markedly changed psychological profile of subjects emphasizes the need for the full clinical, neurological, and psychological assessments of all subjects likely to undergo ECE to be undertaken *before*, as well as *after* the event, so to permit valid, meaningful, and comparative (post-ECE) behavioral profiles. That is the proper meaning of a prospective study of ECE phenomenology: the results of such a desirable, critically controlled experiment are still expectantly awaited.

The relevance of that requirement follows from the possibility that susceptibility to ECE may relate to subclinical temporal lobe damage. For example, 1,096 young adults surveyed claimed to have experienced episodes consistent with underlying temporal lobe malfunction, due

Near-Death Experiences, Table 1 This table shows that NDE/OBE is more properly envisaged to comprise early-phase, and late-phase, phenomena. Precise classification is, of course, obscured by the marked idiosyncratic and unrepeatable nature of each experience. Listed are those prominent features of the early and later phases of ECE, thereby revealing that the so-called “core” and “depth” criteria employed by others are meaningless and inappropriate

Near-death and out-of-body experiences	
Early phase	Late phase
No pain	Feeling (injury-related) pain
Ability to traverse solid objects – walls, ceilings	Inability/unwillingness to cross physical barriers
Absence of gravity – “floating,” “weightlessness”	Bumpy return to body – sense of heaviness (gravity)
Sense of motion – acceleration, rotation	Reinhabiting a motionless body
Seeing a “light” and people	Hearing real voices or sensing contingent worldly events
No “moral” qualms when leaving family of friends behind	“Moral” urgency to return and resume earthly duties

to childhood head trauma and febrile illnesses and so on. Second, in another study, such episodes were controlled by the antiepileptic drug carbamazepine. Third, and more importantly still, in a smaller comparative study of control and ECE subjects, the latter revealed evidence on EEG traces, and through appropriate questionnaires, of subclinical temporal lobe damage (Britton and Bootzin 2004). Subclinical temporal lobe auras may possibly predispose a small number of subjects to the possibility of an ECE when undergoing stressful events later in life.

In order to advance this field, it is suggested that precise, incisive neurophysiological or neuropathological questions should be raised and dealt with empirically and prospectively, as with all good science. This entry has outlined some necessary procedures required, including the very vital assessments of likely subjects, *before* the ECE occurs. If, however, such questions cannot ultimately be answered through quantifiable, neuroscientific approaches as suggested herein, then indeed, there may be grounds for considering ECE to be one type of evidential demonstration of existence beyond the known universe.

There could, however, be validly held doubts about such eventuality.

Cross-References

- [Anthropomorphism](#)
- [Body](#)
- [Death](#)

- [Dualism](#)
- [Neurophysiology](#)
- [Neurotheology](#)
- [Philosophy of Mind](#)
- [Religious Experiences](#)
- [Soul](#)

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Negative Theology

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Description

The basic idea of negative theology is that of God, we can know and say only what “he” is not. Since God is metaphysically anterior to the world of intelligible beings, no predicate deployed within human language is capable of circumscribing him within the limits of signification. In the discourses of negative theology, everything that is said about *theos* is said under erasure and as cancelling itself out, since God is understood to be unnameable, unsayable, and indeed inconceivable.

The philosophical motivations for negative theology derive first from classical antiquity (especially in Plato’s *Parmenides*) and subsequently from the late antique developments of Neoplatonism in the writings of Plotinus, Porphyry, Iamblichus, and Proclus (Carabine 1995). These Greek writers sought foremost to elucidate how the first cause of Being remains ultimately inscrutable to finite human intelligence, and they demonstrated the incomprehensibility of the One beyond Being through logical means. Developing alongside these philosophical trends were, first, the Jewish belief in an absolutely transcendent deity (YHWH), emblemized in Moses’ encounter with God atop Mt. Sinai (Exodus 3:13–16) in clouded darkness, and, second, in the early Christian conceptions of Christ (Logos) serving as the revelatory word/icon of the hidden God (cf. John 6:46). Negative theology is a mode of human speech for signaling the elusiveness of God, where “God” can function differently in the various trajectories of ancient philosophy, Judaism, Christianity, and Islam.

Negative theology has been engaged by a number of thinkers in several traditions, but after the ascendancy of Jewish, Christian, and

Islamic culture in the Middle Ages, these three respective approaches have each engendered their own specific treatments of the ineffable God. It should be noted that if negative theology represents primarily the path of delineating what God *is not*, then differing identities of God (YHWH, Allah, the Trinity) receive correspondingly different manners of negation. Each tradition has manifested its own systematic outline of negative theology through the medieval, modern, and postmodern eras. Thus, while the several traditions often share a desire to limit the reach of human discourse *vis-à-vis* God, they each have developed their own idiosyncratic patterns of negation that should not be conflated indiscriminately.

Self-Identification

Science

To the extent that “science” denotes the process of fashioning a systematic study of all reality (biological, chemical, anatomical, cultural, etc.), it would be unfitting to describe negative theology as a science. Without calling into question the philosophical legitimacy of creating a comprehensive conception of reality, negative theology has tended to emphasize above all else that “God” cannot be located within such a scientific schema and, perhaps more importantly, that God’s ontological nature is not equivalent to that of discrete beings. Therefore, since we cannot know *what* God is, it would be fundamentally misguided to assign God a place within the order of beings studied by the different sciences. None the less, the philosophical underpinnings of negative theology suggest that negation is intrinsic to the very operations of human thought, even those that are systematized within organized methods of study.

Negative theology is at work in the negating function and dynamic of language in its essential character and from its very origins. It is operative universally throughout the whole extent of language, which is never without negation. Saying anything is always *not* saying something else. Since language operates on

a principle of difference, negation is a basic condition of sense. This condition is theological, furthermore, to the extent that the whole of reality and even the ground or source of reality is implicated in it: “reality” and the idea of its being “whole” themselves emerge only with language and its negations. The real is understandable only through distinction from the unreal and the whole only as not partial or fragmentary.

The real as a whole, moreover, is a theological conception, to the extent that it cannot be found as an item anywhere within the ambit of the sum of realities but transcends this order. In this sense, “theos” is not a distinct thing or entity but rather the always conjecturable ground or source presupposed by everything else – the condition of there being any distinct things or any reality whatsoever. Language first confers the conception of things as some kind of a grounded whole or universe, yet it can do so only by means of negation, since any item it can define and affirm cannot be the final ground. Negative theology is the self-critical thinking that brings this negative predicament of thought in language to consciousness and exposes its groundedness (or negatively expressed, its groundlessness) in the abyss of endless negation of everything that is any finite, definable thing.

Religion

Negative theology is a mode of reasoning and speaking endemic to many faith traditions (variously manifested, e.g., in Judaism, Christianity, and Islam), sharing also some philosophical registers with strains of thought from non-Western belief systems such as Taoism, Vedanta, and Buddhism as well. The Greek term *apophasis* (“away from speaking,” “negation”), upon which negative theology is based, has analogous terms in Hebrew, Arabic, Latin, and Chinese, though all are not purely identical in meaning. For this reason, negative theology is less of a religion *per se* and more of a form of theology that can subtend and suspend uncritical belief in any religion’s positive or primary discourse.

Characteristics

The relative uniqueness of negative theology inheres in its overarching disposition toward epistemology and the apprehension of God and existence by human consciousness. The whole of reality cannot be grasped as such, certainly not by a finite mind, without itself becoming something finite and limited and in fact, for that very reason, not whole. A truly universal whole cannot exclude anything else beyond itself. Only a whole that is broken open to its own “beyond” can count as truly universal, truly All, but in this case, such a whole is not definable except negatively – as including also everything that it is not but rather opens toward everything that can be projected as being beyond it. Only in this relation to its beyond is the whole really whole, and thus it is whole only in and as its own self-negation.

Accordingly, a whole and a ground of All without exceptions or exclusions can only be conceived of negatively. The whole in question is not one that can be grasped by any positive formula, since it is formed by negation. It is infinite. It is whole not because it can be encompassed conclusively but because it is broken open to the unlimited. It is an ungrasped, unencompassable whole. It must embrace – in the mode of opening itself toward – even what it cannot encompass or embrace. This includes the real and the unreal together, since any delimitation of “reality” would leave something out and not be truly all nor all-inclusive. Thus, this All has to be conceived of as the not-All. A notion of the not-All is developed by thinkers like Slavoj Žižek and Eric Santner with reference especially to Lacan, who writes of the “pas tout” and Rosenzweig, who thinks the “nicht Alles,” respectively. Only as not-All does it remain truly open to all that it cannot encompass or say in its own or in any language. It is rather the function of infinite openness to all through self-negation that is made possible through language. And this is the fundamental resource and source-spring of negative theology.

Indeed, like divinity, negation is infinite. Any notion negated – not A, for instance – opens to

an indefinable infinity of all that is not A. The “infinite” itself is transparently a negative conception. And likewise, any truly all-inclusive whole can be conceived of not positively (it could never encompass everything actual and possible) but only by negating all restrictions, exclusions, and limitations.

Thus, negative theology points to certain limits of all disciplinary discourses, their inability to circumscribe their domains and give an adequate account of themselves. It points to something undisciplinary – not capable of being reduced within the compass of any given discipline – and yet lying at the foundation of every discipline and every discourse (Franke 2007).

Relevance to Science and Religion

Theology, as the discourse of the unlimited, or as discourse without limits, turns out to be radically negative. However, this discourse is the revelation of a predicament that applies to the real quite generally. Negative theology, deeply considered, is not a specialized discourse or discipline to be ranged alongside others, each with a domain proper to itself and differentiated from others by criteria of exclusion. Negative theology invades discourse throughout its whole extent. There is always a factor of negation in discourse, since it *is not* what it says. And there are no limits to the capability of recursive self-negation of discourse: it reaches to infinity. This makes negative theology impossible to define. In fact, it does not exist, as Jacques Derrida lucidly maintained. There is no negative theology as such; there can only be a negative theology of negative theology: a discourse that cancels itself out by its very nature and necessity and that exists only in and as this act of self-annihilation or self-erasure. This is the case for negative theology in any of its ostensibly positive articulations – whether in Neoplatonic, Gnostic, Scholastic, or otherwise mystic discourses.

While negative theology functions to recognize the limits of discursive explanatory power, it should not be assumed that there is something radically antiscientific about it. Historically,

philosophers interested in negative theology’s ability to inculcate a devotional awareness of language’s finite power have concomitantly produced advancements in what is commonly called semiotics. In a sense, the underlying motivations of negative theology function as a science of signification. Thus, negative theology can function at the interstices of “science and religion” if both domains are understood to be modes of affording coherence to reality via language. Negative theology, in treating aspects of divinity, simply maps out the limits of language’s coherence when used descriptively of God. In the process, it gains even more traction on language’s conventional usage in speech.

Sources of Authority

Historically, the discourses most manifestly charged with testimony of this mysterious, self-annulling movement of thought and language that is constitutive of negative theology include monotheism and Neoplatonism and a wide range of mysticisms from the vedantic to the baroque and romantic. There are immemorial precedents in even more ancient mystery cults, in which silence was an essential step to initiation and illumination – for example, in the Eleusinian mysteries and among the disciples of Pythagoras, to cite just two classical instances. The broader anthropological background in primordial practices of shamanism, too, would surely furnish abundant parallels, yet without the same degree of critical self-reflectiveness.

Indeed, negative theology should best be considered to begin with rational reflection on divinity and with critical insight into the inescapable *aporiae* of all forms of its representation. This is developed systematically by the Neoplatonists through exegesis of precedents in Plato, especially in the *Parmenides*. And also the Jewish prophetic fulminations against idolatry open a similar vein of insight into the limits of all theological representations and become another foundation for negative theological reflection later in tradition.

There are important distinctions to be drawn between the different strands of negative theology through history (Olivetti 2002). As it was understood by its ancient philosophical expositors, negative theology was the deductive realization brought about through metaphysical speculation. For both Plato and Plotinus, since being is inextricably connected to intelligibility (i.e., to be is to be intelligible), then the “origin” of All (the One) can only be described in an analogous sense as the source of causality. Beyond this attenuated construction, the One must remain ineffable since it is impossible to allow the admixture of multiple predicates to our conception of the One’s radical unity (note that even “unity” fails in this case, as Plotinus suggests).

Without jettisoning the philosophical justification of negative theology, Judaism and Christianity had, in addition to these metaphysical insights, the warrant of inspired scripture that proclaimed the ineffable nature of God. In the Hebrew Bible, God has the unintelligible name of “I AM THAT I AM” (cf. Exodus 3), while the Christian New Testament bears witness to Paul’s mystical rapture to the third heaven where he encounters the ineffable presence of God, which he declares is forbidden to encapsulate in language (cf. 2 Corinthians 12). Revelation thus provides a supplementary impetus toward negative theology.

In the Middle Ages, both Judaism and Christianity would engender unique forms of negative theological speculation. Pseudo-Dionysius the Areopagite (fl. 500 C.E.), long held to be St. Paul’s direct disciple (cf. Acts 17:34), articulated a Christian Neoplatonic form of negative theology in his works *The Mystical Theology* and *The Divine Names*. Mosheh ben Maimon (Maimonides) systematized negative theology within Judaism in the twelfth century C.E. by arguing that no positive attribute could be predicated of God without risk of conceptual idolatry. Respectively, Dionysius and Maimonides would become the most authoritative voices of negative theology within Christianity and Judaism. They would in turn receive much commentary in the centuries that followed the dissemination of their writings.

Ethical Principles

First and foremost, negative theology is concerned with the ethical and moral orientation of the human mind toward God (conceived differently as the First Principle, the One, YHWH, the Trinity). From the perspective of Platonism and Neoplatonism, negative theology does not immediately engender an ethical awareness toward fellow human beings. Within Judaism and Christianity, however, the authorities of scriptural texts and doctrinal positions have coalesced to give negative theology a new valence of ethical awareness.

It is commonly held within Judaism and Christianity that humans are creatures made in the image of God (cf. Genesis 1:27). When coupled with the insights of negative theology, interesting ethical stances emerge from this belief. For instance, negative theology posits that God’s essence is incomprehensible in its very nature. If humans are made in the image of an incomprehensible God, then it follows that humans are, to some extent, incomprehensible in their very natures as well. There is thus something altogether indeterminate about both the nature of God and the nature of humanity. In the same way that negative theology seeks to deconstruct objectifying speech about God, it would follow that we should similarly call into question objectifying speech about human beings. Negative theology necessitates a more nuanced conception of personhood in our understanding of deity as well as our understanding of human psychology. Taken to its logical conclusions, then, negative theology fosters a heightened sensitivity to the incommensurable nature of persons, thereby eschewing degrading or disparaging speech about human beings.

Key Values

Negative theology is a way of thinking that is self-critical without limits. It can occur in all speculative discourses aiming at truth or meaning or sense. This sort of self-reflexive, self-critical

negation of oneself or of one's own discourse or affirmation may even be viewed as the ineluctable and necessary destiny of all reflective discourses aiming to expand consciousness without recognizing any intrinsic limits.

The importance and potential of negative theology as an overarching paradigm in our post-modern times (Halbmayer & Hoff 2008) lies in its offering ways of reading all the traditional and dogmatic discourses of religions and other ideologies less according to the letter of their ostensible affirmations and more in open receptivity to the enabling insights by which they are inspired and animated but which cannot be adequately expressed as such in articulate speech governed by binary laws of making articulate sense. The positive, dogmatic expressions of religions appear as exclusive of one another and are liable to create division and strife, even deadly conflict. However, in stepping back via negation (the *via negationis* or *via negativa*) from their own positive assertions, religious systems and visions are likely to find themselves inhabiting a common space that opens without restriction to infinity and divinity.

Conceptualization

As a theological process, negative theology eschews schematic definitions of discrete *aspects* of many things, especially as they are understood in relation to God. None the less, negative theology engenders specific theological orientations toward the domains of human categorization.

Nature/World

Pseudo-Dionysius the Areopagite, who is often considered the founder of Christian negative theology classically construed, coined the term *hierarchy* (*hierarchia*) in Greek to encapsulate his metaphysical understanding of reality (which he develops from the systems of the pagan writers Plotinus and Proclus). For Dionysius, hierarchy can be understood in ontological, celestial, and ecclesiastical terms. The levels within these hierarchies correspond to varying degrees of

participation in the ineffable God, who, despite resting beyond being, is the ground of all beings. According to the Neoplatonic tradition (ranging from Plotinus through Pseudo-Dionysius to Thomas Aquinas), since effects resemble their causes, then the first cause (i.e., God) must be approached metaphysically through the circumlocutions of negative theology. Therefore, negative theology enjoys a very specific conceptual relationship to causality within the natural world.

Human Being

As intimated above, given negative theology's emphasis on the incomprehensibility of God, the Judeo-Christian belief that humans were made in the image of God suggests that human nature is similarly incomprehensible. When the conception of human being is extended to include its bodily form, negative theology can be brought to bear on this as well. Ancient, patristic, and medieval understandings of negative theology purposefully eschewed dualistic frameworks of the mind-body relationship, positing on scriptural grounds that the body was essential for human nature (especially with regard to resurrection). Thus, negative theology, particularly in its more modern developments, has worked against a materialist or positivist construction of the human as merely body, for this would constitute another manner of objectifying speech about the corporeal form of humanity (Boesel & Keller 2010).

Life and Death

Death, like God, is treated as a name for the unnameable by numerous modern authors, Georges Bataille and Maurice Blanchot in particular, who draw upon and extend negative theological reflection. Life, too, because of the inaccessibility to experience of its origin (we do not remember being born) is treated as a mystery in a negative theological mode by authors from St. Augustine to Jean-Louis Chrétien.

Reality

The reality intended by any name ultimately escapes verbalization and is, finally, none other

than God, since in a monotheistic perspective only God is ultimately real: all other things are real only by virtue of participation in the one true Being of God. The reality named by all names, therefore, can be none other than God, and yet all names fail to attain the ultimate and divine reality, which remains, finally, nameless.

Knowledge

In its Neoplatonic and Christian manifestations, negative theology understands knowledge to be apprehension of discrete things or concepts. Indeed, since ontology and intelligibility function interdependently (i.e., to be is to be intelligible as an object of thought), then knowledge is the purview of a finite intelligence or mind. According to this logic, negative theology works against any putative suggestion that God could be an object of knowledge beyond the attenuated concept of causality. Even assigning God some agency as the first cause tells us nothing about the essence of God, which eludes all modes of knowledge. By calling God “infinite,” the negative theologian is not predicating any characteristic of God, but rather working through negation to suggest that it is impossible to subsume God into the categories of finite reality. Since God negates every discernable object of knowledge, then “knowledge of God” must be understood in non-intellective and nonpsychological terms. Throughout the Christian tradition, this modality of knowledge has been approximated as ecstasy, mystical union (i.e. with God), and transcendence.

Truth

There are innumerable names for the unnameable – indeed all names in some sense qualify. The apparent ban (in negative theology) on all discursive approaches to true divinity paradoxically yields inexhaustible streams of discourse relating to the mystery of the divine. Negative theology is, in fact, bound up with the extraordinarily rich culture and history of aiming at fathoming or registering the divine transcendence of every possible kind of discourse. However, even the conception of divinity as “transcendent” – like every conception – is

not strictly permissible for negative theology, except heuristically and provisionally. All themes and conceptions and contents are eventually transcended by whatever it is that drives negative theology.

Perception

In the Neoplatonic and Christian approaches to negative theology, Being is ineluctably tied to intelligibility. Plotinus and Pseudo-Dionysius routinely suggest that to be is to be intelligible. This means that human perception has a crucial function in marking the divide between the finite and the infinite. That which is intelligible is necessarily finite and therefore circumscribable within the ambit of human discourse. By contrast, the infinite (which, as the names signifies, is the total negation of finitude) escapes language. God is therefore legitimately called “infinite” only to the extent that such a description points toward God’s hyper-transcendent nature that eludes all intelligibility through perception. In a different cultural context, the Jewish prohibitions against idolatry work in a similar manner to emphasize that God’s authentic transcendence is not localizable in discrete objects or perceptible forms.

Time

What is left of negative theology, after this self-effacement, is its trace in history. Negative theology can only be glimpsed as a tradition, an archive, or a corpus of texts. As positive discourses, all these extant traces are no longer truly negative theology, yet we understand that they have been left in the wake of an impinging of the unthinkable upon thought and of the pressure of the unsayable against saying that has cancelled itself out as such by an intrinsic propulsion of its own constraining it to betray itself in some form of prolusion. This is why Levinas insists that the *Dire* is always betrayed by any *Dit*. We are thus able to read the negative theology in positively existing texts and discourses – to the extent that texts and discourses can positively exist, since in some sense they are always only projected by reading. Actually this ongoing activity of reading is never definitively localizable in place or time.

Conformably, negative theology itself never has any positive or fixed existence as such. It is divined always only in disappearing; it is grasped only to the extent that it escapes; it is present always only as absent.

Consciousness

Negative theologies in Eastern religions, particularly in Advaita Vedanta and in Mahayana Buddhism, in different ways turn on the realization of consciousness as an absolute reality – or on its extinction.

In Western Christianity, there is a discernable tradition of thinkers who posit that human consciousness and God's unknowability go hand in hand. These writers include figures such as Pseudo-Dionysius the Areopagite, John Scottus Eriugena (c. 800–c. 877), and Meister Eckhart (c. 1260–c. 1327). Thus, it is possible to articulate a form of apophatic anthropology (cf. Stang in Boesel & Keller 2010) that figures the mutual incomprehensibility of both God *and* person as fundamentally united in the ground of existence.

Rationality/Reason

These discourses of negativity across the ages and across disciplines and cultures are theological in scope, since they concern reality without limits and in relation to its projected and conjecturable grounds or origin. Negative theology is not irrational nor does it necessitate a fideistic stance in theology. While Judeo-Christian forms of negative theology often have as their goal the speculative protection and reverence for God's absolute or mediated transcendence, the logic of negative theology was first articulated in the rational discourse of Neoplatonic philosophy. Rather than occupying an antirational space, negative theology represents reason's deductive endpoint beyond which metaphysical speculation cannot venture without compromising the ineffable threshold of God's essence.

Mystery

The concept of mystery has much resonance with the enterprise of negative theology. Indeed, the founder of Christian negative theology, Pseudo-

Dionysius, encapsulated his philosophy most succinctly in his treatise *The Mystical Theology*. Etymologically, “mystic” means “silent” and derives from the Greek root *muein*, which signifies the closing of the lips to pronounce the consonant m. Within the Christian context, the Latinate word “sacrament” corresponds to the Greek term *mysterion*, which signals that which cannot be addressed in language. Thus, sacramental theology can be understood as the schema of ritualistic participation in the ineffable Godhead. While “mystery” points toward the disposition of reverent silence endemic to many faith traditions, it also gestures beyond the confines of specific doctrines through performative dramatizations of speechlessness. In this manner, while God remains ineffable, the human encounter with the mystery of his incomprehensibility can be performed through language (Sells 1994). Mystery then can embody multifarious indices of negative theology.

Relevant Themes

Negative theology is a form of critical thinking and even in some ways, its extreme development to the phase of an acute crisis of self-critical thinking that negates the very possibility of discourse, even its own. It began with Neoplatonic critique of all discourse concerning the One and continues through the anti-idolatry discourse of Critical Theory, especially in Theodore Adorno and Max Horkheimer. Negative theology can be seen as a self-critique of science that opens it to a religious dimension of the incalculable and ungraspable within its own bosom.

Cross-References

- ▶ [Critical Theory](#)
- ▶ [Epistemology](#)
- ▶ [Interreligious Studies](#)
- ▶ [Metaphysics](#)
- ▶ [Mysticism](#)
- ▶ [Names of God](#)

- ▶ [Negative Theology](#)
- ▶ [Philosophy of Language](#)
- ▶ [Philosophy of Religion](#)

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Neglect

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Related Terms

[Spatial hemi-inattention](#)

Description

Unilateral spatial neglect is a neuropsychological syndrome caused by cerebral lesions which in humans typically involve the right cerebral hemisphere. Neglect has been described also in animals (monkey, cat, rat) with, however, no hemispheric asymmetries. Patients with neglect fail to orient to events (visual, auditory, tactile stimuli) occurring on the side of space

contralateral to the side of the lesion (i.e., the left-hand side in right-brain-damaged patients) and to explore it. Unilateral neglect is currently interpreted in terms of deficits of higher-level processes supporting spatial cognition: impaired orientation of attention toward the contralateral side of space or defective conscious representation of it, with attentional and representational accounts being not mutually exclusive. Spatial neglect is not due to primary sensorimotor deficits (e.g., visual disorders, hemiplegia). It may involve both the contralateral side of extra-personal space (“extra/peri-personal” neglect), the contralateral side of the body (“personal”), as well as internally generated images (“imaginal”). One component of the syndrome is unawareness (*anosognosia*) of neurological deficits contralateral to the side of the lesion (hemiplegia, hemianesthesia, hemianopia). These different manifestations of neglect are frequently associated but may manifest also in isolation, for instance, with patients showing extra-personal, but not personal, neglect and vice versa. These dissociations suggest that, although our phenomenal experience of space is unitary, the underlying processes are multivarious and may be selectively affected by brain damage (Bisiach and Vallar 2000; Heilman and Valenstein 2011; Husain 2008).

Self-Identification

Science

Unilateral spatial neglect has been first described in the medical literature published in the second half of the nineteenth century. Early brief clinical reports came from physicians specifically involved in investigating neurological and psychiatric diseases caused by brain damage: the Czech neuropsychiatrist Arnold Pick (1854–1924) in Prague and the British neurologist John Hughlings Jackson (1835–1911) in London. Subsequently, spatial neglect has been investigated in more and more detail, and it became increasingly clear that the deficit includes many components, which can present as selective deficits. This

suggests an articulated and complex structure of the spatial attentional and representational systems supporting spatial cognition. After the early investigations, performed in a medical context, the manifold behavioral manifestations of spatial neglect draw also the attention of many psychologists, including, among others, Oliver Zangwill (1913–1987) in Cambridge, UK. Since its inception, therefore, the study of neglect characterized itself as the description, assessment, and interpretation of a clinical medical disorder, within the domain of *neurology* and, subsequently, of *experimental and cognitive psychology*. The scientific features of the study of spatial neglect became more specific with the development of the scientific discipline of *neuropsychology*, which was defined in its aims and methods in the early 1950s. Neuropsychology aims at investigating the relationships between the mind and the behavior on the one hand and the brain on the other, combining knowledge and methods primarily from neurology and psychology but also from psychiatry and neurophysiology. The main, though not exclusive, source of empirical neuropsychological evidence has traditionally come from behavioral disorders in brain-damaged patients. Current neuropsychological methods include the following: on the neurological side, first of all a state-of-the-art assessment of the site and size of the responsible cerebral lesion by structural neuroimaging techniques, and investigations of the functional state of the damaged brain by functional neuroimaging and neurostimulation techniques; and on the behavioral side, a quantitative assessment of the pathological behavioral changes, through tasks based on cognitive models of the mind. In this perspective, spatial neglect is the object of investigation of brain (mainly neurology), and behavioral sciences, including connectionist simulation of behavior. One feature of the neglect syndrome is of interest for a discipline, outside medical and psychological sciences, namely, *philosophy*. One main feature of spatial neglect is the lack of perceptual consciousness of events occurring on the neglected side of space that are nevertheless processed. Secondly, patients are typically

unaware of their spatial neglect. Thirdly, the neglect syndrome includes other selective disorders of consciousness, with monothematic delusions. Patients may be unaware of and deny the presence of left-sided sensory and motor neurological deficits. In 1914, the French neurologist Joseph Babinski (1857–1932) definitely described unawareness for hemiplegia and coined the neologism *anosognosia* (from the Greek: *agnosia*, lack of knowledge; *nosos*, disease). Patients may also report delusional beliefs concerning left-sided body parts, which are experienced as not belonging to them. These deficits were systematically described by the Austrian and then North American neuropsychiatrist Josef Gerstmann (1887–1969), who coined the term *somatoparaphrenia* (*paraphrenia*: a psychotic syndrome characterized by hallucinations and delusions; *somato*: a prefix from Greek, meaning “body”: Gertsmann 1942). The selectivity of these deficits of consciousness suggests a multicomponent architecture of what may be termed the person’s *phenomenal conscious experience*, which, in the absence of brain damage, is reported as unitary.

Characteristics

The syndrome of unilateral spatial neglect is distinctive among other neuropsychological disorders in one main aspect. The deficit involves one specific sector of space which is most frequently lateral (along a left-right dimension) but may be also altitudinal (along an upper-lower dimension). The divide between the “neglected” and the “preserved” portion of space may apply to different spatial reference frames, namely, ego-centric, referred to the patient’s own body or body parts, and allocentric or object-based, referred to environmental or imagined objects. Even when neglect applies to representational domains such as language (*neglect dyslexia*, *neglect in spelling*) and numerical cognition (*a rightward bias in the mental number line*), its distinctive feature is a lateral bias toward the side of the lesion.

Relevance to Science and Religion

Characterizing unilateral spatial neglect as a spatially selective disorder of consciousness makes its manifestations of interest to philosophers concerned with the functional properties of the mind. Specifically, the empirical observation that these disorders of conscious experience may be selective (for instance, patients may be unaware of their left hemiplegia without showing left extrapersonal and personal spatial neglect and vice versa) suggests a multicomponent functional architecture of awareness of space and of the self. Pathological symptoms such as somatoparaphrenic phenomena, characterized by a disownership of left-sided body parts, often the hand, shed light on the organization of aspects of the self, such as ownership, from a neuropsychological perspective. From the vantage point of spatial neglect, the self includes a particular and unique 3D object in space (the body), surrounded by other animate and inanimate objects. This aspect may be of interest to religion.

Sources of Authority

The authorities in neuropsychological deficits are clinical and behavioral neurologists and psychologists concerned with cognitive disorders brought about by brain damage or dysfunction. After the first reports in the second half of the nineteenth century, in 1913, the Austrian neurologist Hermann Zingerle (1870–1935) described deficits of impaired perception of the body in right-brain-damaged patients, including left hemiasomatoagnosia, unawareness of left hemiplegia, and left motor neglect, and suggested that they might be due to an impaired representation of the left side of the body, caused by the right-sided lesion (Benke et al. 2004). In the 1940s, the British neurologist Walter Russell Brain (1895–1966) and the psychologist Oliver Zangwill reported symptoms of left unilateral spatial neglect after right-sided lesions. After the Second World War, spatial neglect was considered a clinical sign of damage to the parietal lobe,

particularly the right one. The neurological literature was summarized in 1953 by the British neurologist MacDonald Critchley (1900–1997) in the scholarly book *The parietal lobes*. In the subsequent two decades, many clinical and experimental studies on spatial neglect were published in neurological and neuropsychological scientific journals. The first book, specifically devoted to spatial neglect was edited in 1977 by the North American neurologists Edwin A. Weinstein (1907–1998) and Robert P. Friedland (1948): *Hemi-inattention and Hemisphere Specialization, Advances in Neurology, Volume 18* (Friedland and Weinstein 1977). Other books rapidly followed. In 1987, the French neurologist and neurophysiologist Marc Jeannerod (1935–2011) edited the book *Neurophysiological and neuropsychological aspects of spatial neglect*. In 1993, the British psychologists Ian H. Robertson (1951) and John C. Marshall (1939–2007) edited *Unilateral neglect: clinical and experimental studies*. At present, spatial neglect is discussed as a discrete and specific neuropsychological deficit in handbooks and textbooks of clinical neurology and neuropsychology. The sources mentioned above are as authoritative as can be scientific work in the domains of neurology, psychology, and neuropsychology.

Ethical Principles

Unilateral spatial neglect is a neurological and neuropsychological disorder. Seen in this perspective, as medical subdisciplines, neurology and neuropsychology are guided by the oath and law of the ancient Greek physician *Hippocrates* (born 460 B.C.) who is considered the so-called father of medicine. This “Hippocratic Oath” has been supplemented by the rules of the *Declaration of Helsinki* of 1971.

Key Values

A key value of neuropsychology, shared with neurology, is alleviating human *sufferings*,

understood as *disorders of the nervous system*, which lead to physical and mental impairments, personal dependence, and even death. Behavioral neurologists and neuropsychologists aim at developing and implementing diagnostic tools and therapies that are able to alleviate the patients' behavioral deficits, reducing their severity, both by enhancing recovery of the defective function and through learning of compensatory strategies by the patient. A related key value in neuropsychology is the counseling and guidance of patients during and after *acute* and *chronic neurological diseases*, which bring about neuropsychological deficits.

Conceptualization

Nature/World

Nature, in the broadest sense of the term, is conceptualized as the complete system of living and nonliving things. The world comprises the whole of things and the interspersed space of the universe. Right-brain-damaged patients with left spatial neglect are unaware of left-sided real-world situations and may perceive objects in the world as having no or corrupted left side, without noticing such abnormalities.

Human Being

The human being is conceptualized as a biological *being* equipped with a highly developed complex brain, and a body, which enables sensorimotor functions, and higher-order processes, including perception, action, speech, thinking and reasoning, creativity, ethics, morality, arts, and science. Unilateral spatial neglect is not specific to humans, but has been reported in animals, with, however, no hemispheric asymmetries.

Life and Death

In a broader sense, life is conceptualized as the property or condition of physical systems (*living systems*), with a higher degree of organization and complexity, with the *cell* being a basic unit. In living systems, a number of subsystems or organs constitute a *living organism*. Living

organisms, at variance with inanimate objects, have signaling and self-sustaining processes, with death being the cessation of them. In the human body, as well as in animals, these different organs include a *nervous system*.

Reality

Reality is the quality and condition of what is “real,” of things that actually exist, including our body and objects in the physical world around us. Our experience of reality, namely, of the whole physical environment which surrounds us, is subtended by discrete neural systems.

Knowledge

The term refers to the knowing, through experience and learning, of someone or something, as well as to the already acquired knowledge of people, objects, and facts. The acquisition and retention of knowledge are closely related to the multicomponent processes of memory and, more generally, to the whole of the cognitive and sensorimotor systems. Neuropsychological deficits may selectively impair components of the patient's knowledge.

Truth

Truth refers to the fact of being in accordance to reality or given principles. Statistical procedures may allow to estimate and recognize the “truth” regarding the reality of brain–behavior relationships, as investigated scientifically by neuropsychologist and behavioral neurologists (Zakzanis 2001).

Perception

Perception refers to the processes leading to awareness of events which stimulate our sensory systems. One main component of unilateral spatial neglect is defective perceptual awareness of events occurring in the neglected side of space.

Time

Time refers to the intuition and the representation of the fact that events take place in succession, so that some occur after and before others. With reference to the human experience, events belong

to the present (current), the past, or the future. Right-brain-damaged patients show defective estimation of time, and this has been taken as evidence that temporal processing involves spatial codes, with an important role of the right hemisphere.

Consciousness

Consciousness refers to the persons' awareness of themselves, including their bodies, and of the external world around them (i.e., objects and space among them). Spatial neglect may be considered a selective disorder of consciousness, of one side of space, and of objects in it, including the unique and special object of the body. Consciousness includes a number of discrete processes, which, under unimpaired conditions in a healthy individual, integrate into a coherent system, giving rise to awareness of the self as a unitary entity, distinct from objects in the external world. Spatial neglect may disrupt specific, spatially qualified, aspects of this awareness.

Rationality/Reason

Rationality is the quality of what is rational, a faculty of human beings who possess reason. Reason is the faculty of thinking, of relating concepts, as well as of distinguishing truth from falsehood, what is right from what is wrong. Reason includes judgment, discernment, and logic and is a foundation of accountable and responsible human behavior. Some aspects of reason may be impaired in component deficits of the neglect syndrome, such as anosognosia and somatoparaphrenia.

Mystery

Mystery refers to everything cannot be clearly and definitely understood and explained. Mystery may be considered to be contradictory to science, but it may be seen also as what is yet unknown or incompletely understood. However, the subjectivity of phenomenal experience may be regarded as "mysterious," as it cannot be accounted for, and explained in objective terms (see *subjectivism* vs. *objectivism*).

Conceptualization

A critical issue in neuropsychology, with reference to the relationships between "science" and "religion," is the notion of *subjectivity*. Subjectivism refers to views which, at various extents, reduce extramental reality to the way it is perceived and, more generally, known by the subject. In patients suffering from spatial neglect, the phenomenal experience of the outside world and the body is pathologically altered in ways that are only partially known by the experimenter, through the analysis of the patients' behavior and its neuropathological correlates. It remains possible that the patients' phenomenal experience, as subjective, cannot be completely understood, like that of every human being.

In a broader perspective, neuropsychology may also consider questions regarding how complex behaviors, thoughts, and feelings occur when they are associated with religious and spiritual experience and also by determining their underlying neural and cognitive underpinnings.

Cross-References

- ▶ [Attention](#)
- ▶ [Blindsight](#)
- ▶ [Body](#)
- ▶ [Cognitive Neuroscience](#)
- ▶ [Cognitive Psychology](#)
- ▶ [Self, from a Psychological Perspective](#)
- ▶ [Space](#)
- ▶ [Space and Time](#)

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Neo-charismatic Movements

- [Pentecostalism](#)

Neoclassical Theism

- [Process Theology](#)

Neo-Pentecostalism

- [Pentecostalism](#)

Neoplatonism

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Any one of a body of philosophies of a religiously monistic type deriving from an interpretation of the works of Plato. Typically, such philosophies go beyond the doctrines contained in Plato's dialogues, introducing religious or spiritually based elements that result in the assertion of spirit as true being, with which is contrasted material and bodily reality. Such philosophies often contain ethical, devotional, and magical practices aimed toward the progressive liberation of the individual from the constraints of materiality and his or her reuniting with God, as the cosmic One, or true incorporeal reality.

Neopragmatism

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Introduction

Neopragmatism is not a unified philosophical school. Some leading (mostly American) philosophers have, since the 1980s, been described by this term, emphasizing their background in classical pragmatism (on which see the entry "Pragmatism," by Ulf Zackariasson). It is widely agreed that the two most important neopragmatists are Richard Rorty (1931–2007) and Hilary Putnam (1926–); other key figures include Joseph Margolis, Nicholas Rescher, and Susan Haack. The latter two have, in particular, sought to advance Charles S. Peirce's pragmatism, while the most famous neopragmatists have turned to William James and John Dewey instead. Moreover, some authors distinguish neopragmatism

from “new pragmatism,” suggesting that the latter need not be based on “old” pragmatism, despite thematic similarities (Misak 2007). It is often a problem whether the label “neopragmatist” should be attached to a particular thinker; occasionally, the word is used exclusively to refer to Rortyan pragmatism, while some use it broadly to cover different philosophical views influenced by the pragmatist tradition.

Classical pragmatism sought to reconnect philosophical theorizing with human practice. The pragmatic maxim, formulated by Peirce and James, advises us to consider what conceivable practical results our conception of an object may involve; our conception of such results *is* then our conception of that object. Neopragmatists share this general pragmatic approach to philosophical and scientific problems. However, a neopragmatist is not merely someone who studies classical pragmatism. Neopragmatists seek to apply pragmatist insights into contemporary problems, including the one concerning the relations between science and religion.

Like the classical pragmatists, neopragmatists have promoted the science–religion dialogue. While few neopragmatists are primarily philosophers of religion, neopragmatism as a philosophical framework is applicable to the problem of understanding religion and its relations to science. This entry focuses on Rorty’s and Putnam’s neopragmatisms, especially as they emerge as approaches to the relation between science and religion. Some other neopragmatist thinkers and ideas relevant to this topic are also briefly presented. The Rorty–Putnam contrast is, however, crucial for understanding neopragmatism, also because it is an opposition between secular and religiously engaged pragmatisms.

Rorty: Pragmatism as Antirepresentationalism, Philosophy as Cultural Politics

Giving Up the Very Idea of “Human Answerability”

Rorty’s neopragmatism is the best known both among philosophers and nonphilosophers. In

his book *Philosophy and the Mirror of Nature* (Rorty 1979), Rorty redescribed the history of Western philosophy in insightful ways, arguing that the problems of skepticism and the external world are “optional” and need not be taken seriously. Neither the mind nor language is a “mirror of nature” purporting to accurately represent external reality. Language – statements, vocabularies, and what Ludwig Wittgenstein called “language-games” – is a human invention, a collection of tools people may, pragmatically, use for various purposes. No vocabulary (neither scientific nor religious, for instance) is more intimately in touch with the way the world is “in itself” than any other; no linguistic framework is “nature’s own.” This is of profound significance for the science–religion dialogue. Language is used differently for different purposes; its goal is not to represent the way things are but to satisfy human needs and interests. Its main goal, then, is to help us “cope” with the world.

In later works, Rorty urges that pragmatists should enter a “post-Philosophical culture,” giving up “Philosophy with a capital ‘P’” (Rorty 1982); that *solidarity* is prior to objectivity and *democracy* to knowledge (Rorty 1991, 1999); that truth is not a goal of inquiry (Rorty 1998); that we should embrace an *antirepresentationalist* pragmatism, giving up the illusion of accurate representation (Rorty 1991, 1999) and an *ironism* suspicious of any “final vocabularies” (Rorty 1989); and that “cultural politics” should replace traditional philosophical inquiry (Rorty 2007).

Rorty was a radically secular thinker until the 1990s. His criticism of the metaphysical and epistemological tradition of Western philosophy is closely connected with his secularism: he has identified assumptions that have played the role that was in earlier worldviews reserved to God. Such is, for instance, the “absolute,” “independent” reality, the world *an sich*. According to Rorty, as humans and civilization grow more mature, such assumptions are given up. We should not think of ourselves as being “responsible” or “answerable” to any nonhuman power, divine or not. Accordingly, we should not base

our inquiries on the assumption that we are aiming at truth as accurate representation of independent reality. Thus, secularism is a key to Rorty's critique of Western philosophy; he has – to the dismay of scientific realists and naturalists – continuously argued that philosophers have not gone far enough in such secular attitude.

Rorty's *ethnocentrism* (captured in the slogan, "we have to start from where we are") is, however, close to *cultural relativism* (though Rorty denies being a relativist), leaving room for the autonomy of both scientific and religious descriptions of experience. Science is no more closely connected with the way the world is than religion – or any other human practice – is. People living within a religious *ethnos* have to start from where *they* are. Accordingly, Rorty does not maintain, as many atheists do, that scientific progress has made, or will make, religions irrational, unjustified, etc. He holds that modern people ("we Western liberals") would do better without religious vocabularies, just as they would do better without racist or sexist ones – or without the vocabulary of scientific realism and truth-seeking inquiry. Scientific realism and religious fundamentalism, Rorty (1999, p. 157) argues, are "products of the same urge" because attempting to convince people that they ought to develop an "absolute conception of reality" and attempting to convince them that they ought to "live 'for God only'" are "of a piece"; both are "attempts to make one's own private way of giving meaning to one's life – a way which romanticizes one's relation to something starkly and magnificently nonhuman, something Ultimately True and Real – obligatory for the general public."

Philosophy cannot adjudicate between the disputes of science and religion because it possesses no ahistorical "God's-Eye View" (Rorty 2003, p. 39). Secularism – or "anti-clericalism" – is not primarily a philosophical but a cultural-political issue (Rorty 2003, p. 39). The problem, according to critics, is that if Rorty's ethnocentrism leads to relativism, his neopragmatism lacks the normative resources of saying that this is what *ought to be* maintained.

Rorty on Hope

Rorty's attitude to religion slightly changed during his last years. It would be mistaken to call him anything else than secular in his late writings; yet, he authored several essays on religion in the 1990s and 2000s (Rorty 1999, 2003, 2007). This entry discusses the significance for the philosophy of religion of Rorty's view on *hope* as well as his suggestion that the question of religion is ultimately a question of *cultural politics* rather than philosophy.

Beliefs, including religious and metaphysical ones, are for pragmatists habits of action, inseparable from our practice-embedded being-in-the-world (to employ Heidegger's phrase), in which various hopes, fears, and other attitudes are inextricably present. We could hardly acquire *any* beliefs in the pragmatist sense unless we encountered reality in a context colored by hope, being oriented toward future actions which (we hope) may change the world. In a Peircean context, Elizabeth Cooke (2006) has argued that we need to hope that our questions are genuinely answerable for us to be able to inquire. Critics view Rorty's treatment of hope – for many, a paradigmatic neopragmatist picture of hope – as a trivialization of this concept. After all, Rorty's (1999) "philosophy of social hope" is part of his strictly antimetaphysical pragmatism: inquiry does not deal with the way the world is, but is a matter of conversation, replacing contingent vocabularies by other vocabularies.

In the three-essay set entitled "Hope in Place of Knowledge: A Version of Pragmatism" (Rorty 1999, Chaps. 2–4), Rorty proposes that hope should replace knowledge as a central goal and a key philosophical concept (cf. Rorty 2000). This is essential to the future-oriented approach of pragmatism, both classical and "neo." Because pragmatists "do not believe that there is a way things really are," they suggest replacing the reality–appearance distinction by the one "between descriptions of the world and of ourselves which are less useful and those which are more useful" (Rorty 1999, p. 27). Here the concept of hope becomes urgent because "useful" means "useful to create a better future"

(Rorty 1999, p. 27). Moreover, it is Rorty's own meta-level hope that hope would replace the pursuit of knowledge.

Neither realism nor theism leaves room for the right kind of hope, in Rorty's view. Citing Dewey's claim, made in 1903, that Ralph Waldo Emerson should be seen as "the philosopher of democracy," Rorty says, "Hope – the ability to believe that the future will be unspecifiably different from, and unspecifiably freer than, the past – is the condition of growth. That sort of hope was all that Dewey himself offered us [...]" (Rorty 1999, p. 120). He also speaks about "romantic hope" as a "willingness to substitute imagination for certainty, and curiosity for pride," connecting this to the Deweyan rejection of the distinction between contemplation and action and to the more general pragmatist rejection of the dichotomy between theoretical and practical approaches to reality (Rorty 1999, p. 88). He also notes that, with the romantics, history "began to replace God, Reason and Nature as the source of human hope" (Rorty 1999, p. 265).

Religion offers "hope for redemption through entering into a new relation to a supremely powerful non-human person," while philosophy offers hope for redemption through "acquiring a set of beliefs that represent things in the one way they truly are" (Rorty 2007, p. 91). Philosophers' "love of truth," the urge to get something (knowledge, mind, morality, or something else) "right," is the secular version of traditional religious hopes (Rorty 2007, p. 35). These hopes should be abandoned because in a "literary culture" both philosophy and religion are "optional literary genres" (Rorty 2007, p. 91). Again, the problem is how Rorty can argue for these hopes being wrong or misguided. How does his preferred view get its normative force?

Through his pragmatic hope, Rorty (2003) joins Gianni Vattimo's efforts to reinterpret the Christian tradition in terms of secularization, attempting to save religion from "ontotheological" metaphysical assumptions and doctrines: "To save religion from onto-theology you need to regard the desire for universal intersubjective agreement as just one human

need among many others" (Rorty 2003, p. 42). Rortyan hope is thoroughly secularized: "My sense of the holy, insofar as I have one, is bound up with the hope that someday, any millennium now, my remote descendants will live in a global civilization in which love is pretty much the only law" (Rorty 2003, p. 44). It remains unclear whether this admirable hope should be called "religious."

Nevertheless, many pragmatists undoubtedly applaud Rorty's emphasis on hope. In James's (1907, Chap. 3) pragmatic examination of metaphysical problems, there is also an implicit current of hope running through the discussion. Pragmatism, for James, "shifts the emphasis and looks forward into facts themselves," asking, "What is this world going to be? What is life eventually to make of itself?" (James 1907, p. 62). Metaphysical puzzles are not viewed as conflicts between complete, finished views. Rather, they are individual attempts to come to terms with different considerations reason may offer in favor of one or another way of interpreting experience. For instance, the theory of the free will (contrasted to determinism) is "a general cosmological theory of *promise*" and thus "a doctrine of *relief*" (James 1907, p. 61). Turning toward the future is as essential here as in Rorty's neopragmatism, and therefore hope also is.

However, Jamesian pragmatists may hold that hope should *not* be disconnected from metaphysical pursuits, as in Rorty's pragmatism. They may understand hope as a pragmatic way of approaching metaphysics, as an irreducibly ethical attitude to the study of metaphysical puzzles. A "Jamesian" neopragmatist attempts to make both metaphysics and ethics more relevant by reconnecting both with the hope for a better future. Such a metaphysically pregnant hope, which may, according to Cooke (2006), even play a "transcendental" role, being constitutive of any humanly possible inquiry or even thought, is "social hope," too, but not exactly in the Rortyan sense. Arguably, if such a social hope is genuine, then it is in touch with the way(s) the world is, from the perspective of the social practices engaged in, transformed, and redescribed by

those embracing it. Rorty's dichotomy between hope and knowledge is one of the dualisms he – as many critics have pointed out – is unpragmatically committed to, despite his pragmatic urge to destroy dichotomies.

Thus, according to Rorty's critics, his neopragmatism fails to sufficiently account for the role played by hope in inquiry, religious "inquiries" included, although his emphasis on this concept is relevant to neopragmatist philosophy of religion. Furthermore, Rorty's (1999, 2003, 2007) way of locating religion exclusively in the "private" sphere of individuals' lives, instead of the "public" sphere of common concerns, is also, for many critics, an utterly unpragmatist one. Pragmatists have, since Peirce, James, and Dewey, pictured the human individual as an individual-in-a-community, with no sharp separation between private and public issues. If religion is merely private, then, arguably, no genuine religious traditions – and, hence, no religious experiences either, if those experiences are "tradition-laden" – can arise. On the other hand, perhaps that is desirable from the perspective of Rortyan secularism.

Rorty's perspective on religion is, hence, resolutely antimetaphysical. Religion, like everything else, should be emancipated from foundationalist, essentialist, and ahistorical pursuits. "Literary intellectuals" and "ironists" should not only transform culture into a "post-Philosophical" one; they should also bring religious experiences, needs, and interests into a "postmetaphysical" era. Very little remains from traditional theism in such a "religion after metaphysics." Very little, then, remains from the traditional science–religion contrast.

The Question of God as a Cultural-Political Question

Rorty's atheism, secularism, or anti-clericalism can hardly be said to be a normatively defended or argued position, let alone a philosophical theory. In his last writings, Rorty emphasized the cultural-political status of his suggestions concerning religious (and other) ways of using language. Philosophical criticism of religion is, for Rorty, a matter of cultural politics, not

of metaphysics or epistemology. It is a matter of what kind of vocabularies should be maintained in "our" culture (and of how to define "our" culture or who "we" are). The meta-level issue of whether cultural politics should "replace ontology," as it in Rorty's view should, is itself a matter of cultural politics (Rorty 2007, p. 5), which is "the only game in town" (Rorty 2007, p. 8). The critical question is whether this view is coherent. Can Rorty consistently maintain that we should not argue for atheism or any other philosophical view?

According to Rorty, "the question of whether or not to talk about the existence of immaterial and infinite beings is not one of transcendental philosophy but rather one to be turned over to cultural politics" (Rorty 2007, p. 19). Debating over concrete political questions related to religious ways of life, such as whether female Muslim students should be allowed to wear veils on campus, is "more useful to human happiness" than debating over the existence of such beings (Rorty 2007, pp. 25–26). Furthermore, Rorty "drops" the idea that theology employs special kind of "symbolic forms," along with "the idea that God requires to be talked about in a special way because he is a special kind of being" (Rorty 2007, p. 22).

For Rorty, religion is a private matter: "our religion is our own business – something we need not even discuss with others, much less try to justify to them, unless we feel like doing so" (Rorty 2007, p. 25). He claims, controversially, that this is what "most intellectuals" today hold. Again, the critic who wonders how Rorty gets the normative resources to render his position plausible may point out that people, at least reflective people, have an intellectual duty to justify their views about religion or at least a duty to discuss those views as critically and rationally as possible with others. This is not to say that people ought to engage in evidentialist philosophy of religion, or in the religion–science debate. Yet, political issues surrounding religion can hardly be debated if religion is thoroughly privatized, moved beyond the public use of reason.

Rorty's account of religion as private is illuminated through his comments on *polytheism*.

Echoing James and Nietzsche, Rorty characterizes polytheism as the view that there is “no actual or possible object of knowledge that would permit [one] to commensurate and rank all human needs” (Rorty 2007, p. 30). This is comparable to Rorty’s earlier (1989) ironism about “final vocabularies.” Yet, for a truly religious person, such an account may sacrifice the seriousness of one’s commitment. Religion, for such a person, is not a matter of sheer choice, like the choice of clothes or a personal style.

Rorty’s most sustained account of a pragmatist philosophy of religion can be found in his essay “Pragmatism as Romantic Polytheism” (Rorty 2007, Chap. 2). He offers five theses (34–35): (1) Antirepresentationalism: beliefs are habits of action. (2) Romantic utilitarianism: there is no competition between science and religion, nor should one draw contrasts between cognitive and noncognitive or serious and nonserious matters or ways of speaking. (3) The distinction between projects of social cooperation and projects of individual self-development (largely paralleling the one between public and private matters) is important. (4) There is no “love of Truth”: “It is never an objection to a religious belief that there is no evidence for it. The only possible objection to it can be that it intrudes an individual project into a social and cooperative project, and thereby offends against the teachings of *On Liberty*.” (5) Religious fundamentalism is morally irresponsible, betraying the ideals of human fraternity and democracy.

This philosophy of religion is not identical to the classical pragmatists’. James, according to Rorty, *should* have said something like this: “[W]e are free to describe the universe in many different ways. Describing it as the drifting of cosmic atoms is useful for the social project of working together to control our environment and improve man’s estate. But that description leaves us entirely free to say, for example, that the Heavens proclaim the glory of God” (Rorty 2007, p. 36). James should *not* have talked about the literal and objective truth of religious beliefs but should have been satisfied with what he said in “The Will to Believe”: “we have a right to believe what we like when we are, so to speak, on our

own time. But we abandon this right when we are engaged in, for example, a scientific or a political project” (Rorty 2007, p. 37).

The problem here is whether reflective people, say, academics or intellectuals, should not *always* be “on their own time,” autonomous and independent. Rorty may not be able to encourage intellectual *responsibility* through his private–public dichotomy. When contrasting “one’s own time” to public, cooperative projects, he is, arguably, unpragmatic. The critic may point out that one should, even when cooperating with others in shared projects, be oneself, taking responsibility for one’s commitments.

Rorty prefers Dewey’s (1934) philosophy of religion to James’s because Dewey “was much less prone to a sense of guilt than was James” (Rorty 2007, p. 38). However, this sense of guilt may be what ultimately makes religion a deep issue in James, in a way it never is – from a Jamesian perspective – serious enough in Dewey. Rorty recognizes the role played by the concept of guilt in James’s pragmatism, but he overlooks the fact that this concept (or related ones, such as sin and evil) may be needed to make religion serious for James. If, “[i]n a democratic society, everybody gets to worship his or her personal symbol of ultimate concern” (Rorty 2007, p. 40), democratic worship may lack the kind of depth associated with religious ways of life. If everyone started to worship money as a personal symbol of ultimate concern, this would hardly be a religious activity.

Rorty’s neopragmatist perspective on religion may thus have difficulties in maintaining the seriousness of (especially Jamesian) pragmatist philosophy of religion in which guilt plays a strong role. Thus, it may have difficulties in accounting for the fact that religious faith is, for many, truly an “ultimate concern.” Another worry is that Rorty may have sacrificed the normative resources of critical philosophy of religion by reducing the problems of faith to a cultural-political clash of vocabularies. Such reductionism is not part of the classical pragmatists’ heritage. Rorty is not guilty of the “end of philosophy” line of thought sometimes associated with his neopragmatism because he does

maintain an important, though primarily cultural-political, role for philosophy (cf. Brandom 2000); yet, it remains unclear whether there is any critical, normatively structured way to discuss religion (e.g., in dialogue with science) seriously and argumentatively within Rortyan neopragmatism.

Putnam: Synthesizing Pragmatism and Realism

Metaphysical Versus Pragmatic Realism

Hilary Putnam's work on realism is a key element of neopragmatism. Indeed, neopragmatism has largely emerged from a critical dialogue between Putnam and Rorty on realism and truth. Both have subscribed to pragmatism, citing classics like James and Dewey; yet, they disagreed with each other about the significance of this tradition. Putnam has progressed from a scientific (metaphysical) realism through what he used to call "internal realism" toward a commonsense realism, or "cultivated" naive realism, which he claims to find in the philosophy of the later Wittgenstein (see Putnam and Conant 1994). In his critique of metaphysical realism, Putnam employs the views of Immanuel Kant, the classical pragmatists (especially James and Dewey), and Wittgenstein. Instead of detailed interpretations of these thinkers, he creates and recreates his own conception of realism and truth, including realism about religion, drawing inspiration from their ideas.

For Putnam (1981, 1990), *metaphysical realism* is the conjunction of three theses: (1) there is a way the world is in itself, mind- and language-independently, i.e., the world consists of a fixed set of mind-independent objects and properties; (2) the world can, in principle, be described in a complete, unique, and absolutely true representation (presumably an ideal scientific theory); and (3) truth is a non-epistemic notion, correspondence between linguistic items (statements, beliefs, or theories) and objects and/or states of affairs existing in the mind-independent world. Putnam's *internal realism* is, essentially, the denial of these theses. Claiming that the world can be correctly

described from multiple perspectives, reflecting our interests and purposes, internal realism is a version of the *pluralism* one finds in pragmatists like James and Dewey. The internal realist joins Rorty in urging that no description of the world, not even the most advanced scientific one, is the world's own. Descriptions available to us are grounded in human purposes and practices. Ontology, truth, and reference are internal to conceptual schemes serving different purposes. The upshot of this *conceptual relativity* is that we live in a human world; there is no "ready-made" world. It is, in Putnam's view, scientistic – culturally harmful – to view science as a superior language-game describing absolute reality.

In the 1980s, Putnam characterized truth as idealized epistemic justification, rational acceptability, or warranted assertibility, regarding truth as an epistemic notion contrasted to the non-epistemic correspondence concept of truth. More recently, he has noted that his epistemic theory of truth (and internal realism) was a misguided attempt to replace the unintelligible picture of metaphysical realism by a rival picture. We should, instead of succumbing to either metaphysical or internal realism, adopt a commonsensical "natural realism" (Putnam's other labels, "pragmatic realism" and "realism with a small 'r'," still apply to his views; cf. Putnam 1992; Putnam and Conant 1994).

The metaphysical realist's theses cannot, Putnam holds, simply be denied: we cannot affirm their negations because the negation of an unintelligible statement is equally unintelligible as the original one. The metaphysical realist does not, according to Putnam, reach for something (i.e., an absolute conception of the world) which is a meaningful goal and which we fail to achieve; our inability to describe the world absolutely is no failure because the very idea of such a description collapses into unintelligibility – as does the internal realist's view, if construed as the negation of such an idea. This change in Putnam's neopragmatism took place in the mid-1990s (cf. his 1994). It has a pragmatist background, insofar as he finds James's natural realism, along with Wittgenstein's focus on the "ordinary," among his sources.

The relevance of these reflections on realism to the philosophy of religion is obvious. Religious statements or (in Rortyan terms) vocabularies should not be conceived of along the lines of metaphysical realism any more than scientific or commonsense ones should. If any realism is acceptable, it must be “pragmatic” (Pihlström 1996, 1999). Moreover, scientific, commonsense, and religious (and other) perspectives on reality may contain some “truth,” and so do our moral worldviews; Putnam accepts no gulf between facts and values (Putnam 2002).

Putnam’s views on realism, especially internal realism, have been severely criticized both by realists affirming the existence of a mind-independent world and by more radical (Rortyan) neopragmatists who want to set the issues of realism and truth aside as fruitless pseudoproblems. It has been argued, among other things, that metaphysical realism is not an “all or nothing” affair: one can endorse one or two among the theses 1–3 above, without endorsing them all. Putnam, however, has stressed that it is unclear whether those theses make sense in the absence of one another.

Even though Putnam rejects the internal realism he initially propounded, he continues to think that the metaphysical (scientific) realist’s attempt to find a privileged (scientific) standpoint for describing reality in itself, independently of practice-laden perspectives, hopelessly fails. His attacks on strong realism have turned into general attacks on the reductionist, scientific dream of representing ultimate reality in terms of physical theory. Thus, his work on this topic has deep significance for the philosophy of religion. If scientism is rejected and no scientific perspective is treated as “absolute,” then religious perspectives are also allowed to enter critical, rational discussions. The pragmatist point here, echoing James (1907), is that both scientific and religious perspectives must be evaluated pragmatically, in terms of how well they satisfy human purposes.

It remains undecided whether Putnam’s rejection of metaphysical realism can be combined with a pragmatic (commonsense) realism affirming the objectivity and independence of

the world or whether it leads to a conception of the world as dependent on human practices. Putnam has been interpreted as a relativist or even an idealist, but he has reminded his critics that he never regarded the facts obtained in the world as dependent on how we use language (in any normal sense of “dependent”). Still, there is no privileged (scientific) perspective available for any absolute description of those facts. One option is to interpret Putnam’s view as “empirical realism” in Kant’s sense. The world is, according to such a (re)interpretation, constituted by purpose-oriented practices roughly in the manner in which the empirical world is a human construction, without being illusory or fictitious, according to Kant’s transcendental idealism.

Putnam’s views, in general, are thus a mixture of Kantian, pragmatist, and Wittgensteinian insights – and this holds for his neopragmatist philosophy of religion, in particular. There is a sense in which reality and truths about it are human constructions, but this does not entail a Protagorean relativism of individuals or cultures as “measures of what there is.” It is always from a purposive, practice-embedded point of view that we say whatever we say about the world we take to be real; following Wittgenstein, Putnam (2002) emphasizes the *context sensitivity* of meaning, justification, and rationality. It is only in particular contexts of philosophical bewilderment that, for instance, we are required to justify our beliefs about objective worldly facts. As there are several relevant contexts of investigation and justification, this view is close to pragmatic pluralism. In a religious or theological context – a context serving specific purposes – certain statements may be (held as) true, or rationally justified, even though they are not justified in a scientific context serving different purposes. Religious contexts do not require us to justify our views in the same way as scientific contexts do.

Putnam on Religion: Testing Ideas “in the Laboratory of Life”

Putnam has never been a secularist in Rorty’s manner, though it was late in his philosophical

development – only in the 1990s – that he began to reflect on his religious views philosophically (Putnam 1992, 1997). His neopragmatist treatment of the science–religion controversy integrates pragmatist (Jamesian–Deweyan) and Wittgensteinian insights. Together with Wittgensteinian philosophers of religion, Putnam argues that an evidentialist approach mischaracterizes religious faith. Religion is not a scientific theory intended to explain observable events; it is misleading to either support or criticize it on the basis of evidence (or lack thereof). Rather, religion is tied to deeply rooted forms of life within which we find significance for existence. Even if religious ideas can be said to be “empirically tested,” they must be understood differently from scientific theories. Religious views are tested “in the laboratory of life” (Putnam 1997a, p. 182), not in a research laboratory.

Some atheists maintain that “modern science has answered, or at least sketched a satisfactory answer to, *all* the problems with which metaphysics was traditionally concerned, and the answer simply leaves no room for religion [. . .] except as a historically and culturally important kind of *escapism*” (Putnam 1997a, p. 176). However, from Putnam’s pragmatist and Wittgensteinian perspective, the religious way of looking at reality is *not* “simply another scientific hypothesis, to be examined by the criteria of predictive accuracy, simplicity, and conservation of previous (scientific) belief” (Putnam 1997a, p. 178). Religious statements can be neither refuted nor confirmed by evidence. The materialist, reductionist, scientific critic of religion fails to understand what religion – the religious form(s) of life – is (Putnam 1997a, pp. 178–180). The religious fundamentalist commits the same mistake.

Religious responses to life are, for Putnam, varied, but the “potentiality” for making religious language one’s own is “a basic human potentiality,” and it takes “something experiential and not merely intellectual to awaken that possibility in a human being” (Putnam 1997c, p. 492). Religion should not be overintellectualized – as James argued a century earlier. Putnam, however,

reserves a role for intellectual discussion of religion in a way different from Rorty’s reduction of philosophy (of religion) to cultural politics. Putnam summarizes his account of how to philosophize about religion into three principles: (1) The Principle of Experiment: “Ideas must be tested in practice.” (2) The Principle of Fallibilism: “No human being and no body of human opinion is infallible.” (3) The Principle of Communication: “Truth is by its very nature public. Whatever your existential commitments may be, if you claim truth for them, you must be willing to discuss them” (Putnam 1997a, pp. 182–183). Following these principles is to be prepared to test religious views “in the laboratory of life.” While Putnam is sympathetic to Wittgensteinianism, he attacks “pseudo-Wittgensteinian ‘language-game theologians’” for giving up the possibility of reasonably criticizing religious beliefs (Putnam 1997b, p. 419).

How a rational critique of religion ought to be conducted on a pragmatic basis is, however, not obvious from Putnam’s writings. There is an element of existentialism and even mysticism in his position. He draws inspiration from negative theology, particularly Maimonides (Putnam 1997b), and ultimately regards religious ways of life as individuals’ deep personal commitments – resembling Rorty’s privatized religion. Characteristically, Putnam (1992, pp. 190–196) finds James’s perspective on religion superior to Dewey’s, though – in contrast to Rorty.

As another difference to Rorty, Putnam does consider religious ideas and commitments deep, profound, and ultimately significant. “There simply is no uncommitted place to stand with respect to the religious dimensions of human life,” he writes (Putnam 1997b, p. 408). Claiming to be “religious” is an “awesome responsibility” (Putnam 1997a, p. 185). The issue is existential in the sense of going deep into the very being of a human being: “*what it is to believe that God is personal and loves individuals depends on who one is all the way down and how one lives all the way down*” (Putnam 1997a, p. 184; original emphasis). How one uses the word “God” can only be explained with reference to who one

deeply is and how one leads one's personal life (Putnam 1997c, p. 498).

The basic difference between the two leading neopragmatists' views is that Rorty opposes (traditional) religious ideas, whereas Putnam is a "believer," a "practicing Jew." He even finds religious significance, though no sound philosophical theorizing, in the traditional proofs of God's existence (Putnam 1997c, p. 490). While in Rorty's case it is unclear whether, and how, the suggested cultural-political replacement of religious (e.g., Christian) vocabularies by secular ones could be normatively supported, in Putnam's case, the problem of normative force is slightly different. The problem now is whether his respect for individual, personal ways of living religious lives leaves room for any public discussion of reasons for preferring one such (form of) life to another. Putnam may in the end arrive at religious mysticism replacing rational argumentation by blind faith.

Other Neopragmatist Philosophies of Religion

Notably, neopragmatism has, over the past few decades, spread from the United States, the homeland of pragmatism, to Europe and other countries. Dirk-Martin Grube, a philosopher-theologian working in the Netherlands, has explored pragmatist themes in the philosophy of religion (Grube 2003), while Eberhard Herrmann, a theologian based in Sweden, has defended a "pragmatic realism" regarding religious belief indebted to Putnam (Herrmann 2003). Ulf Zackariasson (2002), in turn, has examined religion in the light of "pragmatic philosophical anthropology." European scholarly communities such as the Central European Pragmatist Forum and the Nordic Pragmatism Network attract philosophers and other researchers working on the science-religion dialogue. Thus, while the leading neopragmatists have been American, inheriting and critically developing the essentially American tradition of pragmatism (albeit with its European,

particularly Kantian and Hegelian, roots), this American way of thinking about religion is increasingly firmly established in Europe and elsewhere too. The cultural contexts for the science-religion debate are, obviously, quite different in these different countries.

Major Peirce and Dewey scholars have not focused on the philosophy of religion, however. It has mostly been the task of Jamesian pragmatists to continue religiously relevant philosophizing within the pragmatist tradition (cf. Pihlström 2008). However, the bearing of Putnam's and Rorty's neopragmatisms on the philosophy of religion still needs to be examined. The interpretation and appropriation of their positions in this regard have barely begun.

Moreover, pragmatist philosophers of religion work in close cooperation with other related currents, such as *religious naturalism* and *process philosophy* (including process theology). In some cases, it may be difficult to determine whether a particular thinker or position should be labeled "neopragmatist" or, say, "naturalist." Pragmatism is an open-ended tradition with flexible boundaries. It may be a sign of its vitality that it has been able to accommodate both religious and secular viewpoints, attracting thinkers from both camps.

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NeoZen

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Nerve Conduction Study

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Nervous System

- [Autonomic Nervous System](#)

Nestinari

- [Anastenaria](#)

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Neural Plasticity

- [Plasticity](#)

Neurobehavioral Biology

- [Neuroethology](#)

Neurobiological Constructivism and Insight Meditation

► Constructivism in Buddhism

Neuroethics

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Description

Neuroscientific advances and the challenges they encounter have inspired new academic disciplines. One is “neuroethics” concerned with the consequences, possible benefits, and dangers of modern research on the brain. It deals with our consciousness and sense of self, and the values that this self develops – it is an interface between the empirical brain sciences, philosophy of mind, moral philosophy, ethics, and the social sciences. It is the study of the questions that arise when scientific findings about the brain are carried out into philosophical analyses, medical practice, legal interpretations, and health and social policy. Such questions are not new; they were raised already during the French Enlightenment. Moreover, ethical problems arising from advances in neuroscience have long been dealt with by ethical committees throughout the world, though not necessarily under the neuroethics label. However, as an academic discipline labeled “neuroethics,” it is a very young discipline. The first references to neuroethics in the literature were made a few decades ago. Today, the pioneers of modern neuroethics have developed an entire body of literature and scholarship in the field of neuroethics that is rapidly expanding. So far, researchers in neuroethics have focused mainly on the ethics of neuroscience, or applied neuroethics, such as ethical issues involved in neuroimaging techniques, cognitive enhancement, or neuropharmacology.

Another important, though as yet less prevalent, scientific approach that may be referred to as fundamental neuroethics questions how knowledge of the brain’s functional architecture and its evolution can deepen our understanding of personal identity, consciousness, and intentionality, including the development of moral thought and judgment. Fundamental neuroethics should provide adequate theoretical foundations required in order to properly address the problems of applications. The initial question for fundamental neuroethics to answer is: How can natural science deepen our understanding of moral thought? How is the former relevant for the latter? One can see this as a sub-question of the question of whether human consciousness can be understood in biological terms, moral thought being a subset of thought in general. That is not a new query, but a version of the classical mind-body problem that has been discussed for millennia and in quite modern terms from the French Enlightenment and onward. What is comparatively new is the realization of the extent to which ancient philosophical problems emerge in the rapidly advancing neurosciences, such as whether or not the human species as such possesses a free will, what it means to have personal responsibility, to be a self, the relations between brain and consciousness, between emotions and cognition, or between emotions and memory.

Self-Identification

Science

Neuroethics is based on neuroscience and purports to offer combined philosophical and scientific explanations of important aspects of moral thought and judgment. While the understanding of ethics as a social phenomenon is primarily a matter of understanding cultural and social mechanisms, it is becoming increasingly apparent that the knowledge of the brain is highly relevant in the context. Progress in neuroscience, notably on the dynamic functions of neural networks, can deepen our understanding of decision-making, choice, acquisition of character and temperament, and the development of moral

dispositions. There is as yet no evidence of a dedicated moral-focused area in the brain, but ample evidence shows how brain dysfunctions or damages can underlie a multitude of cognitive, emotional, and behavioral disabilities, such as memory loss, attention deficit, or personality disorders, including moral incapacity. The brain is an organ of individuality – of intelligence, personality, behavior, and conscience – characteristics that brain science and neuroethics are increasingly able to examine, explain, and influence in significant ways. There are inevitable and important social consequences of the neuroscientific advancements, which may come to include profound changes in fundamental notions, such as human identity, self, integrity, personal responsibility, and freedom, but also, importantly, in neuroscience's own models of the human brain and consciousness moving away from modeling the brain as an artificial network, an input-output machine, to picturing it as awoken, projective and dynamic matter.

Characteristics

Neuroethics is simultaneously distinctive and interdisciplinary: it is an interface between empirical science on the one hand and abstract conceptual analyses on the other. It can be regarded and function as a discipline in its own right by virtue of its specific focus on neurobiological, social, and philosophical explanations of moral consciousness, judgment, and behavior; and on ethics applications of neuroscientific and neurotechnological advancements. However, neuroethics can also, by virtue of its interdisciplinary character, be seen as a sub-discipline of, notably, neuroscience, philosophy, or bioethics, depending on which perspective one wishes to emphasize.

Relevance to Science and Religion

Neuroethics is interested in religion primarily as a neurobiological and as a cultural phenomenon. Throughout most of the world, in different

cultures and historical eras, the human being has nourished religious beliefs, such as the dualistic belief in possessing a unique, and from the body distinct, soul. The natural sciences have questioned this belief from different angles, some of which are neuroscientific, with immediate relevance for neuroethics, which adopts a materialistic view on the mind. From the eighteenth century and onward, dualism came under serious attack as the natural sciences developed, suggesting that mental processes should be explained in physiological terms because consciousness is a bodily function. The idea of the mind as a biological entity gained ground, and the question how to understand the nature and origin of mind, and the relations between mind and matter became increasingly acute. The brain replaced the heart as the dwelling place of consciousness during the cephalocentric Enlightenment, and the question became how the mind and the brain are related, or how the brain gives rise to consciousness. Today, neurobiological analyses of consciousness investigate how the content of subjective experience is correlated with events in the brain. One aim is to gain a deeper understanding of the human mind, including its development of religion and morality. Neuroethics studies these neuroscientific advances. Neuroethics also takes interest in the various neurobiological explanations that have been suggested to religious experiences (an area sometimes referred to as neurotheology) and the hypothesis that there is a neurological and evolutionary basis of religious or spiritual experiences. For example, the use of electroencephalography or functional magnetic resonance imaging to localize brain regions that are active, or differentially active, during experiences that subjects associate with “spiritual” feelings or images.

Sources of Authority

Neuroethics is a purely academic pursuit and as a discipline in its own right it is quite young. It has as such no obvious sources of authority that stand out, but individual writers contribute peer-reviewed articles and books in different

countries. Neuroethics' sources of authority are the increasingly numerous individual scientists and philosophers who work in the field, and they are judged by the same standards as in other scientific or philosophical disciplines. A few of the authorities are suggested in the References.

Ethical Principles

The ethical principles that guide neuroethics are similar to those that guide other academic disciplines. They can basically be divided into two kinds: internal responsibilities related to individual conduct toward the discipline, the profession, students, and colleagues; and external responsibilities related to the impact of the discipline upon society. Concerning the internal responsibilities of individual scientists, ethical standards formulated in different disciplines and countries show a high degree of similarity. Five "core values" stand virtually unchallenged: honesty, skepticism, fairness, collegiality, and openness. The external responsibilities of neuroethics largely concern good use of the knowledge achieved, in particular avoiding civilian or military misuse. It should be observed that through its strong explanatory power, neuroscience could be regarded as even more controversial than genetics as a theoretical basis for ethical reasoning. Science can be, and has historically repeatedly been, ideologically hijacked, and more dangerously so the stronger the science in question is. A famous example is the development of evolutionary ethics developed in the nineteenth century, inspired by Charles Darwin's theory of evolution and natural selection, that can summarily be described as an attempt to base ethics on presumed facts about evolution that were not infrequently related to race. Knowledge of the brain can similarly be misused. If humans learn to understand and even design their own brain, that knowledge could be used well – on the other hand, the dream of the perfect human being has a sordid past providing ample cause for concern over such projects. Historic awareness is of utmost importance for neuroethics to assess

suggested applications in a responsible and realistic manner. Researchers in neuroethics have a joint responsibility to focus on realistic suggestions of future applications. In order to ensure that the ethical analyses are based on substantial scientific ground coupled with realism and conceptual clarity, studies in neuroethics should be construed as a threefold task involving scientific interpretation of theories and data, philosophical interpretation of central concepts, and ethical interpretation of problems arising in connection with applications and use. Ethical discussions can precede neither scientific nor philosophical interpretations.

Key Values

The general key values of neuroethics resemble those of other academic disciplines: seeking knowledge, facts, and theories with adequate methods and responsible applications.

Conceptualization

Nature/World

Neuroethics as an academic discipline defines nature as equivalent to the material world, which can include both mental and physical phenomena. It leaves open whether the world can also contain nonmaterial objects, notably abstract objects, such as numbers.

Human Being

Neuroethics defines the human being as a neuronal creature that is shaped both by its cerebral architecture and by the structures of the society and culture in which its brain develops. The human brain's functional architecture and human sociocultural structures develop in symbiosis, and they determine the nature of the human being conjointly. The structures of our societies influence our cerebral architectures, and the architecture of our brains determines the structures of the societies that we create. In that sense, neuroethics can be said to define the human being as a neuro-cultural creature.

Life and Death

Neuroethics defines life in the same manner as biology, which is the study of life: Living organisms have signaling and self-sustaining processes unlike inanimate objects. Death is the state that occurs when these processes have ceased. The aspects of human life and death that neuroethics specifically studies are both neurobiological and sociocultural.

Reality

Neuroethics basically conceptualizes reality in contrast to illusion or appearance, but there is no unique distinction that neuroethics draws in this regard. The realities which a human brain can create are multifarious and numerous, and while neuroethics studies them, the discipline has not an agreed definition of the term reality.

Knowledge

Neuroethics takes interest in knowledge acquisition and function. According to neuroscientific theory, knowledge acquisition takes place by means of cognitive games, in which the brain continuously, spontaneously, and autonomously produces pre-representations that the brain proceeds to test against other previously established models of the world, and against the environment in which it is operative. Pre-representations are selected as representations by reward signals, and models that are confirmed by both external evidence and internal processes of evaluation within the neuronal workspace itself are stabilized as permanent features ("representations") of the developing cognitive apparatus. The anticipation of reward introducing a delay between the elaboration of tacit plans of action and the actual interaction with the world performed by the organism is an additional component of cognitive learning, and a building block of the neural basis of morality. In contrast, a non-emotional system is purely passive and incapable of self-organization or evaluation; it can have no sensitivity to reward signals, and hence it would be incapable of learning, or of the development of moral thought and judgment.

Truth

The abstract philosophical concept of truth is not fundamentally a question for neuroscience, but the mental states of speaking the truth, or of lying, or the mental states of believing that one speaks the truth or lies, are of interest both to neuroscience and to neuroethics. Neurotechnological advances have produced increasingly sophisticated methods for testing whether a person speaks, or believes to speak, the truth, which is strongly relevant for neuroethics. The social, e.g., legal or military uses of such technology raise important ethical questions that neuroethics analyses, not least in terms of the adequacy of the interpretations of measurements that remain controversial.

Perception

The neuronal basis of perception is of high relevance to neuroethics that seeks to understand perceptual experience through studies of the brain functions. The area of vision is particularly interesting in this regard. Functional magnetic resonance imaging (fMRI) studies have shown that, based on patterns of activity evoked by different categories of visual images, it is possible to deduce simple features in the visual scene, or to which category it belongs. Recent studies take this approach a step further: a decoding method, based on quantitative receptive field models that characterize the relationship between visual stimuli and fMRI activity in early visual areas, can identify with high accuracy which specific natural image an observer saw, even for an image chosen at random from 1,000 distinct images. This prompts the thought that it may soon be possible to decode subjective perceptual experiences such as visual imagery and dreams. This research promises important new discoveries but also raises ethical challenges in application.

Time

Neuroethics does not specifically study time except in so far as it is an aspect of the human experience and consciousness. Humans experience time differently, but all have an experience of time; this is part of our neurobiological identity. This identity of experience is a research object for neuroethics and introduces time into

the area of neuroethics. Likewise, the concept of time constitutes an aspect of human nature. An important aspect of the individual cerebral perspective is temporal narrowness: it is extremely difficult, sometimes even impossible, for a human being to be emotionally concerned with, or clearly to envisage, actual or possible states or events that are temporally distant (e.g., imagined to lie one or several generations ahead in the future) compared to how we are involved with the present. Our cerebral structures are egocentric. This egocentricity is psychological, somatic, and spatiotemporal, which means that we, each of us, live in a minute and egocentric world: this-here-now (understanding the “now” as denoting a fairly wide personal time-perspective, since it is notoriously difficult for human beings to live in the “now” understood as the actual present). By nature, we are predisposed to do so. Neuroethics is interested in the nature and consequences of this predisposition.

Consciousness

Neuroethics starts with a by-the-common-sense definition of consciousness according to which consciousness is a state of awareness whether awake, or asleep and dreaming, of different degrees of intensity, and analyzes neuroscientific and philosophical views on this state. Neuroscientific research on consciousness seeks to explain the relationship between subjective mental states and brain states; it analyzes the nature of the relationship between the conscious mind and the electrochemical interactions in the body. This research combined with philosophy of mind form an important part of neuroethics. Neuroethics strives to shed light on the evolution of evaluative conscious minds, and also on the ethical issues that arise through this research. Developments in neuroscience and neurotechnology have opened the door to brain-machine interface communication without first person external behavior or speech. Functional magnetic resonance imaging is used to identify patterns of activity in the brain that suggest the presence of consciousness in people suffering from severe consciousness disorders and methods

to communicate cerebrally with patients who are motorically unable to communicate. It is also used non-clinically to access the contents of subjective experiences, such as emotions, or intentions via brain-machine interfaces. These new techniques hold promises of important medical breakthroughs and new knowledge about consciousness but also give rise to ethical concerns, notably in terms of health care and privacy.

Rationality/Reason

Neuroethics studies the neurobiological bases of reason and rationality and queries the connection with emotions without offering a determinate definition of rationality or reason. A part of the mind has to do with thinking, reasoning, and intellect; another part has to do with emotion. Emotion is an essential feature of value, and without any values a system cannot learn or remember: it has to prefer some stimuli to others in order to learn. Neuroscience is increasingly revealing the neural basis of emotion and cognition and a part of neuroethics focuses on this research. Ample evidence shows how brain dysfunctions or damages can underlie a multitude of cognitive, emotional, and behavioral disabilities, including self-indifference and social or moral incapacity. The ability to pursue rational self-interest, notably to understand a social situation and choose an appropriate action in the circumstances, depends on the architecture of the individual's brain.

Mystery

Neuroethics would conceptualize mystery as a neural-cultural phenomenon. It would seek to analyze the various neurobiological explanations that have been suggested to mystical experiences and relate them to the sociocultural role of the experience of mystery in different societies, religions, and historical eras.

Relevant Themes

Self

Neuroethics conceptualizes the self as an emergent phenomenon of our biology and studies this

phenomenon and its related aspects, such as the nature of the self, our self-conceptions, self-experiences, self-awareness, and self-interest. Applied neuroethics studies the ethical problems that emerge with our increasing scientific and technological capacities to manipulate or experimentally control the self.

Meaning

Neuroethics studies the narration of the human brain which is in constant quest for meaning: we continuously structure our experiences whether any meaning, or structure, “is there” independently of us or not. Numerous experiments have been performed showing that we do not seem to be biologically capable of perceiving, for instance, meaningless geometric figures, but that we construct patterns spontaneously from collections of random dots. To the extent that the dots are randomly placed without forming any pattern except in the eye of the beholder, one could argue that such patterns must ipso facto be perceptual illusions (since they supposedly do not exist independently of any beholder). Another way of seeing this is that such is the world that we experience and through our experience create, because our brains determine the nature of our environments that are not necessarily less real to the extent that we have influenced them. If we experience structure or meaning, then structure or meaning is there, at least on that phenomenal level. In that sense, meaning is a token of its own reality: it is there by virtue of being experienced. That does not mean that the interpretations are philosophically coherent or scientifically correct. Reality is a word with multiple meanings that can be applied to different levels of experience and explanation. Existentially, in the modern materialist models of mind, we are masters of the contents of our brains at least in some modest measure, and thus not to be seen as fettered biological machines operating automatically. We can accordingly influence our reality. Meaning can be created. This emphasizes the existentially and socially crucial idea that being a neurocultural creature is not incompatible with being in control over creating a meaning in our life,

experience, and world views. Meaning, sense, dignity, *raison d'être*, and other notions that human beings profoundly cherish are not lost to us because they are constructs depending on our cerebral architecture: on the contrary, we arguably thereby gain power over them.

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Neuroethology

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Related Terms

[Behavioral neurobiology](#); [Neurobehavioral biology](#)

Description

Neuroethology is devoted to the experimental analysis of the neural (*neuro-*) fundamentals of natural behavior (*-ethology*). Neuroethologists seek to comparatively investigate neural systems of simple and complex organization both in invertebrates and in vertebrates with side glance to humans. Nervous systems are examined in the context of the problems they have evolved to solve. The tasks are diverse such as biosonar signal perception in mustached bats, auditory space perception in barn owls, visual prey recognition in common toads, electrosensory communication in weakly electric fish, or fear experience to noxious skin stimulation in sea slugs.

Questions central to neuroethology (Fig. 1):

- How are behaviorally relevant stimuli in the environment recognized by nervous systems?
- How are stimuli localized by nervous systems?
- How is information about a stimulus acquired, stored, and recalled by nervous systems?
- How is a behavioral pattern encoded, coordinated, and controlled by nervous systems?
- How do hormones and motivational states intervene in the choice and expression of behavior?
- How can the *ontogenetic* development of behavior be related to neural mechanisms, and are there *phylogenetically* conserved neurobehavioral principles?

Recent discoveries pertaining to the neurochemical basis of fear-response-related memory in the sea slug *Aplysia californica* – by Eric R. Kandel and coworkers – substantiate a significant perspective of neuroethology; knowledge of relatively simple neurobehavioral functions gained in phylogenetically lower organisms contributes toward our understanding of comparable complex functions in higher organisms including humans (cf. [Sources of Authority](#)).

Self-Identification

Science

Neuroethology self-identifies as a subdiscipline of neurobiology and belongs to the natural sciences. The research is addressed to the

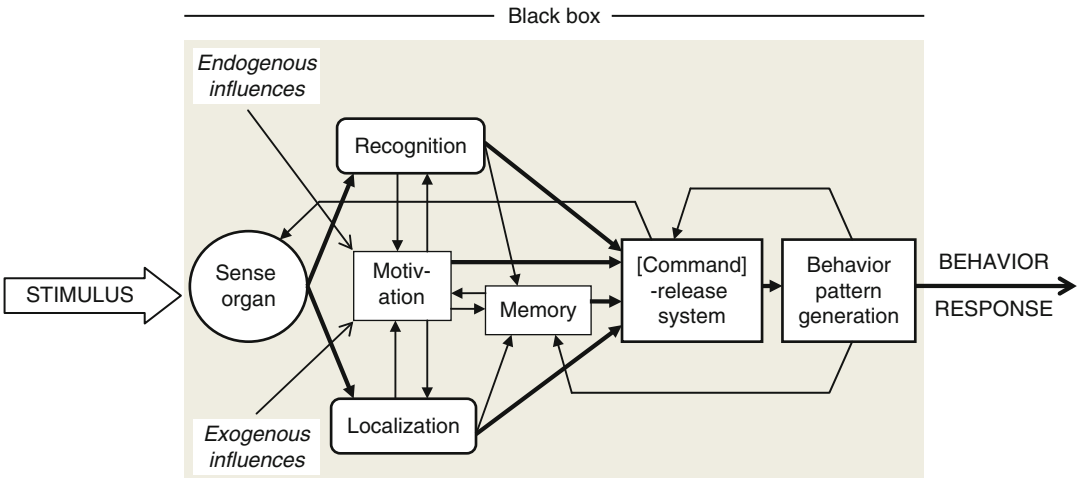
experimental analysis of a neurobehavioral coherency (“black box”). The causation can be interpreted in terms of a hypothesis that allows one to develop a model. Models are predictive, pose new questions, and suggest investigations whose outcome leads to a specification or invalidation of the hypothesis. Aside from its intrinsic topics, neuroethology contributes *concepts* in view of therapeutic developments and *principles* suitable to implement in technical devices.

The accumulating knowledge in the field of neuroethology is treated in congresses and workshops of scientific organizations such as the *European Brain and Behaviour Society* (EBBS) and the *Göttingen Neurobiology Conference*. In 1981, the *International Society for Neuroethology* (ISN) was founded on the occasion of the NATO-Advanced Study Institute “Advances in Vertebrate Neuroethology” held at the University of Kassel in Hofgeismar (Germany). The first president of ISN was Theodore H. Bullock. The ISN has met every three years since its first meeting in Tokyo in 1986. Basic scientific journals include *Brain*, *Behavior and Evolution* and the *Journal of Comparative Physiology A*.

Characteristics

Topics of neuroethology overlap with basic research in *neurology* and *neuropsychology*. Various investigations require multidisciplinary approaches applying methods from *neurophysiology*, *neuroanatomy*, *neuroendocrinology*, *neurochemistry*, *neuroimmunocytochemistry*, *neuropharmacology*, *molecular genetics*, *neural engineering*, and *biocybernetics*. Progress in neuroethological research relies on the development of problem-oriented novel investigative methods.

Neuroethology is distinct from neurology and neuropsychology as it focuses on the neural basis of *natural behavior* in organisms of different organizations including invertebrates. Natural behaviors like feeding, mating, defending, escaping, and navigating emerged during evolution with a survival value for the individual and the species.



Neuroethology, Fig. 1 Schema illustrating some major neural operations mediating between a stimulus and an appropriate behavioral response: stimulus recognition,

stimulus localization, motivation, learning, commanding, motor pattern generation

Relevance to Science and Religion

Different worldviews are shaped by different *ways toward gain in knowledge*. Depending on the context, one such way employs natural sciences, another way, for example, calls for religions. Both are not mutually exclusive. We should be also aware that conceptions born in one such way (e.g., *soul*) may not be explored by methods from a different way (e.g., *neural network approach*). Such an attempt runs the risk of a “category error” (cf. [Relevant Themes](#)).

Different *ways toward gain in knowledge* are essential for multidimensional thinking. In such holistic reflection, for example, creationistic and evolutionary treatments – tackling similar topics in different ways – hold their own place values. According to a creationistic view, the species and the species-specific behavioral skills of organisms are explained by creation, for example, by an intelligent cause: “intelligent design.” Neuroethology explores species-specific behavioral skills in the context of the problems the underlying neural systems have evolved to solve, based on a process of natural selection. Of particular interest are solutions that – in terms of principles – were conserved during evolution. Well-studied examples in tetrapod vertebrates, from frogs to humans, concern the basal

ganglia (neural networks involved in motor control) and the limbic system (neural networks involved in motivation and learning). Another example concerns the genes *otd/Otx*, *Hox*, and *Pax* of the homeobox gene family that are responsible for the tripartite segmentation of the embryonic bauplan of the brains both in insects and vertebrates. The underlying genetic mechanisms suggest a common evolutionary origin.

Sources of Authority

Historically, two main research directions laid the foundation of neuroethology: ethology and neurophysiology. To the turn of the nineteenth century, the comparative exploration of animal behavior was born in conjunction with innovative conceptual analyses of pigeon behavior by Charles O. Whitman (1842–1910) and Wallace Craig (1876–1954). They examined whether Charles R. Darwin’s (1809–1882) theory of evolution applies to particular behavioral modes. Unlike the *behaviorists*, tracing their tradition to Ivan Pawlow (1849–1936) and studying principles of classical and operant conditioning in standardized, automated procedures (e.g., Skinner-box experiments), the *ethologists* seek to analyze naturally occurring behaviors and

to match the natural situation under controlled settings in the laboratory. The founding fathers of ethology – involving Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen (Nobel Prize 1973) – developed important concepts which Tinbergen structured in his scholarly piece *The Study of Instinct* (1951). Later on, various ethological concepts like ► [key stimulus](#), innate releasing mechanism, and fixed action pattern were examined. The ideas contributed toward themes of neuroethological research. The textbook *The Behavior of Animals* edited by Johan J. Bolhuis and Luc-Alain Giraldeau (2005) offers an up-to-date treatment of ethology.

The founding fathers of neurophysiology include John C. Eccles, Alan L. Hodgkin, and Andrew F. Huxley (Nobel Prize 1963), who exposed the ionic mechanisms involved in excitation and inhibition in the nerve cell membrane, and Charles S. Sherrington (Nobel Prize 1932), who ascertained the phenomenon of inhibition as a coordinating principle in the nervous system. In the eye of the horseshoe crab *Limulus polyphemus*, Haldan Keffer Hartline (Nobel Prize 1967) discovered the phenomenon of lateral inhibition, a fundamental filtering principle developed also in other sensory systems both in invertebrates and vertebrates. Pioneers elucidating the neuronal information processing in the visual system and the specialization of the cerebral hemispheres in primates include David H. Hubel, Torsten N. Wiesel, and Roger W. Sperry, respectively (Nobel Prize 1981). Asking “What the frog’s eye tells the frog’s brain,” Jerome Y. Lettvin and coworkers (1969) examined feature detection by retinal ganglion cells in response to behaviorally relevant stimuli, hence tackling questions of neuroethology.

Neuroethology is rooted in the *Verhaltensphysiologie* promoted by Erich von Holst (1908–1962). Selecting three examples of his versatile ingenious research, he explored the principles of motor coordination of locomotion in various species. In collaboration with Horst Mittelstaedt, he discovered the reafference principle. Together with Ursula von St. Paul, he gained insight into the chick’s central nervous

framework of behavior motivations elicited by focal electrical brain stimulation. Walter R. Hess (Nobel Prize 1949) studied the subcortical organization in the cat with respect to the control of vegetative functions and the expression of emotion. He explored, for example, how to distinguish real rage from sham rage induced by electrical stimulation through electrodes in the hypothalamus. Theodore Holmes Bullock (1915–2005) – the leading neuroethologist in the twentieth century – promoted the investigation of neuronal responses underlying behavior patterns in various species of vertebrates and invertebrates toward a comparative approach.

Theodore H. Bullock and Erich von Holst are frequently referred to as the “fathers” of neuroethology. At the second half of the twentieth century, neuroethology was established in special working groups associated with universities or other institutions over the world. The first textbook under the title *Neuroethology* was written by J.-P. Ewert (1976, 1980). Target publications dedicated to neuroethology include P. Marler and W. J. Hamilton (1966), K. D. Roeder (1967), E. R. Kandel (1976), G. Hoyle (1977), D. M. Guthrie (1980), F. Huber and H. Markl (1983), R. R. Capranica (1983), J. M. Camhi (1984), N. Suga (1990), W. F. Heiligenberg (1991), T. H. Bullock (1999), P. Simmons and D. Young (1999), T. J. Carew (2000), M. Konishi and R. Menzel (2003), and G. K. H. Zupanc (2004).

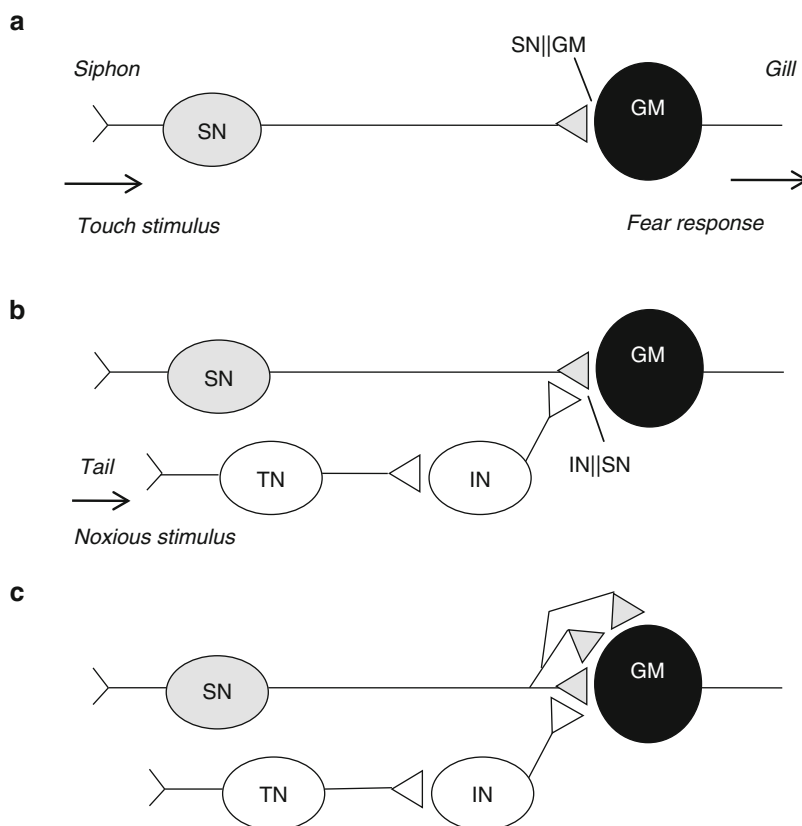
A milestone in neuroethology is marked by the breakthrough in search of the neurochemical basis of fear-related memory by Eric R. Kandel (Nobel Prize 2000, shared with Arvid Carlsson and Paul Greengard for pioneering discoveries concerning signal transduction in the nervous system). Thus, a short extraction of part of his work is appropriate.

Kandel exposed the signal transduction in a neural circuit that enables the sea slug *Aplysia californica* to respond toward a mechanical stimulus with a fear reaction and to memorize fear. Upon touching *Aplysia*’s siphon, the gill is retracted. At first glance, the neuronal circuit underlying this kind of protective behavior

Neuroethology,

Fig. 2 Flow-charts of neurons involved in the fear response of *Aplysia* to touch stimulation.

(a) Stimulus-response mediating pathway; (b) synaptic sensitization via a modulating second pathway, referring to short-term memory; (c) synaptic growth as the basis of a persisting synaptic sensitization, referring to long-term memory. GM, gill motor neuron; IN, inter neuron; IN||SN, synapse between IN and the axonal terminal of the sensory siphon neuron, SN, that is responsive to touch; SN||GM, synapse between SN and GM; TN, sensory neuron of the tail responsive to noxious stimulation



looks like a simple stimulus-response connection; information flow from the sensory siphon neuron, SN, is transmitted synaptically to the gill motor neuron, GM (Fig. 2a).

With repeated stimulation, this fear response undergoes habituation until the reaction ceases. However, a noxious touch stimulus to another part of the body, for example, tail, immediately restores and even facilitates the fear response elicited via SN. The reason for this is that the synaptic transmission from SN to GM, at the synapse SN||GM, can be sensitized by signals of an interneuron, IN, whose axon contacts the axonal terminal of SN, thus forming the synapse IN||SN (Fig. 2b). Actually, that interneuron obtains input of a sensory neuron, TN, of the tail responsive to noxious touch (Fig. 2b). In short, two types of synapses are of interest here: a stimulus-response-mediating one (SN||GM) and

another one (IN||SN) that modulates, i.e., sensitizes SN||GM. Interestingly, the sensitization of SN||GM sustains the offset of the noxious tail stimulus in a manner of *short-term memory*. This results from the synaptic transfer at IN||SN that triggers in the axon terminal of SN a biochemical signal transduction cascade mediated by the chemical messenger cAMP which finally leads to a stronger neurotransmission at SN||GM.

Another signal transduction brings about the synaptic sensitization to persist. This *long-term memory* involves a dialog between synapse SN||GM and genes and hence relies upon transcription in the nucleus of SN; the messenger cAMP initiates activation of cAMP-response-element-binding (CREB) protein and transcription of cAMP-response-element (CRE) gene. That leads to (1) synthesis of growth factors,

(2) sprouting of synaptic axonal terminals, and (3) growth of the synapse SNII_{GM} (Fig. 2c). However, the gene transcription mediated by CREB1 is initially repressed by CREB2 so that an immediate access to long-term memory is blocked; unlocking CREB1 (by inhibiting CREB2) is prerequisite of long-term storage.

Furthermore, a protein CPEB at the amplified synapse SNII_{GM} fulfills two functions: firstly, labeling that synapse and, secondly, stabilizing the persistence of its sensitization. The stabilizing capacity of CPEB takes advantage of a “self-perpetuating” ► [prion-like](#) conformation of CPEB.

One of the important discoveries concerns the fact that long-term memory is based on new synaptic connections. As the neurochemical principle of memory derived from *Aplysia* is shared with mammals and may be akin to that in humans, this discovery promises to treat neurodegenerative memory deficits in humans by innovative medicaments. In progress is a new generation of *cognitive enhancers*, possibly acting by adjusting the cAMP level or the CREB1/CREB2 balance in the hippocampus, the key region of memory in vertebrates. The impact of the cAMP level for memory was checked in mice. Mice do not develop memory disorders comparable to Alzheimer’s disease. However, mice implanted with a human Alzheimer gene show weak memory and display deficits in synaptic axonal sprouting due to a low cAMP level in the hippocampus. Boosting the cAMP level pharmacologically in these transgenic mice stimulates synaptic growth and reduces memory disorders.

Ethical Principles

In neuroethological research, the ethical responsibility of humans to animals significantly accrues from the awareness that humans share with animals various connatural properties.

Experimental research in animals is supervised by authorities such as the regional *Ethics Commissions* appointed through laws of

animal protection, the *Multilateral Consultation of Parties to the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes*, and the *Office of Laboratory Animal Welfare, OLAW*, at the National Institutes of Health, NIH, USA.

Key Values

It is a significant concern of neuroethology to uncover behaviorally relevant functions in the brains of animals of different organizations and differentiation and to derive common principles. Knowledge of neurobehavioral functions accessible in relatively “simple organisms” contributes toward our understanding of comparable functions in “complex organisms” including humans (cf. [Description](#) and [Sources of Authority](#)).

Conceptualization

Nature/World

Nature comprises all organisms and their environments (biotopes, ecological niches). The internal world of an organism, structured by its central nervous system, communicates via sense organs and effector organs with its external world, the environment. The central nervous system contains an image of the external world [cf. *Complex Worlds from Simpler Nervous Systems* edited by Frederick R. Prete (2004)].

Human Being

During evolution, the mammalian species *Homo sapiens sapiens* emerged in Africa (Ethiopia) about 195,000 years ago. Humans are equipped with a highly complex and differentiated brain. Although other organisms with complex brains may be superior to humans as far as particular neurobehavioral skills are concerned, humans are succeeding all by their linguistic peculiarities in syntax, semantics, and patterns of word formation. This affords abstract cerebration,

logic thinking, consciousness, reflection, and rationality – the prerequisites for ethics, religions, sciences, and cultures.

Life and Death

It is suggested that life emerged in the course of molecular and biological evolutionary processes. The criteria of life involve *set(s) of genes, reception, signal transduction (processing), metabolism, growth, and propagation (movement)*. Metabolism – catabolism and anabolism – maintains life. If metabolism ceases, the organism dies.

The concept of autopoiesis in the meaning of self-production is put forward by the neurobiologist Humberto R. Maturana to explain the nature of living systems. In this context, the term self-organization is used occasionally.

Reality

Reality is matched to an observer's perceptive faculty. The perceived reality depends on an individual's evaluation of the information flow received by its different *sense organs* and processed by its *brain*. For example, the biosonar-sensitive receptors confront the bat's brain with a reality that is entirely different from the one experienced, for example, by the human brain. Reality will change if certain processes underlying perception are interrupted. To a common toad after a pretectal brain lesion, the visual reality is quite different than prior to the lesion since every moving object – even an enemy – is perceived as prey.

Knowledge

Knowledge is a property that an individual acquires from perception, learning, memory, and retrieval during lifetime. Neurobiological correlates of long-term memory are newly linked contacts between neurons (cf. [Sources of Authority](#)). During lifetime, the number of neurons may decrease, whereas neuronal cross-linking in the memory-relevant brain regions – and hence wisdom – will increase. To avoid storage of irrelevant information and superfluous networking, selecting processes evolved

that prevent such information from long-term memory (e.g., CREB2, cf. [Sources of Authority](#)). In humans, memory and cerebration are prerequisites of the different ways toward gain in knowledge (cf. [Relevance to Science and Religion](#)).

Truth

The truth value of empiric data, for example, concerning the validity of a neurobehavioral coherency, is correlated with the reliability of the applied experimental measurements. The value that accounts for randomness and uncertainty in the measured data is expressed and quantified in statistic terms of probability. Furthermore, data referring to a causal connection can be interpreted by a hypothesis which again will be subject to experimental proof: verification or falsification.

Perception

Perception is a complex process of receiving, filtering, and binding. The process starts in the sense organs and proceeds in the central nervous system in a parallel-distributed and convergent fashion.

Time

In light-sensitive organisms – from cyanobacteria to humans – clock genes evolved that determine the circadian rhythm (biological clock) suitable to measure both local and elapsed time. Endogenous rhythm is synchronized with the photoperiod. Hormone levels (e.g., melatonin in vertebrates) distribute circadian information within the organism for diurnal changes in physiology and behavior. Time, on a large scale, is related to memory as the “binding agent” that mediates between *present* and *past* in the face of *future*.

Consciousness

Consciousness – self-reflection – presumes attention and requires a registration of perception, action, and imagination. In humans, both a present object *in Perception* and the absent object *in imagery* activate the same neuronal

systems. This demands a process that distinguishes between perception and imagination. If this process fails, hallucinations result, and self-reflection likewise self-confidence is disturbed.

Consciousness is also related to *empathy*, the ability of an individual to share perceptions, actions, and feelings of another individual without confusion of the two individuals. So-called mirror neurons, discovered in the frontal lobes of macaques by Giacomo Rizzolatti, are discussed as possible links to empathy. Mirror neurons are active when a monkey performs a certain task, but they also discharge when the monkey watches someone else performing the same task.

Rationality/Reason

Rationality is associated with reason and presumes insightful behavior of an individual which mainly results from various kinds of experience.

Mystery

Mystery denotes an enigma that refers to phenomena which cannot yet be tackled, investigated, and explained with our presently available causal analytical methods.

Relevant Themes

In view of the current advances in brain sciences, the question arises whether religion may lose some of its foundations if the conceptions are “deciphered” neurophysiologically someday. According to Otto D. Creutzfeldt, such appraisal comprises a significant error. In his book *Cortex Cerebri* (1983), he argues that humans can meaningfully reflect on their rationality and that they can effectually do this without knowledge about the neurophysiological premises of these reflections. The temptation, however, to interpret conceptions like *spirit* and *soul* in terms of specific neuronal activities proceeding in certain brain regions comprises a significant *category error* (cf. [Relevance to Science and Religion](#)) since the strategies of the brain, neurophysiologically, are different from the mental strategies of our rationality.

Cross-References

► [Biology of Religion](#)

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Neuroimaging

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Description

Neuroimaging is a technical discipline that visualizes the measurements of pathological changes in the *brain, spinal cord, nerves, cerebral blood vessels, and skeletal muscles* as well as of normal brain function in pictorial images. Neuroimaging comprises technologies such as *X-ray-based computed tomography, magnetic resonance imaging, positron emission tomography, and Duplex sonography*. Since its beginning in the early 1970s, neuroimaging has grown to a key diagnostic technology in *neurology, neurosurgery, psychiatry, neuropsychology, and cognitive psychology*.

Self-identification

Science

Neuroimaging has self-identified as a natural science because it applies the scientific methods of the natural sciences for clinical diagnostic procedures as well as for basic research. Neuroimaging is based on a mathematical algorithm which allows to calculate tomographic images from non-invasively scanned body parts. This algorithm was developed by Alan M. Cormack (1924–1998) and Godfrey N. Hounsfield (1919–2004) who were awarded with the Nobel Prize in 1979. Paul C. Lautabur (1929–2007) and Peter Mansfield (*1933) developed the basic principles of *magnetic resonance imaging*, which provides tomographic images of a large variety of physiological signals with high sensitivity and high

spatial resolution (Mazziotta et al. 2000). They were awarded with the Nobel Prize in 2003. The steady further development of the neuroimaging techniques and the increasing knowledge obtained by the clinical and theoretical applications is reflected by the formation of national and international scientific organizations such as the International Society for Magnetic Resonance Imaging (<http://www.ismrm.org/>), the American Society of Neuroimaging (<http://www.asnweb.org/>), and the Organization of Human Brain Mapping. These organizations run their regular scientific meetings and have their own scientific journals.

Characteristics

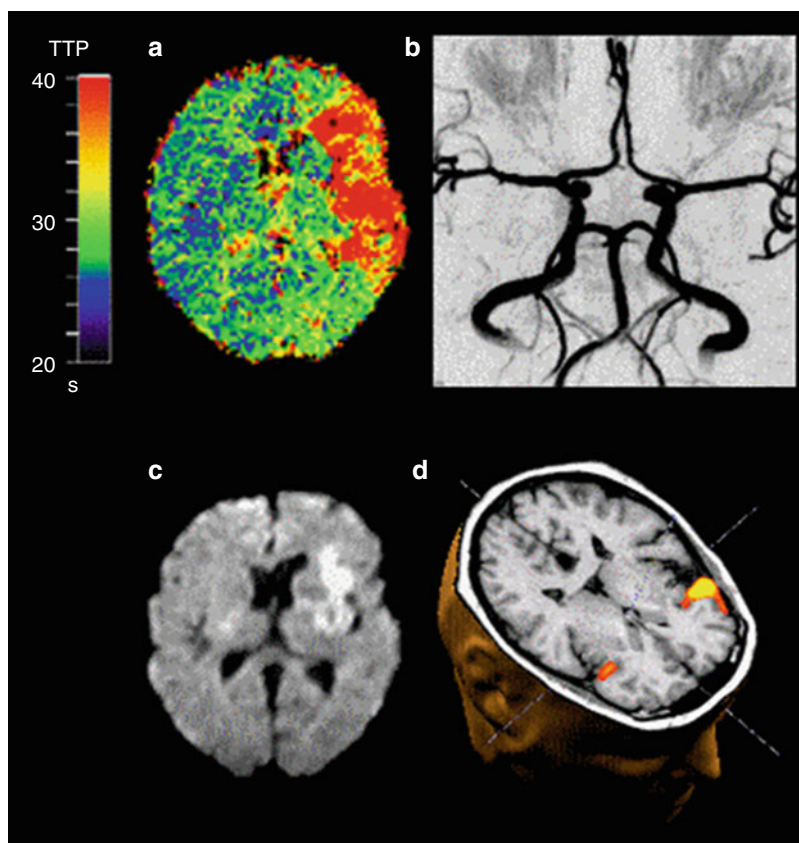
Neuroimaging is distinctive among other medical specialties by the laboratory character of its measurements. Also, the imaging technologies differ from other medical disciplines in that they allow virtually online insight into the body of a person (Fig. 1). Thereby, neuroimaging provides pictorial illustrations of normal anatomy and pathological changes of *brain, spinal cord, nerves, cerebral blood vessels, and skeletal muscles* as well as functional information of a large variety of biological variables including the *blood flow, metabolism, and distribution of neuroreceptors or neurotransmitters*. Also, brain areas involved in functions such as movements, perception, and language production can be identified (Toga and Mazziotta 2000). This is of interest not only in healthy people but also in patients with diseases affecting the ► *nervous system* with respect to how the *brain* is affected and adapts to neurological or psychiatric disorders (Toga and Mazziotta 2002).

Relevance to Science and Religion

Recently, attempts have been made by *functional neuroimaging* to bridge the gap between human brain *physiology* and cognitive and emotional control of behavior, decision making, communication, and *metaphysical* experiences. This interdisciplinary discourse between the neurosciences and the humanities is still in its infancy.

Neuroimaging,

Fig. 1 Example of neuroimaging findings using magnetic resonance imaging. (a) Impaired blood flow in acute stroke indicated by a delay of brain perfusion measured in seconds (*TTP*, red area). (b) Visualization of the intact large arteries supplying the brain with blood. (c) Acute brain infarction as demonstrated by an area with impaired water diffusion through the brain (*white area*). (d) Activation of brain areas related to a syntactic language task in a patient after recovery from aphasia following stroke



Sources of Authority

The authorities in neuroimaging are original publications in peer-reviewed scientific journals. With the advent of the Internet, electronic publishing and electronic libraries have become increasingly important. Of particular note are Internet-based databases, which can be used interactively to compare individual findings with the standard based on large cohorts.

Ethical Principles

As for every medical subdiscipline, neuroimaging is guided by the rules of the Declaration of Helsinki of 1971.

Key Values

The key value of neuroimaging is the objective and accurate visualization of the structure of the ► [nervous system](#) and of functional processes within the *brain, spinal cord, nerves, and skeletal muscles*. The underlying measurements are to be noninvasive with high spatial and temporal resolution.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life on our globe. Nature entertains all dynamic processes in the observable environment. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological *being* equipped with a highly developed complex brain, which enables unique functions including speech, abstract thinking, creativity, and the development of ethical categories such as morality, science, and art. Thus, humans are considered to be distinctive from the rest of the animal world in virtue of the unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body it includes functioning of the different organs, including the ► [nervous system](#). Death is considered the cessation of such physical functions.

Reality

Reality is considered the physical world around us that humans can observe with their senses.

Knowledge

Knowledge is understood to have an *objective* dimension, such that it is the *wisdom* that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal, which humans can grasp only partially.

Perception

Perception is the *conscious sensation* of the forces and influences the external physical world exerts on living beings. Diseases of the human brain may disrupt or impair perception.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time *objectively* and perceive it owing to the changes observed in the surrounding environment.

Human perception of time can be affected by the focus of *attention* or impaired by diseases of the brain.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of *alertness* ranging from drowsiness to full *alertness*, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally, or in differentiated fashions.

Rationality/Reason

Rationality is a foundation of accountable and *responsible* human behavior and of understanding reason as ultimate authority. It is impaired in mental diseases such as *dementia* or neuropsychological disorders.

Mystery

Often mystery is considered to be contradictory to modern medicine including neurology. However, neuroimaging acknowledges in principle a place for mystery – that is, that which is as yet unknown – and thus grants that contemporary knowledge may not have elucidated the entire physiology of humankind. In this view mystery is understood as potentially explainable following the development of sufficiently advanced technologies of investigation.

Relevant Themes

A critical issue in neuroimaging as regards “Science and Religion” is the as yet unresolved question how expressions of religion can be investigated in humans.

Cross-References

- [Magnetoencephalography \(MEG\)](#)
- [Neurology in Europe](#)
- [Neuropsychology](#)
- [Neuroradiology](#)
- [Psychiatry in Europe](#)

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Neuroimaging Technologies

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There are several imaging technologies. In alphabetical order, firstly, the *Magnetic Resonance Imaging (MRI)* uses nuclear magnetic resonance. F. Bloch (1905–1983) and E. Purcell (1912–) noted that atomic nuclei processing in the radiofrequency range could emit a radiofrequency signal that could be detected. In 1977, Damian and coworkers applied this physical principle to receive radiofrequency signals from different tissues of the human body. Secondly, there is the *Myelography* technology, which is used for indirect imaging of the spinal cord and nerve roots by filling the fluid spaces of

the spinal canal with a contrast agent. Thirdly, the *Positron Emission Tomography (PET)* is a highly specialized imaging technique that uses radioactive markers injected into the blood to produce 3D images of those markers functioning within the body. PET enables the location of metabolic activity to be visualized. It has high spatial resolution, in the order of centimeters, but low temporal resolution of minutes, hours, or days. Fourthly, the *Single-Photon Emission Tomography (SPECT or SPET)*, is a functional imaging technique that uses a gamma camera to detect a gamma ray-emitting compound that is introduced in living tissue. The distribution scan is superimposed on a tomographic 3-D image of the tissue. Then, there is the *Superconducting Quantum Interference Devices (SQUIDS)*, which is a highly sensitive sensors used in MEG systems for the measurement of tiny magnetic fields originating in the brain. SQUIDS operate at very low temperature (–269 °C) and require liquid helium for cooling. For more information on the *Magnetoencephalography (MEG)* as well as for, perhaps the most known technology, *Functional Magnetic Resonance Imaging (fMRI)*, see the separate articles on the subject matters.

Cross-references

- [Functional Magnetic Resonance Imaging \(fMRI\)](#)
- [Magnetoencephalography \(MEG\)](#)

Neurology in Asia

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Related Terms

[Neuroscience](#)

Description

Today, in Asia, neurology is devoted to offering detailed diagnostic criteria and therapeutic regimens for the clinical states and syndromes caused by diseases affecting the brain, spinal cord, nerves, nerve-muscle junction, and skeletal muscles.

Japanese Society of Neurology (JSN) was established in 1960 with 643 members, and in 2009 it grew up to a big society having more than 8,000 members including 3,600 neurology board specialists. JSN has greatly contributed in elucidating and resolving many sociomedical problems.

The first neurologic clinic in Korea was established in Jin-Ju City by an Australian doctor Charles Inglis McLaren in 1910. The first Korean neurologist was Dr. Lee Jung-Cheol. He studied and trained in China, Australia, and Japan and began practicing in 1934. The first department of neurology in Korea was founded as independent department in 1958 at the National Central Hospital in collaboration with Scandinavian countries. The development of neurology at Seoul National University was instituted in 1973. The Korea Neurological Association (KNA) held its first annual meeting in August of 1982 and was attended by 206 psychiatrists and internists. The first international academic meeting, the ninth Asia-Oceania Congress of Neurology, was held by the KNA in 1996.

The term neurology was coined in 1921 as an independent department in China, which became common in 1933. But at that time neurology was treated as a part of internal medicine or psychiatry in most hospitals. This development started in the university hospitals and was followed by the establishment of separate departments of neurology in most major community hospitals in the second half of the twentieth century. Till now there are some hospitals that do not have their own neurology emergency department, which may lose some patients. During the period 1966–1976, most neurology departments were cancelled for some reasons, and there were no academic activities, which had an impact on the

development of neurology in China. After that neurology has improved greatly in most fields.

The Society of Neurology became independent of the Society of Neurology and Psychiatry in 1994 and was organized similarly to any US or European professional association. The *Chinese Journal of Neurology and Psychiatry*, founded in 1955, was split into the *Journal of Neurology* and the *Journal of Psychiatry* in 1996. The Neurology Branch of the Chinese Medical Association has set up 13 working groups: (1) Dementia and cognitive disorders, (2) Neurochemistry, (3) Neuropathology, (4) EEG and epilepsy, (5) EMG and clinical neurophysiology, (6) Neurorehabilitation, (7) Neuroimmunology, (8) CSF cytology, (9) Parkinson's disease and movement disorders, (10) Neuropsychology and behavioral neurology, (11) Cerebrovascular disease, (12) Neuromuscular disease, and (13) Neurogenetics. The Chinese Neuropsychiatric Association, founded in 2007, is still in its infancy. The following describes, in large brush strokes, some topics in neurology that have a "Chinese face." More detailed reviews of sister disciplines, for example, neuropathology and neurosurgery, are available.

Self-identification

Science

Neurology has self-identified, from its very beginning, as a mysterious natural science. It has its special way of diagnosing complicated anatomical structures.

In ancient China, the oldest existing Chinese mention of disorders of the central nervous system, such as stroke and epilepsy, appeared in The Yellow Emperor's Inner Canon (Huangdi Neijing). This multivolume collection of medical tractates, comparable to the Hippocratic corpus, dates back to the first century BCE. The Canon's treatment prescriptions were based on the principles of rebalancing yin and yang and the Five Phases, and consisted of pharmaceutical herbs, acupuncture, massage, and physical and mental "self"-cultivation.

Before the first European visited Japan in 1549, traditional Chinese medicine was mainly employed in Japan. Touyou Yamawaki (1705–1762) observed the dismemberment of the corpse of a criminal in Kyoto and was surprised about the accuracy of the Dutch textbook. Soon he published “Records of Dissection” in 1759. After 1853, Western medicine was rapidly introduced into Japan, and great achievements by Japanese medical doctors soon followed.

Since the rapid progress of neurologic anatomy in the nineteenth century in the whole world, neurology in Asia has become an independent field. As the development of the human society, in 1921 the first organization of the human nervous system was founded. At first, neurology in China was greatly impressed by Russia. In the twentieth century lots of investigations resulted in innovations in the clinical field. First, the diagnostic procedure of neurology was divided into a localized diagnosis based on anatomy and a characterizing diagnosis, which is the definition of the disease. The gradually accumulating knowledge of the clinical syndromes is considered as an objective basis for a specific curative or symptomatic therapy. Second, concepts and practices of clinical investigation were developed in the twentieth century. There was great progress in neuroradiology for macroscopy and neuropathology for microscopy both of which were focused on the study of neuroanatomy. This helped neurologists to have more accurate localization and in some extent provided greater details of the character of the diseases. The effort of neurophysiology cannot be disregarded. The neurophysiologic investigations comprise electroencephalography, electromyography, nerve conductive velocity, and evoked potentials, which can evaluate the nervous system objectively and relatively across the board. Neuroimmunology was advanced in the end of twentieth century. The standard diagnosis was made according to it, which was used widespread. The neuromolecular biology and genetics in Asia has its own feature and pace. In the twentieth century, lots of theories were substantiated by observations in pathology of the nervous system and physiological studies in experimental

animals in the field of neurology in Asia. Then cell culture supplemented the scientific methods of the natural sciences for clinical and basic research as well as for diagnostic procedures and therapeutic regimens. Nevertheless, the pharmacochemical understanding of brain function is still in its infancy. This extended from the roles of the different neurotransmitters and their neuroreceptors for neurotransmission in the spinal cord to representations of brain function in the cerebral cortex and the subcortical brain structures including the interactions across these centers. In more recent time, multicenter randomized double-blinded studies have become increasingly important to establish common procedures among different countries.

Religion

Traditional Chinese Medicine (TCM) is worth mentioning here as it continues, at least in its modernized version, to be part of the Chinese medical landscape. However, as is often the case in China, without any official statistics it is difficult to obtain an accurate overview of the extent of the interaction between TCM and Western neurology. TCM is heavily influenced by the healing traditions of Taoism, one of the three major schools of Chinese religious philosophy. TCM posits that physical and mental health is based on a dynamic, harmonious equilibrium of internal and environmental influences. These include the two polar, complementary forces, yin and yang, the Five Phases (wu xing) and qi, the vital force that is both matter and energy (or neither, as Taoist thought just like quantum physics does not differentiate between the two) and flows through the body's dedicated energy channels (jing). Disease is caused by disruption of the balanced state, either in the form of excess, or deficiency. Treatment is aimed at restoring harmony, rather than the identification and eradication of a single pathogen. The history of neurology in China was a long story. Because of unknown and mysterious characters in neurology, some minority ethnic groups treat the diseases in special ways. Chinese traditional medicine is based on its own theory and experiences being different from religion. Up to the nineteenth century people recognized gradually that it was

a scientific discipline rather than a religion based on the rapid improvement of neuroanatomy and neurophysiology. There are different methods to evaluate the function of the brain, spinal cord, peripheral nerve, and muscle. The experimental proof or rejection of hypotheses, and the understanding step by step of the nervous system have told us it is not a religion any more.

Characteristics

Neurology is distinctive among other specialties of medicine in three aspects:

First, neurology aims to establish a strong relationship between clinical deficit patterns and the topography of lesion location within the nervous system, which was called anatomy localization diagnosis. This particular feature of neurology guides the neurologist in assessing the clinical abnormalities in terms of the pathophysiology related to the affected functional systems. Because of its complication, different foundation for Neurology is more complicated than the other disciplines. One millimeter lesion can induce various symptoms, like paralysis, eye movement disorder, dysarthria, dysesthesia, aphasia, and disorders of cognition and emotion that can be assessed objectively by the repertoire of clinical and diagnostic methods. This topographic organization is known to include the cerebrum, cerebellum, brain stem (the midbrain, the pons, and the medulla oblongata), spinal cord, the peripheral nerves, nervous-muscular junction, and skeletal muscles, as well as afferent fibers from sensory organs such as eyes, ears, nose, even the tongue. The disorders in internal medicine can affect the nervous system in a global manner leading to psychomotor slowing, apathy, or even coma. Also the nervous system involvement can be the first symptom or part of the systemic diseases.

Second, neurological diseases have complicated causes which are vascular, toxic, metabolic, hereditary, degenerative, nutritional, autoimmune, infective, neoplastic, and endocrine etiologies. Because the central nervous system can only incompletely regenerate, the degenerative diseases like Alzheimer's disease, Parkinson's

diseases, and amyotrophic lateralizing sclerosis cannot be cured now as they are different from the internal medicine diseases.

Third, neurology is a discipline which has tightest connection with psychiatry. The research of giving up drugs and alcohol by changing the neurotransmitters in the brain made good effect. The impairments in emotion and personality in patients in special situations are paid more attention now including depression after stroke, vascular dementia, temporal lobe and limbic systems injuries. Since other disciplines can have the same problems, the patient care in neurology necessarily is interdisciplinary.

Relevance to Science and Religion

In researches, we can see that the medical systems from ancient India, China, and Greek basically share the same inner structure and also the same logic of the treatment processes. Researchers analyzed the double concept of yin-yang, the Ayurvedic triadic concepts of Pitta, Kapha and Vata, the four elements of Hippocratic humoral medicine, and the five elements of Chinese medicine, and found that each of these conceptual frameworks make up a "theory" or model of the world that is a perfect wholeness, allowing the physician to interpret the world and his patient in order to identify the imbalances of his or her character that need to be treated. Independent of the system, this can be a palliative treatment if energies are only balanced in present time, or a causal cure if the physician is using the similarity principle to take his patient into regression back to the events in the personal history that originally created the imbalances (the traumas).

Religion, spirituality, health, and medicine have common roots in the conceptual framework of relationship amongst human beings, nature, and God. Of late, there has been a surge in interest in understanding the interplay of religion, spirituality, health, and medicine, both in popular and scientific literature. A number of published empirical studies suggest that religious involvement is associated with better outcomes in physical and mental health. Despite some

methodological limitations, these studies do point toward a positive association between religious involvement and better health. When faced with disease, disability, and death, many patients would like physicians to address their emotional and spiritual needs as well. The renewed interest in the interaction of religion and spirituality with health and medicine has significant implications in the Indian context. Although religion is translated as dharma in major Indian languages, dharma and religion are etymologically different and dharma is closer to spirituality than religion as an organized institution. Religion and spirituality play important roles in the lives of millions of Indians and therefore, Indian physicians need to respectfully acknowledge religious issues and address the spiritual needs of their patients.

In China there were few papers about religion and history in any medical discipline/subdiscipline. Though clinical complicated neurologic abnormalities and basic neuroscience phenomenon attracted most neurologists across the world, few neurologists paid attention to the history of this discipline. The improvement of neuroanatomy and neuroimaging gave us a concrete concept of nerve system including the peripheral and central nervous system. There was a religion of diagnosing in a scientific, rigorous, all around way of neurology, which is different from other disciplines. There is no scholarly area called "Science and Religion".

Sources of Authority

The authorities in neurology in Asia came in later than in Europe. The history of Western medicine in China dates back to 1805 when the English physician Dr. Hobson arrived in Canton (now Guangzhou). However, Western diagnoses and treatments of diseases of the nervous system were formally introduced only at the beginning of the Republican era (1911–1949) as part of the missionary project. Paralleling the situation in Europe and the USA, the early history of neurology in China is inseparable from psychiatry since most of the pioneers were practitioners of both specialties. In 1919, a prominent neurologist

from Philadelphia, Andrew H. Woods, became the first professor of neurology and psychiatry at Peking Union Medical College, a Rockefeller Foundation-sponsored university that was then the most prestigious medical institution in China. Two years later, Woods became the founding director of the newly established Department of Neurology and Psychiatry at Peking Union Medical College. The first academic society of the specialty, the Chinese Society of Neurology and Psychiatry, was founded in 1931.

In 1921 Beijing had its independent neurology department to teach neurology, which was established in other areas after 1933. In 1952, Chinese Medical Association Neuropsychiatry society was founded. The first magazine called *Chinese Journal of Neuropsychiatry* was published in March 1955. From November 25th to December 2th, 1963, the first neuropsychiatry academic conference was held in Guangzhou which received 312 articles about acute cerebral blood circulation disorders, epilepsy and brain tumors. At that time, DSA, electroencephalography, ultrasound, and isotope test were progressing rapidly. In 1994, the Chinese Medical Association Neurology Society was founded with nine groups including the electromyography and neurophysiology group (1984), neuropathology (1986), neurobiology (1986), electroencephalography and epilepsy group (1987), neuropsychiatry group (1987), neuroimmunology group (1989), neuromyopathy group (1991), neurerehabilitation (1991), and cerebral spinal fluid cell group (1991). The first edition of the Chinese Journal of Neurology was published.

The first medical society of Japanese neurologists and psychiatrists was founded in 1902, but psychiatrists gradually dominated in number. New "Japanese Society of Neurology" (JSN) was founded in 1960. The number of members was only 643 in 1960, while it rose up to 8,555 in 2009, including regular, junior, senior, and associate members. JSN contributed much to solve the causes and treatment of the medicosocial and iatrogenic diseases such as Minamata disease and SMON (subacute myelopticoneuropathy) at its early period. In undergraduate education at medical school, neurology is one of the core subjects

in the curriculum, and almost all the 80 medical schools have at least one faculty neurologist. The Board of neurology of JSN was started in 1975 as the third earliest of the Japanese Medical Associations. It takes at least 6 years of clinical training after graduating from the medical school to take the neurology Board examinations. By 2009, 4,000 members passed the Board examinations. In 2002, JSN published evidence-based “Treatment Guidelines 2002” of six diseases: Parkinson’s disease, stroke, chronic headache, dementia, and ALS. As to the international issues, JSN hosted the 12th World Congress of Neurology in 1981, and international activities markedly increased after that. The first informal meeting with JSN and Korean Neurological Association (KNA) was held at the 48th JSN Annual Meeting in Nagoya in May 2007. In May 2008, the KNA-JSN 1st Joint symposium was held at the 49th Annual Meeting of JSN in Yokohama on “International comparison of neurological disorders: focusing on spinocerebellar atrophies (SCA) and epilepsies.” In May 2009, KNA-JNS 2nd Joint Symposium was held at the 50th JSN Annual Meeting in Sendai, inviting a speaker from Taiwan Neurological Society, on the subject “History and Education of Neurology in Japan, Korea and Taiwan.” In this symposium, a strategy to make up the Northeast Asian Neurological Association was discussed.

Korea has special medical education including 2 years foundation, 2 years basic class, and 2 years clinical course. Korea Medical Association of Neurology was established in 1982 with five groups including stroke, epilepsy, movement disorders, neuromuscular diseases and infection diseases.

Though the first step was later than the European countries, they can catch up with them, even lead in some research now. The symptoms and morbidity are different from the other continent.

Ethical Principles

Since we became medical students we swore by the oath of medical student “life related, health

entrusted”. We were taught by our senior doctors, in every medical subdiscipline, the responsibilities and kind-heartedness, and the importance of excellent background knowledge. It says “Being a good doctor should be powerful in leechcraft like immortal, be kind like Buddha.” Neurology is also guided by the oath and law of the ancient Greek physician Hippocrates (born 460 BC) as for every other medical subdiscipline, but it may not be as popular as in the Western countries.

Key Values

Like the other disciplines the first key value of neurology is alleviating human sufferings, solving the problems of movement, feelings, perception, visual sense, hearing sense, mental impairments, personal dependence, and even death, which was caused by central nervous system and peripheral nervous system. The brain and spinal cord cannot regenerate, so the neurologists seek the way to prophylaxis the underlying diseases. Many neurological diseases have hereditary causes, and prenatal diagnosis can help these families, though the process and ethics are not consummate enough to practice. Till now neuroscience-based therapies and genetic treatments are not effective and widespread. Most neurological diseases have longer course to recover, so counseling and guidance of patients during and after an acute neurological disease and during the course of a chronic neurological disease for rehabilitation and spirit supporting are very important.

Conceptualization

Nature/World

Nature is conceptualized as every objective things against the subjective consciousness, including the *biological* and *biochemical* foundation of life on Earth. Nature entertains all dynamic processes in the environment. The world comprises the material, most importantly, the human being and artificial things, the countries. Our world has its own stable progressive politics, economics, and civilization.

Human Being

Biologically, the human being is considered as a kind of highly developed mammal with complex brain, which enables unique functions including many kinds of speech, abstract thinking, complicated emotions, strong spirit, rapid creativity, and the development of ethical categories such as morality, science, and art. Thus, humans are considered to be distinctive from the rest of the animal world in virtue of the unique capacities of the human brain.

Life and Death

In philosophy, life is conceptualized as the living things in our biological systems, ranging from bacteria, fungus, virus over plants and animals to humans. Since there is no unequivocal definition of life, the current understanding is descriptive, where life is characteristic of organisms that exhibit all or most of the following phenomena: homeostasis, organization, metabolism, growth, adaptation, response to stimuli, and reproduction. In the human body it is the operation of every different organ, including the nervous system. Death is considered the cessation of such physical functions. Medically “brain death” is an ethical challenge, which is illegal at this moment in Asia. So death is no activities physically including the brain and other organs.

Reality

Reality is considered true world, which is observed by the human beings with any kind of their senses. These different types of information are integrated by human’s brain, which is different from other animals.

Knowledge

Knowledge is understood to be the record of experiences, which can give human beings direction, can light their hope, and help them to make right decisions. Knowledge is a relatively complete, scientific, received standard, or research including every field. In neurology, knowledge was recognized by function of the cortex which depositing the history, experiences, idea and opinion on special things or events.

Truth

Truth is conceptualized as the reality underlying facts and rules, which is opposed to untrue, imagined, or guessed. The truth of neurology was least known compared to other disciplines.

Perception

Perception is the way you regard something and your beliefs about what it is like, and the way you notice things with your senses. In another way, it means the natural ability to understand or notice something quickly. The highest center of perception is our brain.

Time

Time is something that is measured in minutes, hours, years, etc., using clocks. It is a way of self-insight of humans. Time can also be a period of big events. It is a kind of parameter which is used to describe things moving or happening by human. A normal person has the ability to recognize the right time because of the cognition.

Consciousness

Consciousness is a kind of psycho-responsiveness of subjects to any physical stimulus like sound, light, pain, etc., from the outside world. It contains two parts, one is acceptance of the stimuli and the other is responding. The abnormality of consciousness was divided into two aspects: one is the level, and the other is the content. Changing in consciousness level can be graded ranging from coma, stupor, drowsiness to full *alertness*, which comprises crystal clear orientation concerning location, time, situation, person, and full mental capability. The typical change in consciousness content is delirium, which is usually caused by encephalopathy of different reasons.

Rationality/Reason

Rationality is behavior-based on clear, practical, or scientific reasons, which enables us to make decisions based on intelligent thinking rather than on emotion. Reason is the ability to make choice after thinking carefully based on facts. It is impaired in mental disorders, which is caused by injury of the cerebral cortex,

such as various kinds of dementia or neuropsychological abnormalities.

Mystery

Often mystery is considered to be something that is impossible to understand or explain or about which little is known. The mysterious things have the quality that cannot be explained in practical or scientific way, which is contradictory to modern medicine, including neurology. However, neurology has many unresolved issues. Science has its limitation in some way, but we do know to use our knowledge to resolve the mysteries.

Relevant Themes

A critical issue in neurology as regards “Science and Religion” is the notion of subjectivity. Especially in Chinese traditional medicine, there are orthodox rules, which are with personal experiences. But right now there is no pure Chinese traditional medicine at all. They try to identify the results in a scientific way too, so we call this a combination of TCM and Western medicine. Though there are many guidelines of treatment standards in neurologic diseases, they need more evidence-based proofs.

Neurology in Europe

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Related Terms

[Neuroscience](#)

Description

Today, in Europe, Neurology is devoted to offering detailed diagnostic criteria and therapeutic

regimens for the clinical syndromes caused by diseases affecting the *brain, spinal cord, nerves, and skeletal muscles*. The term “Neurology” was coined by the German physician Moritz Heinrich Romberg (1795–1873). Throughout Europe, Neurology became a discipline in its own right in the middle of the twentieth century, being treated as a separate entity distinctive from *internal medicine* or *psychiatry*. This development started in the university hospitals, and was followed by the establishment of separate Departments of Neurology in most major community hospitals in the second half of the twentieth century.

Self-identification

Science

Neurology has self-identified, from its very beginning, as a natural science. It sees itself as a scientific endeavor with the aim to enhance the knowledge about the organization and function of the human ► [nervous system](#) as well as their disease-related abnormalities. The disease concepts and practices of clinical investigation were developed in the nineteenth century and substantiated by observations in *pathology* of the ► [nervous system](#) and physiological studies in experimental animals. The steadily accumulating knowledge of the clinical syndromes is considered as an objective basis for a specific curative or symptomatic therapy. Neurology counts itself among the so-called natural sciences because it applies the scientific methods of the natural sciences for clinical and basic research as well as for diagnostic procedures and therapeutic regimens. Progress in Neurology is reflected by the development of subdisciplines that initially were focused on the study of *neuroanatomy, neurophysiology, neuropathology, and pathophysiology*. This was pioneered for the broad range of human brain functions by Otfried Foerster (1873–1941). Being neurologist and neurosurgeon he supplemented his clinical observations with the cytoarchitectonic maps of the human brain as provided by Korbinian Brodmann (1868–1918) and with careful descriptions of

brain lesions and the effects of electrical stimulation of the cerebral cortex, which is the part of the brain that accommodates the bodies of the nerve cells. It affords brain function including motion, perception, language, emotion, consciousness, and reasoning during open brain surgery (Förster 1936). Subsequently, methods were developed which afforded to assess noninvasively abnormalities of functions of the human nervous tissue. This development started with Hans Berger (1873–1941) who invented the ► **electroencephalogram** and was followed by the development of the electromyography, electroneurography, and the evoked potentials. In the second half of the twentieth century the methodological repertoire expanded over *neurochemistry* and *neuroimmunology* to *neurosonology*, *neuroimaging*, and *molecular neurobiology* as the scientific basis of these methods became available. A prominent focus of scientific work in Neurology has been to elucidate the *pathophysiology* in neurological disorders. This involved also impairments in *cognition* (e.g., *aphasia*, *apraxia*, and *neglect*) that are considered topical to the discipline *Neuropsychology*. More recently, Neurology was equipped also with a broad spectrum of powerful therapeutic regimens resulting from the progress in *neuropharmacology*, *interventional neuroradiology*, and *neurosurgery*. Nevertheless, the pharmacochemical understanding of brain function is still in its infancies. This extends from the roles of the different neurotransmitters and their neuroreceptors for neurotransmission in the spinal cord to representations of brain function in the cerebral cortex and the subcortical brain structures including the interactions across these centers. In more recent times, multicenter randomized double-blinded studies have become increasingly important to establish evidence-based guidelines for treatment regimens.

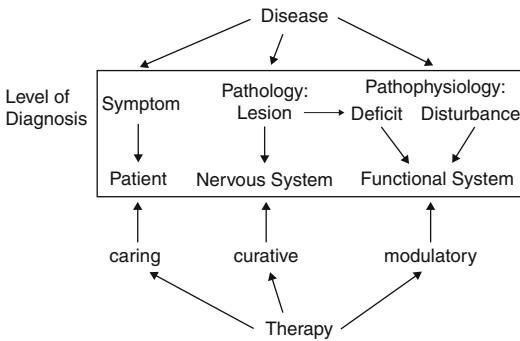
The increase of knowledge in the different clinical and theoretical subdisciplines has fostered the emergence of a broad range of *neuroscience* specialties. This is reflected by national and international scientific organizations such as the European Neurological Society

(http://www.ensinfo.com/about_the_ens/index.html) and the European Federation of Neurological Societies (<http://www.efns.org/>). In addition, societies have been founded addressing specific brain diseases or research topics such as the European Stroke Council, European Epilepsy Academy, European Chapter of the International Federation of Clinical Neurophysiology. These organizations run their regular scientific meetings and the majority have their own scientific journals. These organizations show increasing numbers of members.

Characteristics

Neurology is distinctive among other specialties of Medicine in two aspects:

First, Neurology aims to establish a strong relationship between clinical deficit patterns and the topography of lesion location within the nervous system. This particular feature of Neurology guides the neurologist in assessing the clinical abnormalities in terms of the *pathophysiology* related to the affected functional systems, and in diagnosing underlying neurological disease (Fig. 1). Basic for Neurology is the notion that disease-induced lesions of the ► **nervous system** induce impairments of *motion*, *sensation*, *cognition*, and *emotion* that can be assessed objectively by the repertoire of clinical and diagnostic methods. Clinical observation has led to the conclusion that brain lesions typically do not disrupt these functions altogether or each of them completely, but rather selectively and to various degrees. This topographic organization is known to extend into the *cerebellum*, *brain stem*, *spinal cord*, the *peripheral nerves*, and *skeletal muscles* as well as sensory organs such as *eyes*, *ears*, and *nose*. In contrast, disorders in *internal medicine* typically affect the ► **nervous system** in a global manner, leading to *psychomotor slowing*, *apathy*, or even *coma*. Curative therapy is directed against the underlying disease, while modulatory therapy aims at interfering with *pathophysiology*.



Neurology in Europe, Fig. 1 Effects of a disease and of therapeutic approaches on the patient and his nervous system. The level of diagnosis is multifold

Second, Neurology grants that each organic abnormality can have adverse effects on the patient's psychological functions, and, conversely a patient's psychological state can affect his/her physical status (e.g., movement speed, movement range, and even the willingness to move at all). Accordingly, consideration of the psychopathological implications of a given neurological disease is essential to motivating the patient, both in terms of disease acceptance and in terms of willingness to pursue adequate therapy. Here, Neurology touches upon impairments in *emotion* and *personality* that are considered topical to the specialties in Medicine of *Psychiatry* and *Psychosomatic Medicine*. Accordingly, patient care in Neurology necessarily is interdisciplinary.

Relevance to Science and Religion

While clinical and basic *neuroscience* research has enjoyed a huge attraction across the world, most recently attempts have been made by *functional neuroimaging* to bridge the gap between human brain *physiology* and cognitive and emotional control of behavior, decision making, communication, and *metaphysical* experiences. This interdisciplinary discourse between the neurosciences and the humanities is still in its infancy.

Sources of Authority

The authorities in Neurology used to be scientifically interested physicians who were also instrumental in the establishment of dedicated academic institutions. In 1859 the National Hospital for Neurology and Neurosurgery was founded in London. At this institution Hughling John Jackson (1835–1911) who is considered the founder of modern Neurology was consulting physician. In Paris Jean-Martin Charcot (1825–1893) established a neurological clinic at the Salpêtrière hospital in 1882. In Germany the first Department of Neurology was established in Hamburg in 1896, which was advanced to the first chair of Neurology in 1919. It was held by Max Nonne (1861–1959). Since its infancies, Neurology has considered as authoritative foundational textbooks and handbooks on neurological diseases, as well as a series of human brain atlases. Historically, the first textbooks on neurological diseases were written by Charles Bell (1774–1842), Charles-Édouard Brown-Sequard (1817–1894), Jean-Marie Charcot (1825–1893), and R. Remak (1815–1865). In Germany Moritz Heinrich Romberg (1795–1873) published the “Lehrbuch der Nerven-Krankheiten” in 1851, followed by Wilhelm Erb (1840–1921) who published the first “Handbuch der Krankheiten des Nervensystems” in 1878. Starting in the 1960s, Pierre J. Vinken (born 1926) and George W. Bruyn (1928–2002) edited the “Handbook of Neurology,” which was published by Elsevier and today comprises more than 78 volumes (Vinken and Bruyn 1968). This handbook reflects the broad and diversified development of Neurology giving credit to the various subspecialties that have been established over the years. Of particular importance is the work of the neurosurgeon Jean Talairach (1911–2007) who developed a system for stereotactic localization of human brain structures, which was published in a series of human brain atlases. Beyond its use for stereotactic neurosurgery, it has become the reference system for localization brain activation in *functional neuroimaging*.

With the advent of the internet, electronic publishing and electronic libraries, original

publications in scientific journals have become increasingly important. Based on this rapidly expanding body of knowledge the neurological scientific organizations have established guidelines for *good clinical practice* and evidence-based guidelines which are constantly updated for therapeutic protocols of the major neurological diseases.

Ethical Principles

As for every medical subdiscipline, Neurology is guided by the oath and law of the ancient Greek physician *Hippocrates* (born 460 B.C.) who is considered the so-called father of medicine. This “Hippocratic Oath” has been supplemented by the rules of the Declaration of Helsinki of 1971.

Key Values

The key value of Neurology is alleviating human *sufferings*, understood as disorders of the ► [nervous system](#) and of the muscles which lead to physical and mental impairments, personal dependence, and even death. Toward that end, the neurologist employs and seeks to refine *neuroscience*-based therapies that are able to alleviate or even cure the underlying disease. A second key value in Neurology is that of counseling and guidance of patients during and after an acute neurological disease and during the course of a chronic neurological disease.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life on our globe. Nature entertains all dynamic processes in the observable environment. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological being equipped with a highly developed complex brain, which enables unique functions including speech, abstract thinking, creativity, and the development of ethical categories such as morality, science, and art. Thus, humans are considered to be distinctive from the rest of the animal world in virtue of the unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body it includes functioning of the different organs, including the ► [nervous system](#). Death is considered the cessation of such physical functions. A special case, which has raised ethical challenges for Medicine, is that of so-called ► [brain death](#), which is observed in intensive care medicine. Here, non-brain bodily functions are maintained, but there is no evident brain activity.

Reality

Reality is considered the physical world around us that humans can observe with their senses.

Knowledge

Knowledge is understood to have an *objective* dimension, such that it is the *wisdom* that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries. However, knowledge is also understood to have a *subjective* dimension, which is taken to be the amount of information a person can retrieve from *memory* voluntarily, or by being *cued*.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal which humans can grasp only partially.

Perception

Perception is the *conscious sensation* of the forces and influences the external physical

world exerts on living beings. Diseases of the human brain may disrupt or impair perception.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time *objectively* and perceive it owing to the changes observed in the surrounding environment. Human perception of time can be affected by the focus of *attention* or impaired by diseases of the brain.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of *alertness* ranging from drowsiness to full *alertness*, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally, or in differentiated fashions.

Rationality/Reason

Rationality is a foundation of accountable and *responsible* human behavior and of understanding reason as ultimate authority. It is impaired in mental diseases such as *dementia* or neuropsychological disorders.

Mystery

Often mystery is considered to be contradictory to modern medicine including Neurology. However, Neurology acknowledges in principle a place for mystery – i.e., that which is as yet unknown, and, thus, grants that contemporary knowledge may not have elucidated the entire physiology of human kind. In this view mystery is understood as potentially explainable after accumulation of adequate scientific knowledge.

Relevant Themes

A critical issue in Neurology as regards “Science and Religion” is the notion of *subjectivity*. Subjectivity includes the individual perception of the

outside world and the own body as well as the individual reasoning and valencing of personal experiences, short-lived thoughts, and long-standing *ethical categories*. This pertains to the gap between a science-based medicine and the empathic caring for a physically dependent and/or mentally deprived patient.

Cross-References

- [Clinical Neurophysiology](#)
- [Movement Disorders](#)
- [Neuroimaging](#)
- [Neurology in Asia](#)
- [Neuropathology](#)
- [Neuropsychology](#)
- [Neuroradiology](#)

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Neuromodulation

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Treatment of cerebral disorders like movement disorders, therapy-resistant epilepsy, severe central pain syndromes, severe therapy-resistant psychiatric disorders by deep brain stimulation or spinal cord stimulation, vagal nerve stimulation, and peripheral nerve stimulation.

A neuromodulation system consists of an electrode and a stimulator, sometimes it is an extension cable interconnected. The systems are completely implanted. That means the electrode, the extension cable, and the impulse generator are completely covered by skin or human tissue preventing bacterial or fungal infection of the system and the human tissue. Electrical stimulation is able to mimic neuronal impulses to the brain and is further able to modulate neuronal transmission in respect of augmentation or inhibition. High frequency stimulation (>100 Hz) acts inhibitive in contrast to lower frequency stimulation. Neuromodulation is reversible. That means interruption of current application restores the preoperative neurological state. The therapy can be modulated in frequency, intensity, and impulse widths.

Neuron

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Related Terms

[Dendrite](#)

The principle component of the nervous system responsible for processing and transmitting information to other cells via biochemical signals. The human brain contains roughly 100 billion neurons. Neurons contain a nucleus holding genetic information and are surrounded by a protecting membrane. The task of the membrane is to send information to other cells. The neuron's basic parts are the cell body, the axon and the dendrites, specialized structures to transmit and receive information. The dendrites receive the information passed down to the cell body and on to the axon. The dendrites and the axon are connected

via synapses. The information, once it has arrived at the axon, travels down the length of the axon as an electrical signal (i.e., action potential) and when this electrical signal has reached the end of the axon the information is transmitted across the synaptic gap to the dendrites. Bridging the gap between the neurons may be done instantaneously or by way of chemical messengers called neurotransmitters. A neurotransmitter is a chemical substance which is produced by the nervous system and conveys information between nerve cells. There are different neurotransmitters such as dopamine, serotonin, noradrenaline, and acetylcholine. Acetylcholine also transmits information between the peripheral nerves and the skeletal muscles.

Neuropathology

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Related Terms

[Pathology of the nervous system](#)

Description

Neuropathology is the discipline that studies structural changes of the nervous system in neurological diseases. Originally this comprised only gross and microscopical examination of nervous tissues, in particular of the brain, but also of spinal cord, peripheral nerves, and skeletal muscle. However, more recently additional methodology applied in neuropathology to studies of diseased nervous tissues includes biochemistry and molecular biology as well. Neuropathology gives diagnoses on tissue

obtained by biopsy or autopsy and is essential to confirm the validity of clinical diagnostic criteria and efficacy of therapeutic measures. As an example, operated brain tumors are classified by neuropathologists in distinct diagnostic types as an essential prerequisite for further prognostic and therapeutic considerations (Louis et al. 2007). In many parts of Europe, neuropathology developed from clinical neurology or psychiatry by studying the “Hirnpathologie” (brain pathology) of patients who had died in the same department, in the way Alzheimer studied the brain of Auguste D. as model of the disease that now carries his name. In the Anglo-American tradition, however, neuropathology has more roots in general pathology, when pathologists felt the need for detailed specialization.

Self-identification

Science

Neuropathology self-identifies as a medical discipline that is deeply rooted in natural or life sciences. It aims to improve human health by better understanding of the nervous system during disease. So, on one hand, it is a medical service that relies on learning, observation, and experience, while on the other hand, it fully qualifies as scientific discipline that aims to increase scientific knowledge about diseases of the nervous system by hypothesis-driven experimental research.

Characteristics

Neuropathology excels among other disciplines of medicine by its approach to get to the roots of neurological disorders. Indeed, neuropathology is in the very center of research on diseases of the nervous system, at the interface between basic science and clinical neurosciences (European Confederation of Neuropathological Societies; International Society of Neuropathology). While

in many cases clinical neurology and psychiatry are limited by less-than-perfect diagnostic methodologies, as direct access to nervous tissues is limited in the living patient, neuropathology has the advantage to directly study diseased tissue in situ that is obtained by biopsy (e.g., neurosurgical (Louis et al. 2007; Love et al. 2008; McLendon and Bigner 2006), nerve or muscle (Karpati 2002), rarely brain biopsies, or cytological study of the cerebrospinal fluid) or autopsy (Dickson and Weller 2011; Kalimo 2005; Love et al. 2008). This greatly contributes to the excitement of neuropathology: to be able to check what goes on in brain tissue itself, whereas other clinical methods have to rely on small surrogate “windows” to the brain, e.g., by studying the cerebrospinal fluid.

Relevance to Science and Religion

Neuropathology contributes to our basic understanding of disturbed cognitive, emotional, and behavioral functions. As both science and religion are based on such deeply human functions, neuropathology might be considered to link both areas, in particular in disease-related states. However, there is no direct interest in, and connection to, religion by neuropathology.

Sources of Authority

Neuropathology has been the basis of many historical descriptions of diseases of the nervous system. Like Alzheimer, many of the famous figures of neurology and psychiatry made salient observations by studying tissue alterations in diseases that in part are linked to their names. Practically all diagnostic classification schemes have a neuropathological basis, in particular in diseases with prominent structural changes such as tumors (Louis et al. 2007; Love et al. 2008; McLendon and Bigner 2006) or neurodegenerative disorders (Dickson and Weller 2011; Love et al. 2008).

Ethical Principles

Like all other medical disciplines, neuropathology has to observe all ethical principles that guide the medical profession, ranging from the Hippocratic Oath to the Declaration of Helsinki.

Key Values

The key value of neuropathology is that it provides definite neurological diagnoses and distinct clues on the pathogenesis of nervous tissue lesions. Many clinical diagnostic methods have to await validation by comparison with neuropathological diagnoses as golden standard.

Conceptualization

Nature/World

Nature is conceptualized within the universe of life sciences to which neuropathology belongs. The world is perceived by humans by their brain that is, among other functions, the target of neuropathological assessment during disease. Thus, what we realize is conceptualized in all its qualities as perception of the outside world by the inner world of the brain.

Human Being

The human being may be defined by the abilities of the human brain. Without the human brain, all that makes human beings human beings is lost.

Life and Death

For neuropathology and other natural sciences, life is conceptualized as a universe of physiological processes that characterize distinct biological systems, from single-cell organisms to complex individuals who have the brain as their most complex living organ. Death constitutes the end of these processes and thus may occur at several levels, at cell, organ, or individual level.

Reality

For human beings, reality seems to represent what of the outside world they perceive with their senses.

Knowledge

Knowledge is gain of understanding and reasoning, by learning and experience, or by experimental scientific research. There is nothing specific that neuropathology, as medical and scientific discipline, can provide to the definition of this term.

Truth

There is nothing specific that neuropathology, as medical and scientific discipline, can provide to the definition of this term.

Perception

There is nothing specific that neuropathology, as medical and scientific discipline, can provide to the definition of perception that can be decisively impaired by diseases of the brain that are the study target of neuropathology.

Time

There is nothing specific that neuropathology, as medical and scientific discipline, can provide to the definition of this term. However, the perception of time can be decisively impaired by diseases of the brain that are the study target of neuropathology.

Consciousness

Consciousness is the cognitive condition in which you are aware of yourself as well as of the environment in which you are situated. Consciousness can be decisively impaired by diseases of the brain that are the study target of neuropathology.

Rationality/Reason

Rationality seems to be a quality of a human being, or of its products, of having a sound, logic, and balanced approach to problems. There is nothing specific that neuropathology, as medical and scientific discipline, can provide to the definition of this term.

Mystery

Mystery defies common understanding and experience. It cannot be explained by common knowledge. Thus, mystery is a challenge to a scientific approach to the world that we live in. Neuropathology, as a scientific discipline, may contribute to solve some mysteries that need to be resolved in the area of diseases of the nervous system.

Relevant Themes

As there is no direct interest of neuropathology in religion, it does not have additional and critical issues in this area.

Cross-References

- [Cerebrovascular Diseases](#)
- [Dementia](#)
- [Histology, Cytology](#)
- [Medical Genetics](#)
- [Neurology in Asia](#)
- [Neurology in Europe](#)
- [Neuroradiology](#)
- [Neuroscience](#)
- [Neurosurgery](#)

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Neurophysiology

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Description

Neurophysiology is a subdiscipline of the scientific disciplines *physiology* and *neurosciences*. Neurophysiology is devoted to the functional analysis of the *peripheral nervous system* (PNS) and the *central nervous system* (CNS) applying a variety of experimental and clinical methods. The neuronal structures of interest range from subcellular components (e.g., single voltage-dependent channels or neurotransmitter-gated receptors) to whole organisms. Since the nervous system operates via digital and analog electrical signals (action potentials and synaptic potentials, respectively), classical as well as modern neurophysiological methods generally measure the electrical activity (electrophysiology). Nowadays, neurophysiological techniques are often combined with methods of other scientific disciplines, such as *anatomy*, *genetics*, *molecular biology*, *computational neurosciences*, or *psychology*.

Self-identification

By definition, Neurophysiology is the science devoted to the physiological or functional analysis of the nervous system. Neurophysiology

belongs to the so-called natural or life sciences. Neurophysiology uses physical and chemical methods to study the function and dysfunction (as in *neurology*) of the nervous system or to manipulate the neuronal function (e.g., via electrical stimulation electrodes).

Characteristics

Neurophysiology is partly devoted to the analysis of higher nervous functions, e.g., learning, memory, consciousness. It is distinctive among other specialties of physiological and life sciences that Neurophysiology is studying the molecular and cellular mechanisms underlying these higher nervous functions.

Relevance to Science and Religion

Since Neurophysiology studies the functional states of the nervous system, including the human brain, it is most relevant in the scholarly area called “Science” and to society.

► **Electroencephalogram (EEG)** recordings of the neuronal activity in the human brain performed by Benjamin Libet (1916–2007) have demonstrated that unconscious neuronal processes precede volitional acts by approximately 0.5 s, questioning the existence of a *free will*. These experiments may indicate that consciousness is a side effect of basic neuronal function and an epiphenomenon of brain states. Although Libet’s experiments and conclusions are controversially discussed, they may have a strong impact on society.

Sources of Authority

The role of electrical activity in body function was first described in 1783 by the Italian physician and physicist Luigi Galvani (1737–1798) when he discovered by chance that frog leg muscles contract upon electrical stimulation. Later, the German physician and physiologist Emil du

Bois-Reymond (1818–1896) discovered the nerve action potential. In 1924, the German physician Hans Berger (1873–1941) performed the first EEG recordings by connecting silver foil electrodes on a patients head with a galvanometer. The English physiologists Alan Lloyd Hodgkin (1914–1998) and Andrew Fielding Huxley (born 1917) received in 1963 the Nobel Prize in Physiology or Medicine for their work on the basis of the nerve action potential, which they performed on the so-called giant axon of the squid. In 1991 the German physicist Erwin Neher (born 1944) and the German physiologist Bert Sakmann (born 1942) received the Nobel Prize in Physiology or Medicine for their discoveries concerning the function of single ion channels in cell membranes and for the development of the so-called patch-clamp technique.

The Canadian psychologist Donald O. Hebb (1904–1985) published in 1949 the famous book “The Organization of Behavior” in which he defined a cellular basis of learning, later termed Hebb’s Law (“Neurons that fire together, wire together”): “When an axon of cell A is near enough to excite cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A’s efficiency, as one of the cells firing B, is increased.”

The function of a sensory system in the mammalian brain was studied in great detail by David H. Hubel (born 1926) and Torsten N. Wiesel (born 1924) by performing electrophysiological recordings from single nerve cells in the visual system of the cat. For their discoveries concerning information processing and developmental *plasticity* in the visual system, both received the 1981 Nobel Prize in Physiology or Medicine.

Ethical Principles

In contrast to in vitro neurophysiological studies on isolated brain tissue or single nerve cells in culture, in vivo neurophysiological experiments on anesthetized and non-anesthetized animals

and humans often require the permission of a local ethical committee. These experiments are performed according to national and international laws on the use of animals and humans in research. Clinical investigations using neurophysiological techniques are performed according to the rules of the *Declaration of Helsinki*.

Key Values

The key value of Neurophysiology lies in the understanding of brain function and dysfunction, from subcellular mechanisms to the behavior of the whole organism or human being. Neurophysiological methods are used to identify and to define the states of consciousness and unconsciousness (as during sleep with different functional states of consciousness associated with distinct brain rhythms detectable with the EEG).

Conceptualization

Nature/World

Nature is defined as the physical, chemical, and biological components and processes of living and nonliving parts ranging from the subatomic to the galactic scale.

Human Being

A human being is defined as a bipedal primate of the species *Homo sapiens* with a highly organized brain allowing complex neural functions, such as language, abstract thinking, introspection, science, and art. This mental capability allows human beings to develop concepts of ethics, morality, and religion.

Life and Death

Life is defined as the process of *self-organization* and self-production of an organism which requires energy. Living beings may interact with their environment by the use of sensory organs and their nervous system. In clinical Medicine, an isoelectric (flat-line) EEG is used as one criterion to diagnose brain death in humans.

Reality

Reality is defined as the conscious perception and neuronal processing of sensory information from the external world and from the internal body.

Knowledge

Knowledge is the genetically determined and individually acquired information about the world and oneself stored in neuronal networks of the brain.

Truth

Truth is a proven or verified fact, principle, or information.

Perception

Perception is defined as the transduction of a physical or chemical stimulus from the external world or internal body via a sensory system, its neuronal processing within the brain, and its conscious perception.

Time

Time is the subjective perception of the interval between two events.

Consciousness

Consciousness is a distinct functional state of the brain which enables neuronal processing of information from the external world and internal body or which is generated by imagination and meditation.

Rationality

Rationality is a measure of consistency in individual thinking and action.

Mystery

A mystery is something not understood or beyond current human comprehension.

Relevant Themes

The question on the mechanisms underlying the processing of neuronal information in the brain, the so-called neuronal code, is currently of central interest in Neurophysiology and in *Neurosciences*.

Cross-References

- [Clinical Neurophysiology](#)
- [Cognitive Neuroscience](#)
- [Electroneurography](#)
- [Free Will](#)
- [Neurophysiology](#)
- [Neuroscience](#)

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Neuroplasticity

- [Plasticity](#)

Neuropsychology

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Related Terms

[Brain and behavior](#); [Cognitive](#); [Religious experiences](#)

Description

In contemporary terminology, neuropsychology is the scientific study of the relationship between

the brain and behavioral functions. Central to its purview is the attempt to first understand and then utilize the way brain activity and structure interrelate with psychological functions, such as mental illness, mood, perception, and cognition. As this suggests, there are loosely two foci or branches of neuropsychology. The first, which some call cognitive or experimental neuropsychology, focuses on understanding how human behavior and mental operations arise from brain activity, such as the way patterns of behavioral deficits can be explained in terms of disruptions to damaged neural components. It tries to understand how the functioning of the brain translates into the everyday behavior of the person, as well as the way changes in thought and behavior relate to the structure and function of the brain.

The second emphasis, perhaps synthetically termed clinical neuropsychology, is concerned with the assessment, management, and rehabilitation of neurological disease and injury. It is this emphasis that makes neuropsychology an applied science because it is concerned with assessing and managing the behavioral expression of the brain dysfunction identified by cognitive neuropsychologists. This includes understanding how the deficits associated with neurological conditions are demonstrated, such as strokes, head injuries, and various forms of dementia. To do this, neuropsychological investigations are used to assess a person's cognitive skills and to identify impairments that result from brain trauma and diseases that affect the brain. Among the tools that are employed are standardized cognitive and emotional testing, electroencephalography, neuroimaging (CT, MRI, fMRI, SPECT, PET), the intracarotid sodium amobarbital procedure (Wada test), and transcranial magnetic stimulation. Of these, standardized cognitive and emotional measures are the most commonly used due to their flexibility, price, and facility for tapping into various cognitive functions, such as memory and language, that correspond to general regions and functions of the brain.

Over the past several years, there have been some significant advancements in the field of neuropsychology. Although single-case studies

continue to provide much of our knowledge about the relationship between brain and behavior, there is a growing interest in group studies, likely related to their greater generalizability. One of the by-products of this has been a loosening of attention on focal brain regions and a greater appreciation for the role of neural networks and systems in human behavior, emotion, and neurological disorders. This has been aided by multiple technological advances. Standard measures of neuropsychological assessment are not only improving in their psychometric properties, including being normed and standardized across age and cultural groups, but they are also becoming increasingly paired with new technologies that allow for observing and rehabilitating neurological processes. These include dichotic listening, lateral visual half-field viewing, staining methods to map connections, and functional imaging to capture a dynamic, three-dimensional (3D) representation of brain activity during specific behaviors in both normal and brain-injured subjects. In a similar vein, virtual reality (VR) is being increasingly used to provide multisensory 3D stimulus environments, advanced methods for recording behavioral responses, and ecologically valid simulations that afford a richer understanding of the brain and more immediate feedback during neurosurgery and rehabilitation. Even the emergence of VR approaches reflects neuropsychology's growing scope, addressing not only diagnosis and assessment but also treatment planning and intervention.

Embracing these advancements, some of the fastest growing areas of neuropsychology are in the domains of forensics, sports, terrorism and law enforcement, and gerontology. Neuropsychologists are being increasingly asked to present and evaluate assessment results in the courtroom, as well as to determine the emotional and behavioral sequelae of brain damage in personal injury and criminal cases. This includes complex evaluations of malingering potential, assessment of competency and responsibility, and the capacity for rehabilitation. The sports arena is relying on neuropsychology to understand sports-related injuries, such as concussions, that have short- and long-term consequences. In our growing

age of terrorism awareness, neuropsychology has contributed to the dialogue about the cognitive operations in terrorism, how the brain reacts to elevated anxiety among law-enforcement officials, and how to facilitate optimal decision-making. Moreover, neuropsychology is responding to the advancing age of the general population. This includes not only assessing, diagnosing, and offering treatment recommendations for those with age-related conditions like dementia or Parkinson's disease but also diagnosing earlier manifestations of these conditions that are not readily recognizable by neuroimaging. Similar to the positive psychology movement, this has contributed to the field's shift away from solely focusing on overt injury toward understanding the features of normal behavior and brain function. In doing so, neuropsychology is adding to our understanding about ways to facilitate optimal quality of life and the capacity to succeed in the present environment.

Self-Identification

Science

Neuropsychology self-identifies as a natural and biobehavioral science. It has deep roots in, and a strong commitment to, the scientific method and the principles of objectivity and replication. Using objective examination, it attempts to describe *what* happens in brain-behavior relationships, predict *when* it happens, use systematic control to understand what *causes* it to happen, and offer explanations for *why* it happens. Most of the research in the field is based on hypotheses that can be rejected and designs that maintain experimental control to exclude unwanted variables. When possible, neuropsychologists attempt to include a comparison sample to observe derivations from the sample, although some of their studies are necessarily quasi-experimental because they cannot ethically or practically manipulate some independent variables. It would be unethical, for example, to give parietal lesions to half of the participants in a study. This does limit the generalizability of some findings, but

neuropsychologists attempt to replicate their results to ensure the accuracy of their observations and findings. Neuropsychology is therefore a dynamic and empirical enterprise, building on and refining older observations while making its knowledge and practices open to revision.

Characteristics

Neuropsychology draws on information from several disciplines, including anatomy, biology, pharmacology, physiology, neurosurgery, psychometrics, and philosophy, with the central goal of developing a science of human behavior based on the function of the human brain. Technically, it is a subspecialty or subdiscipline of psychology, which is the study of the mind and behavior, but neuropsychology narrows psychology's scope by examining how complex properties of the brain allow behavior to occur. Like psychology, it describes, explains, and predicts behavior, but it uniquely seeks to understand how this behavior is related to the activity of the brain.

Similar to clinical psychologists, the training of neuropsychologists often includes methods of psychotherapy, counseling, and assessment. They can also provide therapeutic services to patients in need of education and emotional support concerning their neurological injuries or illness. Where clinical neuropsychologists often differ is that they also have extensive knowledge of the brain, including an understanding of neuroanatomy, psychopharmacology, the use of neuropsychological tests to assess cognitive deficits, and the management, treatment, and rehabilitation of brain impairment. In short, neuropsychology is a unique niche of psychology that studies how changes in thought, behavior, and mood relate to the brain's structure and activity.

Relevance to Science and Religion

Unlike the long history between religion and neuropsychology's parent discipline (i.e.,

psychology), the field of neuropsychology is in its infancy in contributing to the dialogue between science and religion. However, the relevancy of neuropsychology to the science and religion discussion is evident even in its philosophical assumptions about the mind-body problem. Deeply embedded in the philosophy of neuropsychology is an abjuration of Cartesian dualism. Taken to the extreme, this could result in the materialization of religion, demoting it to one of many human behaviors or experiences that can be reduced to specific brain processes. Some neuropsychologists rescue religion from this reductionism by adopting a nonreductive form of physicalism, arguing that the human qualities that are distinct to religion are among other higher-order capacities, like creativity and relatedness, that are emergent properties, larger than the sum of the material parts of the brain. Even with this nonreductive physicalism, the findings of neuropsychology introduce significant challenges to a dualistic view of persons and invite greater discussion about the embodiment of spirituality and religion.

Some of this discussion about the nature of personhood and the relationship between religion and brain was given a fillip when the notion of bimodal consciousness, first introduced by ► [split-brain research](#) on the independent functions of the left and right hemispheres, was proposed as a basis for elaborating on different patterns of belief. This generated greater attention to the neural correlates of belief and disbelief, although it remains unanswered whether a belief in a truth that can be verified is different than a belief in something that is unverifiable.

Following this research has been significant interest in the unavoidable relationship between neurological activity and religious experiences. Something clearly happens in the brain during meditation. Similarly, divine intervention insufficiently explains the increase in religious experiences among those with temporal lobe epilepsy. Unable to ignore these relationships, neuropsychologists have been giving greater attention to both normal religious processes

and those that occur in the context of overt neural pathology.

The latter probably emerged first, as seen in the religious experiences of those with epilepsy, schizophrenia, and other brain diseases. For some time, it has been known that individuals can experience chemically induced religious experiences under the influence of LSD. Long-standing research has revealed that those with temporal lobe epilepsy have a greater propensity than the general population for developing religious experiences, including religious hallucinations and feelings of unity with the external world. Mania and depression can be associated with mood-congruent delusions. It is also not uncommon for the positive symptoms of schizophrenia, particularly hallucinations and delusions, to be infused with religious content and meaning. Despite the religious or spiritual nature of these symptoms, there is little doubt that they are mediated by neuropathological substrates, most likely greater frontal and left temporal activation.

Similarly, there is a clear neurological foundation to the greater levels of religiousness and greater meaning given to spirituality by those with frontotemporal dementia (FTD) (Rosso et al. 2001). This increased religiousness and preoccupation with religious ideas may be one of many behavioral excesses that occur in FTD, alongside hyperorality and hypersexuality. This may be related to the deterioration and atrophy of the orbitofrontal regions that occur in FTD, which leads to a loss of inhibition and a spontaneous release of compulsive and stereotyped behavior, such as hyperreligiousness. Another possibility is that increased religiousness is a by-product of the altered ability to infer one's own and others' mental states, which seems especially related to the degeneration of the ventromedial prefrontal cortex. Many of those with FTD undergo significant changes in their concept of self, including food preferences, dress styles, and even religious ideology. Some of these changes can also be traced to abnormalities in the right frontal lobe, suggesting that normal functioning of the right frontal lobe is necessary

for the maintenance of key aspects of self, including religiousness. This highlights the potentially challenging reality that religion is affected by neurological changes and activity.

It would be easy to look at this research and simply conclude that religion is a secondary by-product to pathological processes or, more concisely, that mysticism is not that far from madness. However, the emergence of a field called "neurotheology," which attempts to identify neural substrates putatively mediating spiritual experiences, has helped shift attention away from pathological manifestations of religion to specific areas of the brain activated during *normal* religious experiences, such as prayer or meditation. For example, a substantial amount of research has implicated a frontal-parietal circuit underlying normal spiritual and religious experiences. When Carmelite nuns were asked to "remember and relive the most intense mystical experience ever felt in their lives," the brain areas that were activated were medial orbital, medial prefrontal, anterior cingulate, and parietal cortices (Beauregard and Paquette 2006). During religious meditation, Franciscan nuns and Tibetan monks showed increased blood flow in prefrontal, inferior frontal, and inferior parietal lobes, commensurate with a marked decrease in the activity of the posterior superior parietal lobe (Newberg et al. 2003; Newberg et al. 2001). Moreover, out-of-body and near-death experiences seem to be related to hippocampal and limbic hyperactivation. Clearly, there are neural substrates to even normal religious experience.

This research raises important questions that neuropsychology and religion will eventually have to address. Should this neurological basis be taken as evidence that our brains are wired for dialogue with the divine? Some have brazenly taken these findings as revelation for a God spot in the brain. If we make this conclusion, what do we do with the finding that religious experience is often the result of neural hyperactivity or an unnatural release of inhibition, rather than a normal manifestation of brain activity at rest? An alternative option might be to co-opt these

findings to argue that all spiritual or religious experience is merely an artifact of neural activity, without any corresponding connection or meaning to some nonphysical entity. Those adopting this approach could argue, for example, that revelations occur on mountains primarily due to the effects of chronic altitude hypoxia on the prefrontal cortex and temporoparietal junction. This conclusion seems unwarranted, though, because, to date, the only research in this area is correlational in nature, showing an *association* between certain experiences and certain brain activities, but not that religious experience is an *effect* of neurological processes. Although there are no certified answers at this point, it is clear that neuropsychology is showing itself to be a tool to aid in understanding theology, religion, and spirituality.

Sources of Authority

The primary source of authority for the field of neuropsychology is scientific research. Our knowledge of the brain and its influence on human behavior is constantly being furthered, challenged, and refined by research studies. This includes empirically derived data from neuropsychological testing, brain imaging studies, and cognitive science, to name a few. Many neuropsychologists place the primary focus on quantitative data, although some notable figures in the field also endorse an approach that incorporates qualitative data (e.g., the Boston process approach).

If the primary source of authority is scientific research, then the principal method for accessing this source is journal articles, particularly recent ones. Although journal articles are given greater authoritative value, books and book chapters can also be helpful resources for reviewing the current knowledge in a particular area of research. Unique weight is given to those that are grounded in scientific or empirical methodology rather than theory alone. Moreover, influential neuropsychologists who have written significant works, such as Alexander Luria (Luria 1976), Muriel Lezak (Lezak et al. 2004), and Edith Kaplan (Kaplan 1988), serve as sources of authority by

the nature of their seminal writings and because their important conclusions are consistently tested and refined.

Ethical Principles

Neuropsychology is guided by the ethical guidelines of the American Psychological Association (American Psychological Association 2002) and the American Medical Association, as well as supplementary publications that pertain to ethical standards for this field. These include such principles as respect for human dignity, professionalism, integrity, and beneficence rather than maleficence toward clients. Competency is a key principle, which includes attaining proper education and training, as well as appreciating the role of cultural context in research and clinical work. It is important for neuropsychologists to avoid dual or multiple relationships that may compromise professional boundaries and misuse the power differential with clients or research participants. Neuropsychologists submit their research to Institutional Review Boards, seek to protect patients' and participants' privacy and confidentiality, and ensure that informed consent is achieved. They also strive to minimize risks to mental or physical health, which includes using measures that are psychometrically sound and that have culturally sensitive norms. To ensure adherence to these ethical principles, neuropsychologists are typically licensed by the Board of Psychology in their respective states and held to the standards of the American Psychological Association's Code of Ethics.

Considering the rapid growth and technological advancement in neuropsychology, a new field has emerged called "neuroethics." This field deals with ethically challenging questions and dilemmas, such as the effects of psychotropic medications on the mind, the determination of mental capacity and informed consent, the rights of the individual versus the interest of society, and issues involving personal identity and sources of meaning. This field will likely continue to guide the development and refinement of the ethical principles in neuropsychology.

Key Values

In addition to subscribing to the highest level of ethical principles, neuropsychology also places a high premium on the values of curiosity, scientific inquiry and rigor, and materialism. To be a neuropsychologist first and foremost requires that one is curious – curious about behavior, emotions, and the interaction between brain activity and behavioral expression. It is this inquisitiveness that cultivates a high level of openness and creativity on the behalf of the neuropsychologist, ideally letting the patient or research findings speak on their own terms. In a sense, neuropsychologists prefer to be the *object* that the *subject* of the patient or research findings impresses itself upon.

This inquisitiveness is given structure and objectivity by the importance placed on scientific inquiry and methodology. Trained in clinical psychology programs, most neuropsychologists aspire to the principles of objectivity, controlled observation, experimentation, confirmation of predictions, statistical analysis, and replication. Experimental control and falsifiability are highly cherished, as well as honesty in reporting and healthy skepticism in both interpreting and writing. Such a reliance on scientific methodology as the primary method of epistemology may eclipse other methods of knowing, such as insight or experience, but those in this field are often willing to forego this knowledge to avoid false-positive conclusions and to secure the greater control and caution that are garnered by scientific principles.

Most of neuropsychology is also infused with a high level of ► [materialism](#). Even in its early forms, neuropsychology emerged out of a reaction to nonmaterial explanations of human behavior and emotion, be they religious or environmental. Deep within the core of this field is an attempt to seek knowledge about the material world of the brain and to localize brain disease and psychiatric problems within the physiology, structure, and networks of neural functioning. Consequently, most research questions and findings are viewed through the lens of materialism.

Conceptualization

Nature/World

Nature/world are primarily conceptualized as being naturalistic and physicalistic. In other words, they consist of material things that can be understood using the scientific method. From a neuropsychological perspective, this includes internal neural activity, such as brain-behavior relationships and emotional and cognitive processes, as well as the external physical environment with which this neural activity interacts.

Human Being

Most neuropsychologists conceive of the human being as a material and physical entity. As previously mentioned, when confronted with the mind-body problem, neuropsychology predominantly champions materialism and a bottom-up view of human behavior and mental activity. In other words, the aspects and characteristics that distinguish someone as human are largely neurological and the sum of the parts. There may be emergent properties that cannot be reduced to individual neurological elements, such as morality and the capacity for relationships, but many neuropsychologists struggle with this view because it introduces an unknown and unobservable element that is contradictory to their values of empirical testing and falsifiability.

Although all parts of the brain likely contribute to the essence of humanness, particular attention is often given to the frontal lobes and the prefrontal cortex. This is because the frontal lobes are the last region of the brain to develop, both from an evolutionary and ontogenetic perspective. They are the final and most advanced region of the brain, which most likely evolved to guide organisms toward selecting the behaviors that confer the best chances of survival. It is this region that is intimately involved in personality, emotion, information processing, language, and executive functions (e.g., abstraction, planning, inhibition), all of which constitute the unique cognitive and neurological features that distinguish us from nonhumans. Inherent in this is an evolutionary perspective, implying that humans have evolved from nonhuman species and that

their basic neurophysiology and neuroanatomy give rise to those features that distinguish humanity.

Life and Death

Put simply, life is the presence of neurological and cardiovascular activity, born of evolutionary processes. Death, in contrast, occurs in two forms. On a microlevel, there can be neuronal and synaptic death that occurs during normal cognitive aging and/or brain injury. The macroform of death is the complete cessation of these neurological and cardiovascular processes.

Reality

Reality corresponds to the objective state of the external environment. Humans gain information about reality primarily via sensory experience and develop cortical maps, or internal representations, of reality. Distortions in a person's understanding of reality can occur when there are disruptions in neural processing, as commonly manifested in the delusions of those with schizophrenia.

Knowledge

Knowledge is the accrual or combination of both learned and innate information. The acquisition of knowledge involves long-term potentiation and the strengthening of synaptic connections. Once acquired, knowledge is retrieved from different areas of the brain, primarily in the temporal-parietal-occipital regions, depending on the category or type of knowledge. Knowledge is then expressed through language or demonstrated by motor behaviors.

Knowledge also has a complex and interwoven relationship with intelligence. Many neuropsychologists conceptualize intelligence as the way one applies knowledge to a variety of scenarios and problems in life. However, it is also recognized that there are different forms of intelligence, ranging from fluid and crystallized intelligences to a wide range of abilities and skills, including musical, bodily kinesthetic, linguistic, and interpersonal intelligences. Therefore, knowledge and intelligence are not interchangeable concepts; rather, intelligence is the application of all sorts of knowledge to the vicissitudes of life.

Truth

Absolute truth cannot be fully known or discerned. Using scientific findings about brain-behavior relationships, it is possible to only gain successively closer approximations to truth. Neuropsychologists deal with hypotheses, theories, and data, which must be verified repeatedly and statistically with a large, representative sample. Even when findings or ideas meet these criteria, they are always regarded with a healthy dose of suspicion based on the possibility of subsequent studies supporting inconsistent findings. As a result, the closest we can approximate truth is through the aggregation of repeatedly verified scientific findings.

For the individual, truth is often relative and defined through attributional processes that are linked to specific neurological pathways. To a certain extent, truth is the result of a neurally based schema or interpretation system through which events and experiences are filtered. As a case in point, some individuals with dysregulated brain functioning (e.g., Korsakoff's syndrome) will confabulate or generate false narratives that they hold as truth. Others, like those with Parkinson's disease, may have visual hallucinations accompanied by difficulty differentiating between real events and internal representation of events.

Perception

Neuropsychology recognizes that sensation and perception are inextricably intertwined. In their simplest form, sensation refers to the neural detection of stimuli, whereas perception is the interpretation of those stimuli. Perception helps to make conceptual sense of what the senses have detected. It can happen in response to external stimuli, such as a traffic signal, or internal stimuli, such as a rapid heartbeat. In both of these cases, the stimuli are first detected and then interpreted. A red traffic light might be interpreted as an indication to brake one's car, just as a rapid heartbeat might indicate nervousness or physical exertion during a workout. Perception refers to this interpretational process, which involves many different streams of processes in the brain, depending on the nature of the stimulus.

Distortion of these normal perceptual processes can be caused by multiple factors, such as hallucinogenic drugs or the chemical imbalances in the brain that accompany some neurological disorders, such as schizophrenia.

Time

Neuropsychology's concern with the subject of time centers on the internal perception and representation of time intervals. Time perception involves many different cortical systems working in parallel, including sensory-perceptive and semantic processing governed by an integrated web of neural systems involving the basal ganglia, cerebellum, and hippocampus. Some mechanisms are specialized to detect and estimate shorter time intervals, while others are specialized for longer time durations. Memory is also involved in the detection and recall of the passing of time; working memory is necessary for shorter intervals, whereas episodic and long-term memories are required for longer intervals. Moreover, the accuracy of time discrimination may depend on neurological functioning, as reflected in the differences in time accuracy between normal and psychiatric populations.

Consciousness

Consciousness refers to a general alertness or awareness, which emerges from the intersection of various cognitive functions, including arousal, perception, attention, and working memory. Several automatic behaviors occur below the threshold of consciousness, such as breathing and eye movement, since there is no awareness or voluntary effort required to control these processes. Attention is therefore necessary in order for a stimulus to break into consciousness. This may be why greater attention and a higher level of consciousness are elicited in the presence of novel and/or unexpected stimuli. Among the areas critical for consciousness are the prefrontal cortex and anterior cingulate, although there are specific neurotransmitters and other brain processes that are necessary for conscious awareness.

The field of neuropsychology also appreciates distinct forms of consciousness, ranging from

comatose to different stages of sleep. Each level is associated with various brain wavelengths and a unique system of neural mechanisms. For example, beta waves are associated with alert wakefulness, whereas delta waves are found during stages three and four of sleep. Sleep, as a state of consciousness, is regulated by many neural mechanisms that work in synchrony, including the secretion of melatonin by the pineal gland. Conscious experience can also be altered by hallucinogenics that act upon and disrupt the usual functioning of neurotransmitter systems.

Rationality/Reason

Rationality is an epistemological approach to knowing the world. It involves logical thought procedures to process information, solve problems, and make decisions, with both inductive and deductive reasoning being key components. The prefrontal lobes, particularly the left inferior and middle frontal gyri, are involved in rational thought, as well as the bilateral frontal, parietal, and occipital cortical regions. A decrease in acetylcholine may contribute to impaired reasoning abilities. Therefore, rationality is not only a way of knowing, but it can also be linked to specific cognitive processes and areas of brain activation.

Mystery

Neuropsychology generally conceives of mystery as the occurrence of experiences and events that do not match known physical or natural laws. Sometimes, these experiences violate known expectations concerning the nature and behavior of physical objects. At other times, they simply extend beyond the known principles that govern the natural world, particularly the explanatory power of the brain. If pressed, the majority of neuropsychologists would argue that laws actually exist to explain these events and experiences but that we simply have not found or explicated them yet.

Perhaps more important is the actual neurological mechanisms involved in the way humans respond to mystery. When encountered with counterintuitive or mysterious phenomena, the brain assigns significance or meaning to the

events. The frontal lobes in particular may be wired with an agency-detection mechanism that is ready to be triggered by novel and unusual information as a way of imputing causality to events. They are also responsible for our theory of mind, namely, the process by which we attribute complex mental representations of intentional mental states to other agents and persons. Activation of the frontal lobes may therefore stimulate the release of personally salient mental representations or cognitive schema that has distinct specifications about causal relations. The actual schema that is activated may depend on one's existing knowledge and belief systems. Some may attribute the mysterious phenomena to coincidence and others to divine intervention.

As this suggests, neuropsychology grants a place to mystery, conceiving of it as events, brain activity, or natural laws that are currently inexplicable but that will likely be explained when our knowledge of the natural and neurological world improves.

Relevant Themes

As the field of neuropsychology continues to grow, more themes and questions are coming available to those in the science and religion engagement. One emerging and salient issue is the actual *effect* of religion and spirituality on brain activity. A substantial amount of literature has been devoted to the relationship between religion and mental health, but the next step seems to involve examining how this relationship impacts actual brain systems. For those afflicted with brain diseases, religion appears to enhance coping and recovery, but does this translate into actual brain changes, and in what way? If these changes in metabolism or neurotransmitter activity do appear, is it also possible to identify the negative effects of destructive forms of religious belief?

A related theme is the way that humans make meaning. Religion is generally a meaning-making enterprise, so a better understanding of religion may be found in continuing to explore and identify those neural substrates involved in

attribution, inferring agency, and constructing a narrative that provides purpose and meaning. This exploration may provide an entryway into further studying the brain systems underlying morality, which itself will invite difficult discussion about the ethics of rehabilitation and repairing disrupted morality, as in the case of those with antisocial tendencies. Behind this may even be a debate about the entire conception of freedom of will and original sin. It seems important that any discussion of sin should consider the impact of brain activity on behavior.

Finally, there are ongoing discussions about multiple methodological issues that continue to need attention. These include understanding how to best operationalize and measure spirituality and religion, as well as understanding which neuropsychological tools are optimal for examining religious or spiritual variables. As these themes suggest, neuropsychology has a unique contribution to the leading edge of the science and religion conversation.

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Neuroradiology

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Related Terms

Diagnostic neuroradiology; Interventional
neuroradiology

Description

Neuroradiology is a medical discipline devoted to diagnose diseases of the central nervous system, nerves, and muscles in the living human being with imaging techniques, and to treat diseases that can be approached trans-vascular with catheters or percutaneous with needles in close collaboration with Neurology and Neurosurgery. The development of Neuroradiology is connected to the development of imaging and interventional techniques mainly based on x-ray or magnetic resonance techniques. During the first half of the twentieth century, above all, Neurosurgeons were interested to improve the safety and efficacy of their operations by visualizing the pathology that they were going to treat. W. Dandy (1886–1946) had the idea to use air as contrast agent within the cerebrospinal fluid spaces and developed the air encephalography (i.e., indirect imaging of the brain by filling the intracranial fluid spaces with air via a needle), and myelography that showed the shape of the air-filled cerebral ventricles and cisterns allowing checking for compression and shifting by space occupying processes (Davidoff and Dyke 1937). E. Moniz (1874–1955), a Portuguese Neurologist, developed contrast agents that allowed studying the blood circulation through the brain by means of x-ray technique (Cerebral Angiography). Later, other and less toxic contrast agents were developed that allowed the visualization of the spinal

canal (myelography) and cranial cisterns and making cerebral angiography safer. In parallel, x-ray technology improved over time. The most important step with considerable impact on Neuroradiology was the invention of computed tomography by G. Hounsfield in 1972. Computed tomography (CT) revolutionized x-ray technology by exactly measuring the x-ray attenuation of tissues and by the application of computer capacity that calculates repeated attenuation measurements allowing the visualization of soft tissues in a three-dimensional space. For the first time, physicians could see and evaluate the brain and spinal cord and its pathology. Only a few years later, the physical principle of nuclear magnetic resonance – known since 1946 – was applied to medical imaging and achieved images of human tissues with high spatial and contrast resolution. Since then, magnetic resonance imaging (MRI) became the imaging modality with the best potential to explore brain function and pathology, a development that is not yet final (Damadian et al. 1977) (► [Neuroimaging](#)).

Since 1980, the development of microcatheters and other devices allowed approaching the brain and spinal cord via arteries and veins. With this technique, the treatment of stenotic and occluded arteries with the risk of stroke became possible. Moreover, Neuroradiologists now use catheters to treat the sources of intracranial bleeding like aneurysms and arteriovenous malformations and to embolize tumors before surgery in order to reduce the risk of bleeding. With the support of CT, Neuroradiologists learned to exactly puncture sites around the spinal cord in order to take biopsies or inject drug, e.g., for pain relief.

In addition to Neurosurgeons, Neurologists and Radiologists specialized in imaging techniques and interventions for the diagnosis and treatment of the central nervous system. Neuroradiology became finally a subdiscipline of Radiology in many countries like in Germany, but has gained the status of an independent medical specialty (discipline) in some countries like Portugal. In contrast to general Radiology, Neuroradiology focuses on a single organ, the nervous system and muscles, its development, function, pathophysiology, pathology, and

diseases, and is free to apply the most appropriate techniques for research, diagnosis, and treatment.

Self-Identification

Science

Neuroradiology is in its essence applied natural science. Neuroradiologists need to acquire a deep understanding of the anatomy, development, and physiology of the nervous system in order to learn about the law of nature that rules neurological function and diseases. In addition, Neuroradiologists need to critically appreciate the methods they use to observe the nervous system under normal and pathological conditions. This requires open-mindedness, very careful, and unbiased prospective observations with the test of hypotheses, and experience in the methods applied. Neuroradiologists are trained in the use of different imaging modalities, know its limitations, and can thus give a valid and reliable interpretation of medical images that help to understand the function and dysfunction of the nervous system, to predict further disease development and the effect of specific treatments.

Characteristics

Neuroradiology shares similar aims with Neurology ► [Neurology in Europe](#), Neurosurgery ► [Neurosurgery](#), Psychiatry, and Radiology. It is distinct among these disciplines by combining deep knowledge and experience in medical imaging with its application to the special requirements of the nervous system, thus allowing the exploration of nervous function and diseases.

Relevance to Science and Religion

The development of functional neuroimaging including the imaging of focal metabolic changes in association with special brain functions and the imaging of connectivity between brain areas is

highly relevant to the area of “Science and Religion.” The timing of visualized brain function and action, e.g., has provoked questions about the freedom of will.

Sources of Authority

In 1929, C. Dyke became the first full-time American Neuroradiologist and published a classic text on pneumoencephalography. M.M. Schechter developed a completely independent Neuroradiological Unit at St. Vincent’s Hospital in New York. With the support of the National Institute of Neurological Diseases and Blindness, training programs in Neuroradiology were established under Schechter and J. Taveras in 1960. J. Taveras, together with J. Wood, wrote the standard text, *Diagnostic Neuroradiology* in (Taveras and Wood [1964](#)), and became later the first editor of the *American Journal of Neuroradiology*. Now, textbooks on Neuroradiology are available in different languages (Jansen et al. [2008](#)). At the university level, Neuroradiology is now organized in independent departments or divisions in Europe and the United States of America.

Ethical Principles

Neuroradiology is guided by the same ethical principles as other medical disciplines that are the Oath of Hippocrates and the Helsinki declaration of “Good Clinical Practice.” Practice in Neuroradiology follows established guidelines and standard operation procedures based on evidence.

Key Values

The key values of Neuroradiology are the training in reliably interpreting medical images of the nervous system and the experience in guiding catheters into the diseased vasculature of the central nervous system to enable treatment with minimal invasion.

Conceptualization

Nature/World

A Neuroradiologist conceptualizes nature in its broadest sense like other Neuroscientist as equivalent to the material universe or the material world. Manufactured objects and human interactions generally are not considered part of nature. Nature ranges in scale from the subatomic to the galactic and follows laws that can be detected and used to understand nature and the causal relationships within the material world.

Human Being

Human beings are part of nature and here primates in the family Hominidae. Human beings differ from other living creatures in having a highly developed and complex brain, capable of abstract reasoning, introspection, language, and problem solving. Research in and treatment of human beings by human beings require respect and ethical considerations.

Life and Death

Life is a process of organisms, capable of growth and reproduction. Death is the end of life. Neuroradiology helps to determine whether the diseased brain of human beings is irreversibly injured and whether the patient has a chance of survival.

Reality

Reality includes everything that is existent. Neuroradiology as a natural science helps to describe the reality of the nervous system and to reject concepts of nervous function that are not existent.

Knowledge

Knowledge is expertise and skills acquired by a person through experience and education involving perception, learning, communication, association, and reasoning that are complex cognitive processes, which could be followed by imaging in the future.

Truth

Truth is the agreement with reality, on which a Neuroradiologist will rely on. Neuroradiology

as a natural science seeks to define the laws and conditions that rule the nervous system.

Perception

Perception is the active process of attaining awareness or understanding of sensory information ► [Perception](#). Neuroradiology can image structures that enable and process perception, assesses causes of disturbed perception, and contributes to the question which sensory stimuli are realized.

Time

Neuroradiologists rely on the Newtonian time, considering time as part of the fundamental structure of the universe, a dimension in which events occur in sequence. Neuroradiologists use time to sequence events, to compare the duration of events and the interval between them, and to quantify the motion of objects like the blood flow through the brain.

Consciousness

Consciousness is a mental state that allows the perception of the self in relation to other human beings and the universe. Components of consciousness are thoughts, inner language, sensations, perceptions, moods, emotions, dreams, and self-awareness. Neuroradiologists have to deal with patients who have lost consciousness. A loss of consciousness is a symptom of severe brain disease that should be diagnosed as soon as possible in order to avoid permanent brain damage.

Rationality/Reason

Neuroradiology as a natural science is devoted to rationality in the sense of logical validity in understanding nature and its underlying conditions and laws.

Mystery

Mystery as something unexplainable does not exist in the reality of Neuroradiologists. If confronted with a “mystery,” Neuroradiologists like other natural scientists will seek an explanation for this phenomenon ► [Rationality \(philosophical\)](#).

Cross-References

- [Neuroimaging](#)
- [Neurology in Europe](#)
- [Neurosurgery](#)
- [Perception](#)
- [Rationality \(Philosophical\)](#)

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Neuroscience

- [Neurology in Asia](#)
- [Neurology in Europe](#)

Neuroscience of Religion and Spirituality

- [Neurotheology](#)
- [Psychology of Religion](#)

Neurosurgery

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Description

Today neurosurgery is dedicated in offering detailed surgical therapeutic regimens for the clinical

syndromes caused by diseases affecting the brain, spinal cord, and nerves. Already in Persia, Egypt, Greece, Arabia, and North Europe neurosurgical procedures were performed since more than 10,000 years. The purpose for surgery in ancient times had been for medical or religious reasons. The second half of the nineteenth century was the beginning of modern neurosurgery. The demands for establishing modern neurosurgery were the possibilities of general anesthesia, asepsis, and correct localization of functional areas in the brain. These demands were fulfilled in the second half of the nineteenth century: In 1846, first operation was performed under general anesthesia (JC Warren, WTG Morton), asepsis, by intensive cleaning of the surgeon's hands with soap (J Semmelweis), possibility of exact localization of certain brain areas:

- Sensory motor region (J Rolando)
- Localization of language functional areas (PB Broca, C Wernicke)
- Focal motor seizures (JH Jackson)
- Direct electrical cortical stimulation in awake dogs (G Fritzsche, E Hitzig)

Pioneers in neurosurgery were surgeons and neurologists focusing on surgery of the central nervous system. The leading countries were Germany and England. The names of these pioneers were Ernst von Bergmann, Victor Horsley, Fedor Krause, and Otfried Förster. Ernst von Bergmann wrote the first book on neurosurgery in 1887, *Die Chirurgische Behandlung von Hirnkrankheiten*. Fedor Krause in Berlin used electrophysiological examinations to identify cranial motor nerves during surgery of the cerebellopontine angle in 1899, and he was able to identify first the facial nerve and the current spread through the cerebrospinal fluid intraoperatively. Despite the leading role of German surgery during the Gründerzeit (1920–1961), the development of neurosurgery, during that period, happened in the USA. Harvey Cushing is regarded as the founder of neurosurgery because he founded the first school of neurosurgery in the world. Therefore he was elected and nominated being “The Neurosurgeon of the first half of the twentieth century” by the world federation of neurosurgeons. In the first half of the

twentieth century, the development of neurosurgery went parallel with neurology. Milestones in the development of modern neurosurgery were:

- 1920: foundation of the American Society of Neurological Surgeons
- 1926: foundation of the first European Society of Neurosurgery in England
- 1936: founding of the first scientific magazine on neurosurgery in the world “Zentralblatt für Neurochirurgie” by Wilhelm Tönnis (1898–1978)
- 1950: foundation of the “Deutsche Gesellschaft für Neurochirurgie” (DGNC) in Bonn
- 1951: introduction of the specialist title “Facharzt für Neurochirurgie” in Niedersachsen
- 1956: introduction of the specialist title in all German countries
- 1961: introduction of microneurosurgery by using a operations microscope by T Kunze and SB Doyle
- 1966: first microneurosurgical clipping of an intracerebral aneurysm by JL Pool and RP Colton
- 1972: computed tomography
- 1978: magnetic resonance tomography
- From 1990: neuronavigation

For his achievements in microneurosurgery, Mahmut Gazi Yasargil (July 6, 1925) was elected and nominated as “The Neurosurgeon of the second half of the twentieth century” by the world federation of neurosurgeons.

Throughout Europe, Neurosurgery became a discipline in its own right in the middle of the twentieth century, was treated as a separate entity distinctly from other surgical disciplines such as general surgery or cardiac surgery and other disciplines covering diseases of the brain like neurology, psychiatry, and internal medicine. This development started in the university hospitals followed by the establishment of separate Departments of Neurosurgery in most major community hospitals in the second half of the twentieth century. In Europe and USA, there are about 3,000 neurosurgeons each. Modern Neurosurgery has benefited from advances in imaging. Until the beginning of the 1970s, no direct visualization of the brain tissue was available. The instruments

of visualization of cerebral structures until then were angiography and pneumoencephalography. Since the second half of 1970s, direct visualization of brain tissue was possible by computed tomography (CT), magnetic resonance tomography (MRT), positron emissions tomography (PET), and magnetoencephalography (MEG). Since the end of 1980s, even functional activity of the brain could be visualized by PET, MEG, and MRT. At the end of the nineteenth century, brain functions like motor functions could be already identified by direct electrical stimulation and visualization of the evoked phenomena (Moller 1995). This was pioneered for the broad range of human brain functions by Otfried Foerster (1873–1941) in Breslau. Because of the development of the y-knife by Lars Leksell from Stockholm in the 1950s radiosurgery is possible since 1967. These innovative advanced techniques allow neurosurgeons to treat tumors and vascular malformations without opening the skull of the patients. In the last 20 years, recent developments in endovascular therapy, like the coiling of aneurysms, enable the treatment of cerebral aneurysms without opening the cerebral skull for clipping aneurysms. Neurosurgery treats diseases of the brain, spine, and peripheral nerves. Topics are:

Neurotraumatology: Treatment of traumatic lesions of the head and neck, spine and peripheral nerves by trepanation and hematoma removal, reconstruction surgery of the skull or spine or peripheral nerves, including intensive care medicine.

Neurooncology: Treatment of tumors of the brain, spine, and peripheral nerves, including tumors of adjacent structures like dura mater and bone tissue by resection, biopsy, endoscopic surgery, radiosurgery, and chemotherapy (Yasargil 1993).

Vascular Neurosurgery: Treatment of vascular malformations like aneurysmata, angiomas, vascular occlusion syndrome including ischemic stroke by resection, clipping, endovascular coiling or glueing, plaque removal and bypass surgery (Yasargil 1993).

Functional Neurosurgery: Treatment of movement disorders, therapy resistant epilepsy,

severe psychiatric disorders, central pain syndromes (Lozano 2009).

Surgery for development abnormalities like hydrocephalus, spinal dysraphic disturbances, and others.

Spine Surgery: Removal of herniated intervertebral herniated disk prolapses, spinal stenosis, spinal tumors, spinal vascular malformations, and affection of the stability of the spine.

Peripheral Nerve Surgery: Therapy of nerval entrapment syndromes, tumors of nerves and nerve sheaths, nerval reconstruction.

Therapy forms are Macroneurosurgery, which is neurosurgery as it is used since ancient times. The skull will be opened (trepanation) by stone or metal instruments. Surgery is performed under direct visualization without microscope or other devices to improve the visual perception of the surgeon; Microneurosurgery, ► [Stereotactic Surgery](#), Radio-surgery, Vascular Neurosurgery, Spinal Neurosurgery, Neuroablation, ► [Neuromodulation](#), ► [Neurotransplantation](#), Restorative Neurosurgery.

Self-Identification

Science

Neurosurgery has self-identified, from its very beginning, as a natural science. It sees itself located in a certain scientific area between the field of surgery and neuroscience. The aim of neurosurgery is to enhance the knowledge about the organization and function of the human nervous system as well as their disease-related abnormalities as a basis for surgical strategies to treat diseases of the nervous system. The concepts of understanding the human brain were developed by comparison studies between neurological deficits and neuropathological examinations of the same persons before and after their death. Clinical investigations in experimental animals could enlighten many questions on neurofunctionality. But higher cognitive functions like language and memory for example had to be examined in pre-, intra-, and

postoperative comparison studies following neurosurgical procedures from the nineteenth through the twentieth century until now. Intraoperative examinations could be performed under general anesthesia for motor functions but other functions like sensory functions needed the so-called awake surgery. During awake surgery procedures the skin and the skull of the patients were opened under local anesthesia and examinations took place by using direct electrical stimulation of the human cortex and visualizing the evoked motor phenomena. Higher cognitive functions like language and speech could be identified by electrical inhibition of the function by electrical stimulation of brain areas activated by specific tasks. Otfried Förster introduced that method to the armamentarium of neurosurgery already in the 1930s. Even surgical procedures to alleviate the shaking palsy and other motor symptoms of the Parkinson's disease in the last 60 years gave as deep insights in motor functions of the human brain as gained by experimental animal studies and neuropharmacological studies. Neurosurgical experimentations and neurosurgical studies add scientific information to the field of neuroscience as the fields of neurochemistry, for example. Surgical strategies and methods were evaluated for its content and value for treatment of patients in prospective studies, very often in prospective randomized blinded multicenter studies. This approach let to a broad spectrum of powerful options for the treatment of neurological diseases.

Characteristics

Neurosurgery is distinctive among other specialties of Medicine:

Neurosurgery concentrates on surgical cure or therapy of diseases in and around neuronal tissue. The neurosurgeon faces different causes for therapy. It can be originated in traumatic, oncologic, vascular, neurodegenerative, or malformed circumstances in its development. The decisive moment is the necessity of a surgical intervention; otherwise, severe

damage to the health or life of a human being is apparent. The second decisive moment is that the problem being treated is originated in or around neural tissue like the brain, spinal cord, or nerves. These two effective stages define neurosurgery and distinguish it from other surgical or medical disciplines.

Relevance to Science and Religion

Neurosurgery was and is able to give fundamental information on clinical and basic neuroscience research. It attracted the interest of the world medical community, while trying to identify cerebral functions by intraoperative examinations, for example, in awake surgeries. Most recently attempts have been made by comparison of intraoperative findings and functional neuroimaging to bridge the gap between human brain physiology and cognitive and emotional control of behavior, decision making, communication, and metaphysical experiences. This interdisciplinary discourse between the neurosciences and the humanities is still in its beginning.

Sources of Authority

Authoritative sources in neurosurgery are reputed textbooks, reference books, publications, peer-reviewed scientific papers containing results of prospective randomized blinded studies, the guidelines for good medical practice and evidence-based medicine, and of course the authoritative guidelines of the Medical Societies of neurosurgery, such as the European Society of Neurosurgery or the American Society of Neurosurgery.

Ethical Principles

Neurosurgery is guided by the oath and law of the ancient Greek physician Hippocrates (born 460 B.C.) who is considered the so-called father of medicine. This “Hippocratic Oath” has been

supplemented by the rules of the Declaration of Helsinki of 1971. Now the local, national, and international ethical committees such as the European Ethical Committee are allowing and controlling every study concerning medicine and patients. For animal studies the National Ethical Animal Committee is allowing and controlling every experimental animal study.

Key Values

Compared to other nonsurgical disciplines neurosurgery has the advantage of acute and immediate medical observations and results which are able to give hints or ideas concerning the neuronal functionality and functional distribution in humans. Without the comparative findings between neurosurgery and imaging modalities like functional imaging, it would have been impossible to gain the exhaustive amount of knowledge till now.

Conceptualization

Nature/World

Nature is the entirety of life and matters attending a concrete system of laws.

Human Being

The human being is the most evolved being on earth and is also the only representative of his species (*Homo sapiens*).

Life and Death

Life is determined by cellular activity. It is identified by cellular anatomy and interaction of the cellular organelles. Just amino acids do not make life but amino acids are parts of living systems. Cell groups are able to form an organism with specialized cells in function. All cells are dividing by that the system is growing following a special program and time frame. Death is the cessation of cellular function. The cell will be destroyed chaotically (like in fire) or systematically like in the process of apoptosis where parts of the destroyed cells will be used again.

In human beings we define two forms of death. The first form is characterized by cessation of all cellular activities by stopping nutritive circulatory actions to the whole system causing autolysis of the whole system. The second form of death is the brain death. Here the nutritive circulatory function is still efficient working but the system of cognition and emotion (supratentorial brain and most parts of the brainstem) has stopped its function and the human being is unable to regain consciousness in the future.

Reality

Reality is the world's nature around us as it appears, the life existence in a concrete space at a given time opposite to illusions, dreams, ideas, desires, and feelings.

Knowledge

Knowledge is the understanding of the world reality but is also the experience, the intuition, the conscience, the education, and the instruction. Knowledge is the capacity of creating a concept and analyzing a thought.

Truth

Truth is the knowledge of the reality, excluding errors and conjectures. The truth for a human being is perceptible in the moment where his brain-mind gives his assent.

Perception

Perception is everything happening and coming to one's senses within a time frame of 3 s. Information entering human brain by the five senses are short in duration. The time frame is mostly within a single second or up to a few seconds. If there is no input to the human brain, then this will reset the state of information every 3 s. Because of that the actual being is defined as now in a frame of 3 s. What happened before is the past. What happens later is the future.

Time

Time is a construct like a neuronal network. Astronomy defined a complete cycle of the earth around the sun a year.

Consciousness

Consciousness is the state of intercommunication of a physical being with its surrounding world.

Rationality/Reason

Rationality is a form of human behavior. A human being acts in the way the society demands to. Rationality is in some time an unaccountable and a responsible act. For example a neurosurgeon should remove a brain tumor and not the brain.

Mystery

Mystery is how it happened that a huge cluster of cells has formed organisms and structures like the brain. Each acting and cognitive system runs parallel with little situations of damage to other systems. For example it is a mystery that we are driving in different lanes with high speed on the motorways without collisions every few meters?

Relevant Themes

Neurosurgery is the attempt to cure or influence mechanically brain and nervous dysfunctions and diseases. The process of research to understand brain functions is still ongoing and will be never ending. Neurosurgery is capable to change brain functions of human beings or animals in many ways. Neurosurgery is able to destroy or change the will, the emotions, the perception, and behavior of beings. Because of the responsibility for human beings treatment by neurosurgeons must be governed by ethical rules to help patients regain their quality of life without negative changes in their being and in their personality.

Cross-References

- ▶ [Anesthesiology](#)
- ▶ [Clinical Neurophysiology](#)
- ▶ [History of Medicine](#)
- ▶ [Neuroimaging](#)
- ▶ [Neurology in Europe](#)
- ▶ [Neurosurgery](#)
- ▶ [Science and Religion](#)

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Neurotheology

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Related Terms

[Neuroscience of religion and spirituality](#)

Description

Neurotheology is an emerging discipline that integrates religious and spiritual concepts with neurological and neuropsychological analyses. Thus, both the neurological and theological perspectives must be considered if one is to find the best way of understanding both the human brain and how that brain perceives and experiences religion. Clearly, one of the initial problems with neurotheology as a field is the use of “neurotheology” as a term (Newberg 2010). Too often, the term “neurotheology” has been used inaccurately or inappropriately. Many times, it appears to refer to a study or idea that incorporates neither neuroscience nor theology. Strictly speaking, neurotheology refers to the field of scholarship linking the neurosciences and theology. Neuroscience would thus refer to the empirical study of the central nervous system or brain, and theology would refer to the critical and

rational analysis of a particular religious belief system, specifically one pertaining to God. Of course, both the terms “neuroscience” and “theology” have evolved over time. Neuroscience used to imply the study of nerve cells and their function without a clear regard for behavioral and cognitive correlates. Neuroscience today tends to reach over many different fields including cognitive neuroscience, neurology, psychiatry and psychology, and even social behavior. The tools have also become more advanced including a number of functional brain imaging capabilities for exploring the translational relationship between the brain and various cognitive, emotional, and behavioral processes.

Theology has also changed over time. In a very strict sense, theology is the study of a *theos* or God. Thus, the word “theology” should be reserved for theistic traditions only and, even more specifically, from those arising out of the Greco-Jewish tradition, i.e., Judaism, Christianity, and Islam. However, with the development of comparative theology in the early part of the last century, it became apparent that the nontheistic Eastern religions possessed many of the formal characteristics of the classic Western religions. It became academically fashionable to use the term “theology” for the formal study of any belief system centered on an Ultimate or Absolute, whether theistic or nontheistic. It is now acceptable to speak of a theology of Buddhism, a theology of Hinduism, and even of a theology of Shamanism.

Within each religious tradition, the word “theology” can be used in two senses – natural theology and theology proper (or dogmatic theology). Natural theology is not really theology at all but rather a branch of philosophy. It attempts to prove, or at least prove probable, the existence in reality of God or the “Absolute” by reason alone, without any appeal to Divine Revelation (in the West) or to fairly rare esoteric experiences (in the East). Theology proper represents intellectual deductions from a foundational story or myth (i.e., the primary myth upon which the religion is based) as well as “reasonable” extrapolations upon such a myth. Such extrapolations may also involve the employment of analogical

reasoning and symbolic logic that does not necessarily neatly fit within a logical reasoning pattern. Eventually, theology becomes a process of reflecting upon the way individuals of a particular religion should live out their faith. Depending on how it is applied, neurotheology may be of use in both natural theology and theology proper. The possibility that neurotheology may help to “prove” or “disprove” the existence of God should at least be considered, although this might be quite difficult. Neurotheology may also inform scholars regarding the process of theology proper to help better elucidate how and why human beings come to specific beliefs and understandings about religion and God.

Neurotheology should not be limited to only neuroscience and theology. In reconsidering the term “neurotheology” then, it seems appropriate to allow for expanded uses of the “neuro” component and the “theology” component. It would seem appropriate for neurotheology to refer to the totality of religion and religious experience as well as theology. This ability to consider, in a broad scope, all of the components of religion from a neuroscientific perspective would provide neurotheology with an abundant diversity of issues and topics that can ultimately be linked under one heading. As we shall see, the neurosciences also must be considered in a broad scope to include not only what goes on within the human brain but within the human body as a whole. Furthermore, since mental processes are intimately linked to the brain, the “neuro” component of neurotheology should be considered to include psychiatry, psychology, endocrinology, as well as other macro- and micro-perspectives of the neurosciences. One might even consider variations on the theme of neurotheology to include other hybrid terms such as “neurospirituality,” “psychotheology,” or “biotheology.”

Self-identification

Neurotheology as Pertaining to Science

Neurotheology constitutes a wide variety of scientific endeavors that include cognitive

neuroscience, functional neuroimaging, psychology and behavior, and anthropology (Newberg 2010). With these fields in mind, there are a number of scientific approaches to measuring different aspects of religious and spiritual phenomena. Objective measures of religious and spiritual phenomena that pertain to the neurosciences include a variety of physiological and neurophysiological measures. Recent advances in fields such as psychoneuroendocrinology and psychoneuroimmunology address the important interrelationship between the brain and body (Damasio 1994; Gazzaniga 2000). While this can complicate measures as well as introduce confounding factors, this integrated approach allows for a more thorough analysis of religious and spiritual phenomena.

Several types of measures which have already been reported in the literature include measures of autonomic nervous system activity. These are the most common approaches to specific religious and spiritual practices such as meditation or prayer. A number of studies have revealed changes in blood pressure and heart rate associated with such practices. It is interesting that the actual changes may be quite complex involving both a relaxation as well as an arousal response. Measures of hormone and immune function have more recently been explored especially as an adjunct measure to various clinical outcomes.

Neurophysiological changes associated with religious and spiritual states can be obtained through a number of techniques that each have their own advantages and disadvantages. In general, the primary requirement is that the methodology evaluates functional changes in the brain. However, there are many ways of measuring such functional changes. Early studies of meditation practices made substantial use of electroencephalography (EEG) that measures electrical activity in the brain. EEG is valuable because it is relatively noninvasive and has very good temporal resolution.

Functional neuroimaging studies of religious and spiritual phenomena have utilized positron emission tomography (PET), single photon

emission computed tomography (SPECT), and functional magnetic resonance imaging (fMRI) (Beauregard and O'Leary 2006). In general, such techniques can measure functional changes in the brain in pathological conditions, in response to pharmacological interventions, and during various activation states. Activation states have included sensory stimulation (i.e., vision, auditory, etc.), motor function and coordination, language, and higher cognitive functions (i.e., concentration). The changes that can be measured include more general physiological processes such as cerebral blood flow and metabolism, in addition to many aspects of the neurotransmitter systems. For example, the serotonin, dopamine, opiate, benzodiazepine, glutamate, and acetylcholine systems have all been evaluated in a number of brain states.

Neurotheology as Pertaining to Religion

Neurotheology also requires religion and theology as major contributors to this field of scholarship (Newberg 2010). One important aspect is the importance of utilizing phenomenological assessment of the subjective nature of religion in order to fully understand any potential neuroscientific information. Neurotheology requires as thorough a phenomenological understanding of religions as possible. While whole departments and seminary schools are devoted to the full understanding of religions or a particular religion, basic components of religion such as ritual, community, prayer, meditation, charity, and forgiveness can be evaluated via neurotheology, but only if they are well understood from the religious perspective. Therefore, a substantial amount of information required for neurotheology must be derived from sacred texts of various religions as well as from the theological developments that are derived from them. In addition, neurotheology must focus on the subjective nature of religious and spiritual experiences. This will be important to observe how different religions treat the human psyche and human behavior and also to eventually contrast these concepts with the scientific perspectives in future chapters.

Regardless of the approach one takes toward theological method, it is important to observe the cognitive and emotional elements involved. For example, all theologies are based on a primary faith system. Thus, belief is first and foremost at the foundation of any theology. However, the analytical component can have an emphasis on thought, feelings, experiences, practical behaviors, or other elements that can be related eventually back to various functions of the human mind and brain. Thus, any method of theology can theoretically be evaluated from a neurotheological perspective in addition to its more traditional approach.

Characteristics

Neurotheology is a distinct discipline since it is the only one that directly connects neuroscience to religious and spiritual phenomena. It may draw from information and data from related fields such as cognitive neuroscience, medicine, anthropology, sociology, ethics, philosophy, religious studies, and theology. However, neurotheology appears to have a unique perspective by trying to integrate fully the notion of religion in the context of the human mind. It also has the important opportunity to improve our understanding of both neuroscience and religious and spiritual traditions.

Relevance to Science and Religion

Since neurotheology is a field that specifically describes an integration of neuroscience and religion, it is a field that lies near the heart of science and religion scholarship. The field of neurotheology is also unique in that it can be approached from many other disciplines. Thus, in an academic setting, a psychologist, neuroscientist, or anthropologist can all do neurotheological research while maintaining themselves in their own fields or departments. Neurotheology simply requires adding the "neuro" component to whatever religious issue

is being evaluated or a “theology” component to whatever brain and behavioral issue is being evaluated. Neurotheology has the potential to engage many academic disciplines in fruitful and productive ways. This is also relevant in the healthcare setting in which physicians, nurses, and pastoral care counselors can all turn to neurotheology to address both academic and clinical topics. Thus, neurotheology is highly relevant to the science and religion dialogue, and vice versa.

Sources of Authority

As neurotheology is a multidisciplinary field, it has multiple sources for providing relevant information and data. Certainly, the scientific disciplines can provide objective measures of body and brain function associated with different religious and spiritual phenomena. However, the requirement of subjective information on such phenomena necessitates the use of subjective religious and spiritual experiences, written documents, sacred texts, and human thoughts and feelings as sources of information. These sources all provide the phenomenological information required to develop and interpret neuroscientific data.

There are at least seven paradigms which can readily contribute to the initial operationalization of neurotheological studies. These seven paradigms include (1) the neurophysiology of spiritual interventions; (2) altering spiritual experiences; (3) drug-induced spiritual experiences; (4) neuropathologic and psychopathologic spiritual experiences; (5) spiritual experiential development in infants, children, and adolescents; (6) physical and psychological therapeutic interventions; and (7) neurophysiology of beliefs. After these study designs are considered, the biostatistical issues with such studies can be reviewed.

The Neurophysiology of Spiritual Interventions

The first paradigm involves an experimental spiritual intervention such as prayer or meditation

with concomitant measures of a psychological- and spiritual-dependent evaluation (Wallace 2006). This will help to define and delineate the nature of the spiritual intervention itself. These psychological and spiritual measures can then be compared to simultaneously derived neurobiological parameters, such as electroencephalographic activity, cerebral blood flow, cerebral metabolism, and neurotransmitter activity (Austin 1999; d’Aquili and Newberg 1999). Such measures can be performed with state-of-the-art imaging techniques including positron emission tomography (PET), single photon emission computed tomography (SPECT), and functional magnetic resonance imaging (fMRI). Body physiological scalar parameters such as blood pressure, body temperature, heart rate, and galvanic skin responses (that measure autonomic nervous system activity) can also be measured. Other body physiological parameters such as immunological assessments, hormonal concentrations, and autonomic activity should also be included to complete a thorough analysis of the effects of spiritual interventions.

Altering Spiritual Interventions

A second existing paradigm that might be employed to investigate spiritual experience from a neuroscientific approach uses pharmacological agents or other interventions in an attempt to alter spiritual interventions. Thus, using this paradigm, a previously measured spiritual intervention will be compared to the same intervention with the addition of some intervention. For example, studies might attempt to show the effects of an opiate antagonist on the strength of the subjective experience of meditation or prayer. The effects of transcranial magnetic stimulation, other pharmacological agents, or even surgical procedures (performed for other purposes) could be evaluated. However, it is clear that more extensive studies measuring a number of neurophysiological parameters are required. Other agonists and antagonists may be utilized to determine their ability to augment or diminish spiritual experiences. In addition, the exploration of various pharmacological agents on spiritual interventions may help to delineate

the role of different neurotransmitter systems. Such studies also offer the possibility of measuring dose responses in terms of spiritual interventions.

Drug-Induced Spiritual Experiences

A third paradigm that might be employed utilizes those people whose use of hallucinogenic agents has resulted in intensive spiritual experiences. Since it has long been observed that drugs such as opiates, LSD, and stimulants can sometimes induce spiritual experiences, careful studies of the types and characteristics of drug-induced spiritual experiences, perhaps utilizing modern imaging techniques, may help elucidate which neurobiological mechanism is involved in more “naturally derived” spiritual experiences. Some studies related to the use of such hallucinogenic agents have already been performed, but a more extensive study of such agents, particularly in relation to religious and spiritual experiences, is required. Comparing this paradigm to naturally occurring spiritual phenomena may allow for a better distinction of pathological and nonpathological spiritual experiences. There are obvious ethical and legal considerations with studies such as these (although studies outside of the United States may be more possible). However, subjects who have had pharmacologically induced spiritual experiences can be studied using radioactive analogues of such agents as a means of determining the concentration of receptors and their agonists. Another related approach would be to study the effects of drug withdrawal on spiritual experience.

Neuropathologic and Psychopathologic Spiritual Experiences

A fourth paradigm would utilize patients with various known neuropathologic and psychopathologic conditions (Newberg and Waldman 2009; Koenig et al. 2001; Koenig 1998). Neurological conditions including seizure disorders, particularly in the temporal lobes, brain tumors, and stroke, have been associated with spiritual experiences or alterations in religious beliefs. For example, temporal lobe epilepsy has been associated with hyperreligiosity and religious

conversions. Psychiatric disorders such as schizophrenia and mania also have been associated with spiritual experiences and religious conversions. Delineating the type of pathology and the location of that pathology will aid in determining the neurobiological substrate of spiritual experience. Thus, neuropsychiatric disorders can be an effective tool for the neuroscience of spiritual experience.

Research on pathological conditions has classically been used to elucidate the normal functions of biological systems. Spiritual experiences in psychiatric and neurological disorders may be central to the identification of largely nascent neurobiological systems that subserve “normal” spiritual experience. This presents a crucial distinction to the historic psychiatric implication that spiritual experience is an expression of psycho- or neuropathology. This provides a framework in which normal spiritual experience can occur in pathological and normal conditions and pathological spiritual episodes might occur in individuals with or without psychopathological disorders. However, care must be taken to avoid referring to spiritual experience only in pathological terms or associated with pathological conditions as well as not reducing spiritual experiences only to neurophysiological mechanisms.

Spiritual Development

There has been a fairly extensive literature regarding the developmental aspects of religion and spirituality. These reports consider the overall development of spiritual experience from infancy through adolescence and into adulthood. There is also consideration of the necessary neurocognitive developments for spiritual experience to arise. For example, a more primitive form of undifferentiated faith may occur in infancy, while the more complex aspects of spiritual experience which include cognitive, cultural, and affective components usually require growth into adulthood. Most of these analyses of spiritual experiential development are grounded in psychology. However, neuroscience may be able to utilize these findings and compare them to the development of various brain structures

and neurocognitive processes. This may help elucidate which brain structures and functions are required for various components of spiritual experience. The developmental approach can also be viewed from the end of life perspective. For example, alterations in spiritual functions may be associated with diffuse neuropathological conditions (e.g., dementia). Furthermore, it may be useful to study alteration in spiritual functions that are associated with decrements in neurocognitive functions as well as decrements in physical health.

Physical and Psychological Therapeutic Interventions

There are a large number of ongoing studies which have explored the therapeutic effects of meditation, stress management, prayer, and other related interventions for various psychological and physical disorders including anxiety disorders, hypertension, coronary artery disease, cancer, and the human immunodeficiency virus. While these studies focus on the effects of the intervention on various disease parameters, it may be possible to “piggyback” onto these studies to include measures of spiritual experience and well-being. Utilizing measurement scales already available in the literature, it may be possible to determine the relationship of spiritual experiences and well-being to the intervention as well as to the progression of the disorder. Performing high-quality studies is essential to demonstrating the relationship between spirituality and health especially in light of the various criticisms that have been raised regarding methodological issues with these early studies.

Neurophysiology of Beliefs

This last paradigm considers one of the essential characteristics of spiritual experience which is a sense of belief, faith, or certainty that the experience represents reality. This is what helps differentiate dream states from spiritual experiences which may have similar components. The spiritual experiences are invariably perceived as being real. This sense of certainty is also an integral part of the concept of “faith.”

One can even try to explore the relationship between certain types of beliefs – i.e., religious individuals versus atheists – and how such beliefs are manifested in different brain activity patterns.

Ethical Principles

Ethical principles of neurotheology are similar to that for other biomedical-type studies. The various measures and phenomena to be studied must be made clear to participants in such research, including the potential risks and benefits. There are several interesting issues that are probably unique to neurotheology compared to other types of studies. One issue is that individuals may experience a change in their religiousness or spirituality. The result of participation might be a greater sense of spirituality and religiousness or a reduction in these feelings. Participants need to be aware of these possibilities. It is also important to be clear about the nature and goals of the study since some researchers may have the hypothesis of proving religion to be good or proving it to be bad. To the extent possible, it is important to reveal to research subjects the biases of the researchers. This is similar to the financial disclosures that might be given in more traditional biomedical studies, but in this case represents a kind of “religious disclosure.” It is also important to be clear about the potential implications of neurotheological research. If results would be observed that might support or refute specific aspects of religious or spiritual beliefs, then there could be a significant effect on a group of people or on an ideology. While this may not inherently be a problem, it is important to try to clarify these perspectives as best as possible.

Key Values

An important value about neurotheology as a field and term is that neurotheology should be considered a “two-way street” with information flowing both from the neurosciences to the theological perspective and from the theological

perspective to the neurosciences. In other words, neurotheology should not be considered the “neuroscientific study of religious or theological concepts,” a procrustean trap that many scholars have fallen into. Theology and religion must also be able to freely inform us about neuroscience and how we interpret the human person from a psychological, social, and spiritual perspective. By enabling a free exchange of ideas, data, and information, neurotheology can achieve a very high level of sophistication.

It is also important that neurotheological research should strive to support both practical and esoteric goals of scholarship and research. This notion recognizes the interrelatedness of both types of problems. Thus, neurotheology research may gain as much from a study of religiosity and mental health as an analysis of the meaning of sacred texts in determining the nature of God. Each issue may require its own distinct paradigm in order to arrive at some conclusion, but the results may ultimately have implications for the other.

It is important to continue to advance the scientific evaluation of various aspects of religious experience and practice. Studies relating religiosity to health and well-being as well as neurological studies of specific types of religious phenomena help to provide a foundation of data from which neurotheology can address many different questions. An additional benefit is the ability for neurotheology research to advance scientific methodology in evaluating subjective experience and complex neurocognitive processes. This area of research also helps to advance our overall understanding of the human person and human health from both a biological as well as a spiritual perspective.

Esoteric goals of research may include both philosophical and theological analysis of various types of rational, emotional, and perceptual concepts in the theological arguments. These goals would help to address traditional theological issues relating to the nature of God, the interpretation of sacred texts, and the ability to relate such ideas to human life and behavior. In many circumstances, such an analysis may rely very little on actual neuroscientific data, but rather focus on

theoretical aspects of the human psyche and mind. Esoteric goals may also relate to questions regarding the possible dual nature of the human body and the human spirit. Questions regarding the soul, consciousness, spirit, mind, and brain should all be accessible to the field of neurotheology.

Neurotheology research must allow for new methods, concepts, and conclusions to arise. This notion recognizes the complexity of the field of neurotheology in the context of how this field should proceed from a methodological perspective. The implication here is that the questions involved in neurotheology are so multidisciplinary and complex that existing methods in both science and theology may ultimately be limited in their capabilities. This does not mean that the existing methods should be bypassed. Quite the contrary, existing methods should be the initial approach for neurotheology scholarship. However, should various issues and problems arise that go beyond the ability of current methods, it is critical to be open to the possibility of developing new methods and new paradigms for understanding neuroscience and theology.

It should also be mentioned that a new approach that fully integrates theological and scientific perspectives might be necessary. Such an approach may represent a “contemplative science” in which scholars engage in both contemplative practices such as meditation and mysticism as well as empirical research found in the neurosciences. Several scholars have suggested this path may be necessary for a deeper understanding of the universe. Recognizing inherent limitations in both science and religion, a combined approach, if performed carefully, may provide a methodology for bypassing such limitations.

Conceptualization

Definitions in neurotheology are of particular interest because it is necessary to clearly define various terms in order to be certain about results from research studies. For example, if a study of a particular religious experience points to certain

brain changes, it is important to adequately define what the experience is and how it is characterized by the subjects. However, for neurotheology in a broader context, it is usually best to try to define terms as broadly as possible to begin with and then narrow and alter them according to future findings and scholarship. This dynamic aspect of definitions is crucial to neurotheology as a field. Thus, the definitions offered below are meant as starting points rather than definitive.

Nature

Neurotheology would define nature as pertaining to all things that can be conceived of or perceived as part of the processes of the human brain.

Human Being

The human being would be defined as the sum or integration of the social, psychological, biological, and spiritual dimensions of an individual (Brown et al. 1998).

Life and Death

Life would pertain to the active functioning processes of the human body and brain. When these processes stop, death would occur. However, these definitions would apply specifically to the body, and neurotheology would also potentially allow for a soul or spirit that could transcend the body's functions.

Reality

On one hand, reality might be defined as whatever exists that results in our perceptions, thoughts, and feelings about it. This definition presumes that our perceptions, thoughts, and feelings are not necessarily accurate but are related to whatever reality actually is.

Knowledge

Knowledge would be defined as various objects of thought that we take to be an accurate reflection of the world.

Truth

Truth arguably would be defined as that which is accurate with regard to reality. The problem from a neurotheological perspective is that everything

we know about the world is processed by the brain and hence can never be definitively determined to be true.

Perception

Perceptions refer to our senses and experiences of the world, including the world inside our brain.

Time

Time is the perception of a sequence of events in the world that follow one another in some order. Time might exist in itself, but it is our brain that enables us to determine time as it relates to us.

Consciousness

Consciousness typically refers to self-awareness about the world but can also more specifically refer to a reflexive self-awareness (i.e., an awareness of the self and that self's experiences). Neuroscientific models suggest that consciousness is derived from the functions of the material brain. But neurotheology recognizes that the alternative – that the material brain – may arise from consciousness as is suggested in traditions such as Buddhism.

Rationality

Rationality usually refers to thoughts that appear to follow a regular relationship. The brain has a number of abstract, causal, and quantitative functions that appear to underlie what we typically consider to be rationality, although some have suggested that emotions are also critical to rational thought processes.

Mystery

Mystery would refer to the state of unknowing experienced by the brain as the inability to fully comprehend something. This usually triggers not only a cognitive process but an emotional process as well.

Relevant Themes

Neurotheology is an emerging field of study and has the potential to offer a great deal to our understanding of the human mind,

consciousness, scientific discovery, spiritual experience, and theological discourse. However, neurotheology must proceed carefully upon these various schools of thought, developing clear, yet novel methods of inquiry. More importantly, neurotheology must maintain a healthy, but optimistic, skepticism about the nature of science and religion as it pertains to humanity. All results of neurotheological scholarship must be viewed and interpreted cautiously. However, neurotheology has the potential to revolutionize our understanding of the universe and our place within it.

Cross-References

- ▶ [Anatomy of the Brain](#)
- ▶ [Bioethics in Christianity](#)
- ▶ [Biology of Religion](#)
- ▶ [Cognitive Science of Religion](#)
- ▶ [Consciousness, the Problem of](#)
- ▶ [Mysticism](#)
- ▶ [Near-Death Experiences](#)
- ▶ [Neuropsychology](#)
- ▶ [Philosophy of Mind](#)
- ▶ [Philosophy of Religion](#)
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Neurotology

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Description

Neurotology, also called otoneurology, is a medical discipline devoted to the interface between otolaryngology and neurology, exploring the clinical evaluation and management of the sensorineural systems of hearing and equilibrium and its related research. It deals with all aspects of the auditory and vestibular sense organs and its central nervous system pathways, including auditory sensations and perception, the neurophysiology of balance, including special auditory tests, auditory and other electrical responses, congenital and acquired hearing problems related to both the ear and central nervous system, cochlear implantation and all aspects of the vestibular system. The advent of new surgical techniques related to the temporal bone and its vicinities led to the expansion of the specialty to include facial nerve disorders, intracranial complications of ear disease, and pathological processes of the skull base.

Self-identification

As a branch of otolaryngology and otology, Neurotology is a science and applies traditional medical knowledge and investigational methods in its clinical and surgical approaches and in research.

Characteristics

Neurotology uses special types of clinical assessments that were developed by specialists in Neurotology, and used exclusively by these specialists. These tests explore several areas of the central nervous system and constitute the only available clinical tests of the reticular formation in the brainstem. Neurotologists work frequently in interdisciplinary fashion with neurologists and neurosurgeons and also rely on neural imaging for their studies, but audiological and vestibular tests still constitute the mainframe of the specialty.

Special surgical techniques were developed and are employed by neurotologists to relieve vertigo and remove tumors and other disorders from the temporal bone or its adjoining areas.

Relevance to Science and Religion

Neurotology is mainly concerned with two important functions: hearing and equilibrium. Hearing is the basis of speech, language, and communication and at this time there is a significant involvement of the scientific community in perfecting hearing devices, both prosthetic and surgically implantable. Cochlear implants have become the treatment of choice for profound sensorineural deafness, both prelingual and postlingual. Diseases of the vestibular system are frequent in the population and many new medications and rehabilitation methods have been developed, and several surgical procedures have been developed or perfected. The vestibular sense organs and their central pathways have also become important in the area of Space Medicine, since astronauts have to deal with different gravities and accelerations in their travels.

Sources of Authority

The early anatomists coined the term *labyrinth* to designate the inner ear due to structural complexities that they could see in their dissections. It was surmised that part of these structures were auditory,

but the other structures remained a mystery for many centuries. This is understandable, for the vestibular organs are related to gravity and acceleration, and gravity was only discovered by Isaac Newton in 1687. The symptom vertigo was known, but it was considered a type central nervous system disorder until Prosper Menière, in 1791, published his observations that demonstrated that the sensation of vertigo originated in the vestibular organs. Menière's clinical reasoning on describing his case was certainly influenced by his knowledge of the work of a French neurophysiologist, Jean Pierre Flourens, who had performed experiments in the semicircular canals of pigeons. The name *Menière's disease* is still given to a type of vestibular disorder that affects both the hearing and vestibular sense organs. The systematic clinical study of the vestibular system was established by Robert Bárány, who won the Nobel Prize of Medicine in 1914 for his work. In 1961 Georg von Békésy won the Nobel Prize for his enormous contribution to hearing physiology.

In 1926 Georges Portmann, in France, proposed a surgical technique for Menière's disease, of decompression of the endolymphatic sac, thus pioneering surgical Neurotology. He based his technique on the concept advanced by Knapp that Menière's disease might be due to an increased pressure in the labyrinth comparable to glaucoma in the eye. Endolymphatic hydrops as the underlying pathology of Menière's disease, however, was only identified in 1938 by Hallpike and Cairns.

The surgical era of Neurotology actually began with the techniques created or perfected by William F. House, who standardized the approaches to the internal auditory meatus through the middle cranial fossa and through the translabyrinthine approach. These techniques made it possible to decompress the facial nerve in all of its intratemporal portions and became standard operations for the removal of vestibular schwannomas, meningiomas of the cerebellopontine angle, and glomus tumors. He also perfected Portmann's endolymphatic sac operation and pioneered cochlear implants.

There are many important medical societies concerning Neurotology, among them the American Neurotology Society, Bárány Society,

Politzer Society, and Prosper Menière's Society. Other societies, such as the Collegium Oto-Rhino-Laryngologicum Amicitiae Sacrum and the American Otological Society, are also involved with Neurotology.

Ethical Principles

As for every medical discipline, Neurotology is guided by the ethical laws of Medicine.

Key Values

The key value of Neurotology is alleviating hearing impairment, balance disorders, and facial nerve dysfunction, which considerably affect the quality of life. In addition its surgical techniques have contributed for effective and safe removal of tumors related to inner ear structures.

Conceptualization

Nature/World

Nature is defined as the physical world in terms of landscape, plants, and animals, as distinct from human creation. It also refers to physical constitution and dynamic forces of an individual. The world comprises the planet in which we live and the universe.

Human Being

A biological being with a highly developed brain and complex sensory organs that led to the acquisition of language. This specialty regards language as a specialization of the auditory system and considers human communication, abstract thinking, and the creation of ethics a consequence of the development of language.

Life and Death

Life is the presence of physical functions in a biological system, with capacity for metabolism, growth, reaction to stimuli, and

reproduction, ranging from single cell beings to highly complex plants and animals. Death is the cessation of all physical functions.

Reality

Reality is the totality of things and events.

Knowledge

Knowledge is justified or verifiable belief, as distinct from opinion. It includes information and skills obtained through learning or experience.

Truth

Truth is the reality that underlies facts and circumstances, or a fact that has been proved beyond any reasonable doubt.

Perception

Perception is an awareness of our surroundings that is provided by our sense organs. Neurotology deals extensively with auditory perception and balance perception. The vestibular system is a complex apparatus that obtains information from the vestibular sense organs, the eyes, and the proprioceptive system and works at a subconscious level like a sensory organ. Conflicts of perception may arise. A typical example is that of a person reading a book, sitting in a room inside a ship that is traveling in a calm sea. His eyes and his proprioceptive system inform him that he is still, but his semicircular canals inform him that he is moving. This conflict of perception may lead to seasickness.

Time

Time is a measurable period during which an action or condition occurs. It is one of the physical dimensions of our universe. In Neurotology time not only signals the sequence of events, but also frequency, which characterizes different types of sounds and is analyzed by our auditory system.

Consciousness

Consciousness is the state of being awake and capable of acquiring subjective experience. Vestibular disorders can impair consciousness in varying degrees.

Rationality/Reason

Rationality is the ability to think logically. Neurophysiologists involved with the auditory system look at logical thinking as a consequence of the development of language.

Mystery

To science mystery is something that has not yet been understood; to religion it is often defined as something beyond the possibilities of understanding. The study of the Central Nervous System and sense organs still presents many mysteries, but significant progress has been made by man in comprehending many of its aspects.

Relevant Themes

A critical issue in Neurology as regards "Science and Religion" is the notion that hearing and acquisition of language are fundamental aspects of human life and particularly involved in quality of life. Multidisciplinary teams are intensely involved in solving the problems of deafness and communication disorders, and neurologists are important members of these teams.

Cross-References

- ▶ [Clinical Neurophysiology](#)
- ▶ [Electroneurography](#)
- ▶ [History of Medicine](#)
- ▶ [Neuroimaging](#)
- ▶ [Neuropathology](#)
- ▶ [Neurophysiology](#)
- ▶ [Neuroradiology](#)
- ▶ [Pragmatism on Religion and Science](#)

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Neurotransplantation

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Neurotransplantation tries to restore neuronal function by transplantation of neuronal tissue like mesencephalic embryonic tissue, dopamine-producing tissue, stem cells, and neurotrophic factors. Until now, there is some evidence that the methods like transplanting dopamine-producing tissue like human pigmented retina cells or transplanting mesencephalic embryonic tissue are effective therapy forms but shame surgery, without transplantation of tissue, proved effectivity too. Therefore, none of the neurotransplantation methods are ready for non experimental usage.

New Age Religions

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Related Terms

[Meditation](#); [Metaphysics](#); [Mind](#); [Self-help](#);
[Spiritualism](#); [Spirituality](#); [Theosophy](#)

Description

New Age religions lack a formal social structure as a whole. Any easily discernible social group is usually based on a common interest in a specific topic, such as meditation, healing, or energy, rather than a formal commitment (Albanese 2008). Any social structure usually develops out

of an audience membership or with local teachings from a knowledgeable source. A lot of material familiar to the traditions comes from mass media such as books, videos, and Internet websites and may contribute to the nonsocial structure of New Age religions (Jenkins 2001). There is no set belief system that encompasses all New Age religions traditions; rather, markers such as an emphasis on the mind, metaphysics, meditation, human ability, and science's role in spirituality are common characteristics.

The most recent developments incorporate scientific and pseudoscientific findings as quasi-canonical. These teachings are not distributed in any one book or even a set number of books. Instead, those findings, usually from theoretical physics or psychology, that support the revelations of religions such as Hinduism and Buddhism, Gnostic Christianity, and many tribal religions are promoted; the common themes that link these traditions are originality, in that they are considered older and therefore more legitimate than the established orthodoxy and the esoteric nature of the traditions.

Self-identification

Science

New Age traditions do not identify as a science but often claim a scientific base. Current trends in New Age thought are making an apparent push toward a spirituality based on science dealing with consciousness and the human mind.

Religion

New Age religions self-identify more as “spiritualities” than religions. Although this could simply be a semantic boundary, this distinction is usually made to set New Age traditions apart from traditional or dogmatic religions. Regardless, there are popular religious themes that repeat throughout New Age thought from afterlife beliefs, beliefs of the soul, morality, mortality, and theological debates of god's existence.

Characteristics

The willingness of the tradition to incorporate scientific findings makes it distinctive; the contemporary New Age could be viewed as an interpretive lens through which spirituality can interpret science. On the other hand, New Age religion is so large and sprawling that it serves effectively as an umbrella term encompassing many traditions such as some UFO Religions, neo-paganism, nature religions, some branches of eastern esoterism, and Rosicrucianism, to name a few, and is thus not so much “unique” because it is not any *one* particular tradition (Albanese 2008).

Relevance to Science and Religion

New Age religions are very interested in the study of science and religion. Whereas many researchers are interested in religion from a scientific standpoint, New Age thought stands at the other end of the spectrum, as a religion interested in science. The research of scholars looking into the effects of meditation, neuroplasticity, and evidence for alternative histories are often mentioned in New Age materials.

Sources of Authority

Sources of authority are interesting in that they transcend individual texts to also incorporate teachers (e.g., Ram Das, Gregg Braden, and Deepak Chopra) as well as television shows on New Age topics and video media such as the now popular *What the Bleep Do We Know* (Chasse and Vicente 2005). Channeled messages, such as those from St. Germain and other “ascended masters,” and by the proximate authority of other channelers (e.g., J.Z. Knight, Madame Blavatsky, George Adamanski) (Albanese 2008; Melton 1998). These sources become authoritative through general acceptance or a claim to inspiration by superhuman authority.

Ethical Principles

Prior to World War II, ethical guidelines predominantly paralleled Christianity. After World War II, many New Age groups took on a more globalist ethic being that the repercussions of warfare were now on a global scale. This becomes reflected in such ethical principles as ecological stewardship and secular humanism (Rothstein 2003).

Key Values

Many New Age traditions value self-revelation and knowledge. Acceptance is also highly valued and is reflected in the rejection of traditional dogmas and little to no ingroup/outgroup markers, a possible product of its predominantly asocial nature. Revelation, being a predominant source of authority, has a high value in many New Age groups.

Conceptualization

Nature/World

Generally, these are not well-defined concepts among New Age audiences. Nature can be considered to be our environmental biosphere, as well as a transcendent force in and of itself, similar to concepts of “Gaia” (Albanese 2002, 2008).

Human Being

Most commonly, a human is defined in traditional biological terms. However, there are many types of humans when the entire spectrum of New Age beliefs is taken into account. Some adherents believe that humans can be inhabited by spirits from other entities known as “walk-ins.” Others believe in “new” types of humans, sometimes known as indigo children. These humans have above-average psychological abilities and are ascribed psychic power.

Life and Death

Oftentimes, adherents believe in reincarnation (Albanese 2008). Notions of afterlife may

include beliefs in a physical afterlife, but the main theme is the soul’s ability to “survive” death. However, hell is rarely emphasized even among groups and adherents with heavy Christian influence.

Reality

Reality is a debated subject; common beliefs are that individuals make their own reality, and it is our mind that constructs “reality.” On the other hand, many believe that we only perceive a diluted reality, and that the true nature of reality is hidden.

Knowledge

Knowledge can be defined as what someone believes and the authority for such beliefs is accepted to come from many sources: Revelation from an external source, science, experience, and the receiving of teachings are all considered viable forms of knowledge.

Truth

Truth is a polysemous term within the New Age movement, because it is extremely unique to each group or individual adherent.

Perception

In modern New Age belief, perception is defined as that which the mind interprets from the outside world.

Time

Time is viewed most often as an illusion. This comes from one of two trends in modern New Age thought. The first is the rejection of linear time and the acceptance of cyclical time. The second comes from an emphasis on the mind’s perception of time, where time is subjectively mutable rather than an objective standard.

Consciousness

Consciousness is assumed, although not exclusively by the New Age, to come from the soul through the mind. Although dualism is becoming more debated, adherents seem to inherently accept dualism as shown through beliefs concerning how the soul survives after the body/brain no longer physically functions.

Rationality/Reason

These concepts are highly valued, however they are understood to be constrained in that rationality cannot explain everything, thus revelatory techniques such as channeling are used to fill in the gaps where rationality fails.

Mystery

The idea that there is something else beyond what is readily available through conventional means of understanding or traditional doctrines spawned this movement from its enlightenment roots. The context of the enlightenment as the womb from which science was born, and empiricism at its root, also gave rise to the New Age value of empiricism as a way to unlock the mysteries of “reality.” In contemporary times, the interpretation of scientific findings in light of spiritual beliefs to solve that which one does not know also emphasizes mystery.

Relevant Themes

An additional issue for this tradition concerns methodological authority. Although the tradition employs science, it is not bound by the same review process as science. While revelation is an acceptable form of knowledge for religions, it is not for science; where science stops being able to explain something, the New Age can use revelation to fill in the gaps. Science on the other hand must admit that it does not yet have an answer.

Another issue is whether or not New Age thought is a science or a religion. These debates are not so much theological or scholarly as they are legal. Where the modern world has tried to draw clear lines between science and religion, New Age religions have blurred that line. Some traditions claim that they are a religion as well as a science, where ultimately, both legally and methodologically speaking, they must choose one or the other.

Cross-References

- Astrology
- Buddhism in the West

- Incarnation
- Meditation-Research
- Mysticism
- Neuropsychology
- Online Religion
- Posthuman Condition
- Transcendence and Immanence

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New Buddhist Psychology

- Psychology in Buddhism

New Pragmatism

- Pragmatism on Religion and Science

Nivāraṇa (Pāli)

- Hindrances (Buddhist)

Nivāraṇa (Sanskrit)

- Hindrances (Buddhist)

Non-consequentialism

► Deontology

Nondualism

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Nondualism can be regarded as the very peak of consequent application of dialectical reasoning. Nondualism holds that ultimate truth is not categorizable beyond mutually exclusive categories of thought. The famous opening lines of the Chinese Dao De Jing provide an appropriate example:

The Way that can be told of is not an unvarying way;

The names that can be named are not unvarying names.

It was from the Nameless that Heaven and Earth sprang;

The named is but the mother that rears the ten thousand creatures, each after its kind. (Lao Tzu, translation: Waley).

Accordingly, any concept, implying a separative differentiation is regarded as illusive. Paradoxical statements like “form is emptiness and emptiness is form,” cited from the famous Mahāyāna Diamond Sūtra (Sanskrit: Vajracchedikā Prajñāpāramitā Sūtra) are typical to nondualist statements. It is noteworthy that nondualist statements appear highly paradoxical to conventional thought. Any concept, even the difference between saṃsāra (meaning the cycle of birth, life, death, and rebirth) and nirvāṇa (meaning the liberation from saṃsāra) or absolute and relative truth, is considered to be “non-different.” In Buddhism, nondualism is particularly considered part of Mahāyāna tradition (including, for instance, Zen and Mādhyamaka), and partly also in Vajrayāna Buddhism (for

instance, in the Dzogchen practice). In Hindu philosophy, nondualism is central to Advaita, which is the most influential and dominant sub-school of the Vedānta school.

Consequently, nondualist spirituality does not regard enlightenment as an achievable end of a path (as stressed, for instance, in the nirvāṇa concept of Theravada Buddhism), rather as having always been inherent to the path itself (such as, for instance, in Mahāyāna and Vajrayāna Buddhism). The ultimate truth is therefore regarded as omni-inherent and cannot be separated, even from relative truth.

Non-duality

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Non-duality is the experience of the fluid relationship between the self and other. It is an immediate awareness that the boundary between self and other is provision at best. Many contemplative psychologies have the experience of non-duality as central to the purpose of meditation and other spiritual practices. Among Sufis this is called unity of being (*wahdat al-wujūd*), in zen it is called *satori*, and in Christian practice it has been called one as unity, or the unity of experience, as in Meister Eckhart. This was expressed extremely well in the song “Echoes” written by Waters, Wright, Mason, and Gilmour (1971):

Two strangers passing in the street,
By chance two separate glances meet,
And I am you and what I see is me.

Nonreductive Materialism

► Nonreductive Physicalism

Nonreductive Physicalism

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Related Terms

[Emergent monism](#); [Nonreductive materialism](#)

A Survey of Terms

Both “materialism” and “physicalism” have been used to refer *both* to theories of human nature and to a worldview or metaphysical system. In the latter case this involves the denial of the existence of God and any other kind of nonmaterial being. Although “physicalism” is sometimes used in this sense, it is a newer term and so does not have the strong atheistic connotations of “materialism.”

What is at issue in this entry is a theory of human nature. First, physicalism is a denial of body-soul or body-mind dualism. Second, the term “nonreductive” signals denial of the supposition that physicalism also entails the absence of human meaning, responsibility, and freedom. So it is easy to say what nonreductive physicalists are against. It is more difficult to give a positive account. One complication is that there are a wide variety of positions that go under the heading of nonreductive physicalism (hereafter NRP), and there are also a number of positions that are quite similar to NRP that go by different names.

In philosophy of mind, NRP is the most common term for this set of positions but John Searle calls his view biological naturalism (Searle 1992). Among scholars who consider the relations between theology and science a common term is “emergent monism” (Russell et al. 1999). However, NRP is a preferable term because, while “monism” is a proper contrasting term for “dualism,” it means that humans are composed of only one *kind* of substance, but does not tell us whether that substance is physical or something else. Furthermore, while philosophers have done

a good job of distinguishing and defining different kinds of reductionist theses, there has (so far) been less agreement about what “emergence” means. So what do nonreductive physicalists believe about human nature? For dualists the concept of the mind or soul serves the purpose of explaining what we might call humans’ higher capacities. These include a kind of rationality that goes beyond that of animals, as well as morality and a relationship with God. A reductive view concludes that if there is no mind or soul, then people must not be truly rational, moral, or religious; what was taken in the past to be rationality, morality, and spirituality is really nothing but brain processes.

The nonreductive physicalist says instead that if there is no soul, then these higher human capacities must be explained in a different manner. *In part* they are explainable as brain functions, but their full explanation requires attention to human social relations, to cultural factors, and, most importantly, to God’s action in human life.

Historical Developments

At the beginning of the modern period (approximately 1650), there were two major options for understanding human nature. One was René Descartes’s dualism of body and mind or soul (“mind” and “soul” were nearly equivalent in Descartes’s work; it was only later that their connotations diverged). The other was Thomas Hobbes’s reductive physicalism: Hobbes denied the existence of a nonmaterial element constituting human nature, and asserted that human thought and behavior could all be reduced to physics. Idealist-monist positions played an important role in philosophy during the nineteenth century, but in the twentieth century, the primary options were again substance dualism and physicalism.

Several important developments occurred in the latter half of the twentieth century that have implications for theories of human nature. First, reductionism had been considered a highly desirable approach to science, particularly by positivist philosophers of science. They employed the

model of the hierarchy of the sciences, the sciences reflecting increasingly complex systems, each system composed of entities from the next level down. Thus, chemistry studies systems composed of the physicists' atoms; the various levels of biology study larger and more complex systems of biochemicals. The positivists' hope was that higher levels, including psychology and sociology, could be reduced, and thereby explained, on the basis of laws of the lower levels. Since the 1970s this strategy has increasingly been called into question (as will be described below).

A second change was in understandings of philosophical method. Most arguments for dualism were based on conceptual analysis: The concepts of *mind* and *brain* are different, so it is an error to attribute mental properties or capacities to the brain. Conceptual analysis is now being rejected because of its assumption that empirical developments are irrelevant to philosophical arguments. In particular, philosophers of mind are increasingly looking to the cognitive neurosciences for evidence that the brain (suitably contextualized) is indeed the source of all mental capacities.

Third, there is now a greater degree of specialization in philosophy. Discussions in philosophy of biology have led to different resources for understanding a nonreductive version of physicalism than those most often employed in philosophy of mind. There are in fact two ways of arriving at a physicalist position. One is to begin with a dualist view such as that of Descartes and then simply subtract the mind or soul. The alternative arises largely from philosophy of biology and, in particular, from the recognition that, just as life has appeared as a consequence of increasingly complex organization, so too have sentience and consciousness. In general this has been the approach of those involved in religion and science discussions in the West.

Anti-reductionist Developments

The most significant criticisms of causal reductionism (and thereby of epistemological

reductionism) fall into three stages: an early emergentist movement (from approximately 1920 to 1950); the exploration of the concept of downward causation or whole-part constraint (beginning in the 1970s); and, currently, an account of causation that combines both downward causation and emergence.

The idea of emergence was proposed in the philosophy of biology as an alternative both to mechanist-reductionist accounts of the origin of life and to vitalism. The vitalists claimed that in order to get life from inorganic matter something like a vital force or *entelechy* (a quasi-aristotelian notion) needed to be involved. Emergentists, such as Roy Wood Sellars, argued that the increasingly complex organization, as one ascends the hierarchy of systems, accounts for the appearance of new kinds of entities with causal powers that cannot be reduced to physics. The organic emerges from the physical; so too do the levels of the mental or conscious, the social, the ethical, and the religious or spiritual.

Sellars claimed that the ontological imagination was stultified at the start by the picture of microscopic billiard balls. In contrast, he argued that organization and wholes are genuinely significant; they are not mere aggregates of elementary particles. Reductive materialism overemphasizes the "stuff" in contrast to the organization. Matter is only a part of nature. "There is energy; there is the fact of pattern; there are all sorts of intimate relations." "Matter, or stuff, needs to be supplemented by terms like integration, pattern, function (Sellars 1970, pp. 136–138)." With hindsight we can see that Sellars and some of the other emergentists were exactly right; however, their arguments did not prevail against the reductionist philosophers of science.

In the 1970s psychologist Roger Sperry and philosopher Donald Campbell both wrote specifically about downward (or top-down) causation. On some occasions Sperry wrote of the properties of the higher-level entity or system *overpowering* the causal forces of the component entities. The notion of overpowering lower-level causal forces rightly raised worries regarding the compatibility of his account with adequate respect for the basic sciences.

Donald Campbell's work has turned out to be more helpful. Here there is no talk of overpowering lower-level causal processes, but instead a non-mysterious account of a larger system of causal factors having a *selective* effect on lower-level entities and processes. Campbell's example is the role of natural selection in producing the remarkably efficient jaw structures of worker termites. His example is meant to illustrate four theses. The first two give due recognition to bottom-up accounts of causation: First, all processes at the higher levels are restrained by and act in conformity to the laws of lower levels, including the levels of subatomic physics. Second, the achievements at higher levels require for their implementation specific lower-level mechanisms and processes. Explanation is not complete until these micromechanisms have been specified.

The third and fourth theses represent the perspective of downward causation: Third, "[b]iological evolution in its meandering exploration of segments of the universe encounters laws, operating as selective systems, which are not described by the laws of physics and inorganic chemistry." Fourth:

Where natural selection operates through life and death at a higher level of organisation, the laws of the higher-level selective system determine in part the distribution of lower-level events and substances. Description of an intermediate-level phenomenon is not completed by describing its possibility and implementation in lower-level terms. Its presence, prevalence or distribution (all needed for a complete explanation of biological phenomena) will often require reference to laws at a higher level of organisation as well (Campbell 1974, quotation at 180).

It appears that little was written on downward causation until the idea was taken up by philosophers of mind in the 1990s. Robert Van Gulick made an important contribution by spelling out in more detail an account based on selection. The reductionist's thesis is that the causal roles associated with the classifications employed by higher-level sciences are entirely derivative from the causal roles of the underlying physical constituents. Van Gulick argues that even though the events and objects picked out by higher-level

sciences *are* composites of physical constituents, the causal powers of such an object are not determined solely by the physical properties of its constituents and the laws of physics. They are also determined by the *organization* of those constituents within the composite. And it is just such patterns of organization that are picked out by the predicates of the higher-level sciences.

These patterns have downward causal efficacy in that they can affect which causal powers of their constituents are activated. "A given physical constituent may have many causal powers, but only some subsets of them will be active in a given situation. The larger context (i.e. the pattern) of which it is a part may affect which of its causal powers get activated . . . Thus the whole is not any simple function of its parts, since the whole at least partially determines what contributions are made by its parts."

Such patterns or entities are stable features of the world, often in spite of variations or exchanges in their underlying physical constituents. Many such patterns are self-sustaining or self-reproducing in the face of perturbing physical forces that might degrade or destroy them (e.g., DNA patterns). Finally, the selective activation of the causal powers of such a pattern's parts may in many cases contribute to the maintenance and preservation of the pattern itself. Taken together, he says, these points illustrate that "higher-order patterns can have a degree of independence from their underlying physical realizations and can exert what might be called downward causal influences without requiring any objectionable form of emergentism by which higher-order properties would alter the underlying laws of physics. Higher-order properties act by the *selective activation* of physical powers and not by their *alteration* (Van Gulick 1995, quotations at p. 251 and 252)."

From Van Gulick's account we can see that evading causal reductionism requires the recognition that higher-level entities and systems have emerged (evolved) from lower, and that these entities can be somewhat independent of the causal processes of their constituents, thereby manifesting new, higher-level causal capacities. The sort of organization and selection of

lower-level causal processes that Van Gulick describes calls for new concepts, and, in fact, represents something like a paradigm change across the sciences. This is the shift from thinking in mechanistic terms to thinking in “systems” terms.

Alicia Juarrero describes the changes required to understand complex systems. One has to give up the traditional Western philosophical bias in favor of *things*, with their intrinsic properties, for an appreciation of *processes* and *relations*; the components of systems are not things, but processes. So, for example, from a systems perspective, a mammal is composed of a circulatory system, a reproductive system, and so forth, *not* of carbon, hydrogen, calcium. The organismic level of description is *decoupled* from the atomic level. Systems are different from both mechanisms and aggregates in that the *properties* of the components themselves are dependent on their being parts of the system in question. They affect one another not by mechanical pushes, but by the fact that they are internally related to one another, such that a change in one automatically changes the other. These relations she calls context-sensitive constraints (Juarrero 1999).

The concepts drawn from nonlinear dynamical ► [systems theory](#) provide the resources needed for understanding the emergence of the complex systems that then exercise downward constraint on their own components. Nonlinear systems are those in which the current state affects the development of each future state. Some such systems are wildly unstable, some entirely stable, some (chaotic systems) fluctuate in a patterned manner, and, finally, some (far from thermodynamic equilibrium) jump to higher forms of organization.

Terrence Deacon has distinguished among three types or levels of emergence. There is no emergence in mere aggregates, though an aggregate does have one sort of global properties. For example, the weight of a volume of liquid is a simple addition of the weights of its molecules. The important difference between an aggregate and a system is that in a system it is *relational* properties of the constituents (as opposed to

primary or intrinsic properties) that constitute the higher order. In such cases additional configurational and distributional information is needed to account for the higher-order properties. Deacon includes here the viscosity of liquids, turbulence in large bodies of water, and typical feedback systems such as a thermostatically controlled heating system. This he calls first-order emergence. In Juarrero’s terms, the relations among components impose constraints on the system. Because fluctuations in such systems are dampened out across time, it is possible to give (rough) reductionistic accounts of their behavior.

Second-order emergence occurs when there is symmetry breaking or the *amplification* of a fluctuation rather than dampening. Systems in which this occurs are nonlinear; their history matters. There are simpler and more complex versions of such systems. The simpler sort is self-organizing, in that higher-order patterns selectively constrain the incorporation of lower-order constituents into the system or select among possible states of the lower-level entities (this is Van Gulick’s point, as well). More complex second-order emergent systems are also autopoietic: They change the lower-order constituents themselves. Examples of the simpler sort are the Bénard phenomenon (the development of orderly convection rolls in a heated liquid), a thermostat that amplifies rather than dampens feedback, and the development of a snowflake. An autocatalytic cycle is of the more complex sort in that the system manufactures some of its own components. All life involves second-order emergence of the more complex sort.

Deacon distinguishes between first- and second-order (as well as third-order) emergence in terms of what he calls “amplification logic” or “the topology” of causal processes. In systems without emergence, global properties are all produced bottom-up (or by means of *local* interactions with boundaries – e.g., a water molecule constrained by the presence of the surface of the container). In first-order emergent systems there is “nonrecurrent” causal architecture: a simple bottom-up and top-down relation in which global properties of the system (e.g., density of

components) makes a difference to the relations among components and thus to the behavior of the whole system.

Second-order systems have more “tangled” or “recurrent” causal architecture as a result of the amplification of lower-level fluctuations. This amplification changes the total state of the system in a way that makes a decisive difference for the future development of the system. This can lead to new orders of complexity. Deacon’s second-order emergent systems are the simplest of those that Juarrero describes as being driven by context-sensitive constraints: what happens before changes the probabilities for future behavior of the components.

Third-order emergence involves the interaction among three levels and appears (naturally) only in the biological realm. Here a variety of second-order forms emerge, and are selected (constrained) by the environment, but in such a way that a *representation* of its form is introduced into the next generation. The simplest example is the evolutionary process. The micro-level (the genome) in interaction with the organism’s environment directs the construction of the organism (the mid-level), whose reproductive fate is determined top-down by the environment (top level). The preservation of information regarding the organism’s success in the environment is the means by which a relatively stable population of successful organisms can be produced, within which future fluctuations appear. Some of these may be amplified (preserved and reentered into the system) by means of interaction with the environment, thus enabling the appearance of still higher degrees of complexity. Deacon describes such systems as exhibiting recurrent-recurrent causal architecture: Over time, a two-stage process of emergence occurs that results in downward causation not just from top to mid-level, but from top to bottom (environment to genome) (Murphy and Stoeger 2006).

Thus, we can see that Campbell’s example of downward selection of termite jaws is in fact an example of Deacon’s third-order emergence. The development of systems theory, theories of self-

organization, nonlinear mathematics, far-from-equilibrium thermodynamics, and, finally, Juarrero’s concept of context-sensitive constraints gives us the conceptual tools to explain why the whole process could never in principle be reduced to the laws of biochemistry, let alone to the laws of physics.

Significance for Philosophy of Mind

Richard Rorty wrote that it is pictures rather than propositions, metaphors rather than statements, that determine most of our philosophical convictions (Rorty 1979, p. 12). Discussions of reductionism in philosophy of mind have been stultified by an unhelpful picture, which is a major obstacle to understanding downward causation in that sphere. Psychology is above biology in the hierarchy of the sciences; mental properties are higher-level properties than brain properties. So we create a picture such as the following, in which *M* and *M** represent mental properties, *B* and *B** represent brain properties, and the arrow represents the presumed causal relation between the brain properties. The vertical lines usually represent the (now fashionable) ► [supervenience](#) relation; or, in other words, the mental properties are physically *realized* by the brain properties.



With this picture available, philosophers of mind such as Jaegwon Kim can ask what causal work is left for *M*. Here is Kim’s tri-lemma: One possibility is to give up on *any* causal role for the mental – the mental is epiphenomenal – and this amounts to reductive physicalism. Another is to count both *B* and *M* as sufficient causes of *B** (and *M**) but this would amount to causal overdetermination, which Kim simply dismisses as “absurd.” Finally Kim considers that there may be some form of downward causation from *M* to *B** (i.e., *M* and *B* are the jointly sufficient

cause of B^*), but he rejects this possibility because it “breaches the causal closure of the physical domain.” And

...to give up this principle is to acknowledge that there can in principle be no complete physical theory of physical phenomena, that theoretical physics, insofar as it aspires to be a complete theory, must cease to be pure physics and invoke irreducibly non-physical causal powers—vital principles, entelechies, psychic energies, *elan vital*, or whatnot. (Kim 1995, quotations at 208 and 209)

Thus, Kim opts for reductive physicalism, claiming that mental properties are causally efficacious only to the extent that they are reducible to physical properties.

This simple little drawing is one of the major *obstacles* to solving the problem of neurobiological reductionism because, as Deacon has pointed out, the relations of mental phenomena to physical phenomena cannot be understood in terms of simple supervenient emergence. In sum, third-order (evolutionary) emergence contains second-order (self-organizing) emergence as a limiting case, which in turn contains first-order (supervenient) emergence as a limiting case. For this reason it is insufficient to describe mental phenomena as merely supervenient on cellular-molecular interactions. One needs to appreciate the many levels of embedded evolutionary emergent processes characteristic of brains, as well as the fact that typical mental events (consciousness experiences) can only have meaning insofar as they are contextualized within complex systems of human culture (Murphy and Brown 2007). Without this more complex account of third-order emergence and the recognition of the embeddedness of the brain in the physical and social environment, it is not surprising that no sense can be made of how a mental event could have downward causal effects on the brain.

Significance for Religion and Science

The topic of ► [nonreductive physicalism](#) is an important one for those engaged in science and

religion dialogue, especially in the West. In the modern liberal Protestant tradition, it has been common to argue that science is intrinsically irrelevant to religion and theology, because their aims are so different. However, in the case of theories of human nature, this division is clearly untenable. For centuries Christian theology (and often Jewish and Muslim thought as well) has taught (or presupposed) a dualist account of the human being, largely under the influence of Greek philosophy. Informal surveys show that the majority of lay believers in the West hold either a dualist or trichotomist (body, soul, and spirit) account of human nature.

Meanwhile science has increasingly made dualism and trichotomism untenable. The development of modern physics created the problem of mind-body interaction, and most philosophers now judge this problem to be insoluble. Evolutionary biology established the continuity of humans with other animals. If animals have no immaterial minds (as most modern thinkers have assumed), then it is difficult to see why it should be thought that humans do. Finally, the cognitive neurosciences are increasingly explaining all of the capacities once attributed to the mind or soul in terms of very specific brain regions and systems.

Christian and Jewish biblical scholars and historians have long argued that dualism was not a part of early Jewish or Christian teaching. The biblical account portrays humans as unitary beings, although manifesting a variety of dimensions or aspects – physicality, emotion, rationality, spirituality – all understood in relational terms. So one important role for the discussion of NRP in religion-science dialogue is to bring to popular awareness the large-scale rejection of dualism among Western Christian scholars. It is crucial to argue against reductionism, since a reductive physicalism, denying the genuineness of all higher human capacities, would be entirely unsatisfactory from a religious point of view.

In addition, scholars involved in the theology-science dialogue have made significant contributions to the development of nonreductive versions of physicalism. A distinction was made above between two routes toward a physicalist

account of human nature. One, typical of earlier contributions to philosophy of mind, begins with something akin to Cartesian dualism and then “subtracts” the mind or soul. The other arises from consideration of the hierarchy of the sciences (and correlative hierarchy of complex systems), with the recognition that higher-level systems are *generally* not reducible to their lower-level components.

Ian Barbour was perhaps the first to introduce this set of ideas to theology-science scholars and to argue that humans be understood in terms of their position in this hierarchy. In *Issues in Science and Religion* Barbour claimed that “an interpretation of levels can contribute to a *view of man* which takes both the scientific and the biblical understanding into account (Barbour 1966, p. 360).”

Arthur Peacocke made significant contributions, accepting a similar account of humans as part of a nonreductive hierarchy, and also making current scholars aware of earlier work on emergence and downward causation. Finally, he made his own valuable contributions to understanding both downward causation and emergence. He argued that a better term for downward causation is “whole-part constraint.” His writings presupposed the understanding of complex dynamical systems, briefly described above, along with the role of contextual constraints (rather than efficient causes) by which the whole affects its constituents. In his final publications he sketched out an approach to theology that locates the human person as a player in the higher-level emergent system that is the church in relation to God; this system, then, exerts whole-part constraint on the individuals who participate.

Cross-References

- [Complex Systems](#)
- [Dualism](#)
- [Philosophical Anthropology](#)
- [Philosophy of Mind](#)
- [Reductionism](#)
- [Theological Anthropology](#)

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North American Indian Religions

- [Hopi Religion and Anthropology](#)

Not-Self

- [Anattā](#)

Numinosa

- [Das Heilige](#)

Numinous/Numinosity

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Based on the Latin term “numen,” little deity, it refers to the quality of an experience that produces awe, amazement, the uncanny, thrill, and rapture. The numinous is ineffable, unexplainable, and indefinable. It is the experience that produces the chill down one’s spine as one reacts to something that has an extraordinary impact. The numinous experience is thought to be at the very fountainhead of “religion” and “spirituality.” It can be experienced in both positive and negative forms, as in respectively, the experience of the glory of God, as in the lyric “mine eyes have seen the glory of the coming of the Lord,” and negatively in the experience of terror, as in the phrases, the “fear of God,” or the “dark night of the soul” of the mystics. Here the raw, unmediated experience of God is so highly charged as to burn the recipient, so that they look upon the Lord and do not survive it.

Nuptial-Marian Ecclesiology

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Ecclesiology is the branch of Christian theology that is concerned with the structure, constitution, practices, and functions of the church. The descriptor “nuptial-Marian” refers to Balthasar’s belief (not original to him) that Mary the mother of Jesus expressed to God a perfect bride-like response of faith, and that her

assent is the archetype and paradigm of the faith response of the entire church.

Nyāya

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Nyāya (Sanskrit for “recursion,” used in the sense of “syllogism, inference”) is the name given to the school of logic in Hindu philosophy. It is one of the six orthodox or *astika* schools of Hindu philosophy.

Nystagmography

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An electronic equipment to record eye movements, *nystagmus*, either by measuring the corneal-retinal potential, *electronystagmography*, or by means of infrared optical devices, *videonystagmography*.

Nystagmus

A movement of the eyes that has a *fast* phase, which originates in the reticular formation, and a *slow* phase, which originates in the vestibular sense organs. Physiologically it is designed to provide adjustment of the eyes to head position and/or movements. In disorders of the vestibular system, it acquires distinct characteristics.

Objectivity in the Human Sciences

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The notion of objectivity is intimately tied to key issues in *epistemology* and the philosophy of science. The most general formulation of the issues raised in connection with objectivity in modern discussions concerns the extent to which the object of knowledge is empirically and neutrally given (a view associated with the *empiricist* tradition, see Popper 1963) and to what extent it is itself already “theory-laden,” that is, a product of scientific practice and its criteria for determining what constitutes evidence, justification, and proof (Polanyi 1958) as well as what constitutes a scientific problem. This view is associated, in different ways, with *pragmatism*, *structuralism*, *poststructuralism*, and ► *hermeneutics*. Formulated in this way, this question has far-reaching implications for our concepts of *science*, *rationality*, *knowledge*, *certainty*, and ► *truth* (Foucault 1977).

At the same time, there is a great deal of room for interpretation with regard to the meaning of objectivity. Depending upon in which sense it is used, the answer to the question formulated above will be different. The following is a partial list of senses in which the term is commonly used:

Impartiality

Intersubjective testability

Value-neutrality

Generalizability

Scientific consensus

Empirical reliability and predictability

Facticity

Truth (correspondence to reality)

Rationality

What should be noted here is that already this short and incomplete list raises questions. Impartiality and value-neutrality describe a trait of the scientist(s), while generalizability and intersubjective testability are rather methodological attributes of scientific claims or theories. Empirical reliability and predictability say something about the consequences or results of a theory or claim in use, while scientific consensus describes a social fact regarding the practice of the community of investigators. Thus the question of objectivity can be raised in different senses: is it being attributed to a state affairs, the scientist, the scientific community, the methods of science in practice, the goal of scientific practice, or the consequences of scientific practice? What is it that we are calling objective in science: its objects, its hypotheses, its explanations, its descriptions, its results, its methods, its theories, or some combination of these?

The notion of objectivity becomes particularly complex with regard to the human studies or cultural sciences because there is debate as to whether objectivity is possible in any of these senses, or, depending upon what one means by it, if it is even desirable. The human studies are

defined, in contrast to other fields of inquiry, by a specific feature of their object(s) of study: they involve human actions, beliefs, artifacts, and intentions, as well as the meaning conferred to these actions, beliefs, artifacts, and intentions by the object being studied (human beings) (Collingwood 1940; Dilthey 1991). Yet what is to be grouped as “social science and the humanities,” on the one hand, and “natural science,” on the other, depends upon methodological differences which are in themselves largely contingent upon historical and cultural factors. Psychology and many of its daughter disciplines (e.g., the educational sciences) are usually, but not necessarily, grouped among the social sciences, while psychiatry belongs properly to medicine. The difference has to do with whether the emphasis is placed on explanations in terms of mechanisms in nature, such as neurochemistry, or on the social aspect, that is, intention and meaningful action as such, that is, on agency (including things such as authorial intention, interpretation, etc.). Another way of putting the point is to say that causes and functions are involved in the explanation of natural phenomena, while reasons are involved in the cultural artifacts and human action. But this distinction is not readily accepted by all philosophers or social scientists; to the contrary, some claim rather that social, historical, and cultural studies can only attain objectivity, and thus be construed as genuine sciences, to the extent that they explain social and cultural phenomena in terms of causes or functions.

But even accepting such an objection, it is clear that cultural artifacts are distinct from natural phenomena insofar as they are tied to human practice and action. Using the latter as a defining characteristic of humanities and social sciences, we can ask to begin with what sort of scientific demands are implicitly or explicitly involved in research practice, that is to say, which *norms* guide research in the human studies. To begin with, there is a methodological demand that the investigation and its results be open to intersubjective examination and analysis. This means that the study must make clear what material is being studied, provide sources so that these can be

checked, and explain the basis upon which the selection of material was based so that even the starting points of the investigation can be analyzed and scrutinized by other researchers. In short, the scientific norms of the scholarly community determine which means are appropriate for arriving at an acceptable result; this can mean, among other things, that one can use scientific norms to show that certain things cannot be shown scientifically or that the means at our disposal are not sufficient for arriving at certain desired aims. The objective validity of the study then lay in its success in providing an account that any expert in that field of study would accept as the correct result given the method and materials (Weber 1949).

This sense of objectivity is tied to the notion of value-neutrality, which is the requirement that the political or moral values of the researcher or research community do not steer the method, selection of material, or criteria for valid argumentation. In other words, while we as social scientists and humanists are necessarily ourselves a product of certain social relations which guide the sort of questions we ask and the interest we have in them, for a study to be scientific, it must conduct the investigation regardless of how we may evaluate the conclusions that must be drawn (Merton 1968). For example, whatever a political scientist may feel about the war in Iraq, her political views ought not color her investigation of its causes. To allow her own convictions to guide her methods and choice of material would be to disavow the goal of objective investigation, the very aim of science as an institution. This sense of objectivity, however, has been called into question as both a desirable ideal and as a practical possibility by researchers influenced by *poststructuralism*, *postcolonial theory*, and *gender theory*, among others.

Much of the contemporary discussion regarding the possibility or even desirability of objectivity in the study of culture and society has been colored by the tradition of theory of science that has *positivism* as its starting point. The positivist doctrine that has most influenced the discussion is the distinction between fact and value or



descriptive and normative statements. The point of the distinction is to separate that about which we can have objective (that is to say, scientific) knowledge and subject matter that is by definition subjective, a matter of preference, taste, emotional response, social indoctrination, or cultural habit. But this doctrine met with the criticism that such a distinction is not and cannot itself be a matter of objective fact, given its own definition of objectivity, but rather expresses the values, preferences, emotional responses, and cultural habits of a certain (dominant) group during a specific historical period in a determinate social context. If this criticism is correct, then the distinction as a general principle cannot be upheld. As a result, many theorists in the humanities have drawn the conclusion that objectivity, at least with regard to social and cultural artifacts, is not possible; further, the aim itself, according to some, leads to dogmatism, parochialism, and partiality in research. What should be noticed here is that the rejection of the possibility of objectivity in human studies assumes the positivist sense of objectivity; it is this notion, the idea that statements fall into two categories, objective or subjective, fact or value, descriptive or normative, that has been called into question. Nonetheless, there is room for further consideration regarding what sense, if any, can be given the notion that a scientific study of history or art or society differs substantially and intrinsically from mere preference, opinion, belief, or tradition. In short, the question remains as to whether there is or can be some sense of objectivity which describes the scientific enterprise in these fields and distinguishes it from expressions of taste, ideology, or faith.

Some historians of science have argued that for over a century we have been under the spell of a mechanical or automatized notion of objectivity, in which the ideal is that there should be no trace of human judgment in scientific practice or results (Daston and Galison 2007). If this dominant sense of objectivity is dispelled, the rejection of the positivist notion of objectivity does not lead inexorably to relativism. Another sense of objectivity would be that insofar as a social or

cultural phenomenon is a phenomenon, that is, something that is a recognizable object of consideration, it can be studied as such. Phenomena such as belief systems, works of art, and social institutions can be studied for a better understanding of their significance, what they mean. (Gadamer 2004; Winch 1958) In this view, the objectivity of the study resides in their being phenomena at all, something that can be recognized as meaningful. The objectivity of the results of the study consists in the intersubjective possibility of assessing the extent to which the results follow from the framing of the question, the handling of the relevant material, and the rigor of the argumentation. This sense of objectivity is not absolute, but rather expresses an ideal at which all scientific investigation aims or should aim, if there is to be a purpose to a scientific study of culture at all.

Cross-References

- [Epistemology](#)
- [Humanities](#)
- [Knowledge, Sociology of](#)
- [Meaning, the Concept of](#)
- [Neopragmatism](#)
- [Phenomenology](#)
- [Philosophy of Science](#)
- [Political Theory](#)
- [Science and Scientific Knowledge, Sociology of](#)
- [Truth](#)

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Object-Oriented (OO) Programming

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Object-oriented programming is a paradigm that was created to allow software engineers to build large software applications. The motivating factor was to have reusable components so that a programmer would not have to “reinvent the wheel” each time he or she needed a procedure to solve a subproblem. Furthermore, the developers of OO languages felt that important data or information and its associated operations should be grouped together for both readability and, more importantly, maintainability.

The programming language construct that allows for the combination of data and operations is known as a *class*. A class can specify an actual real-world item (e.g., Card) that one could touch or an abstract object (e.g., Holiday). Note that an *object* is an instance of a class.

A class has attributes or instance variables that are usually specified as `private` in Java. In other words, the data cannot be accessed or changed outside of the class without using methods. The access methods are called *getters*, whereas the methods that change the variables

are known as *setters*. The class itself is a template for each instance.

Below is an example of a class (with only the data defined), followed by two instances of the class. Note that most programming languages enclose string values in double quotes. The data type `double` indicates a value with a decimal point. Because it is a `double` rather than a `float`, more memory will be allocated allowing for better precision in calculations.

```
public class Card
    private String occasion
    private double price
```

BdayCard	AnnivCard
“Birthday”	“Anniversary”
1.49	4.95

Suppose we want to define a class to represent a card store. The data for the store can be modeled as an ADT List of Card objects. The List might be implemented as an array or as a linked list. Operations in this class might be the following:

- Add a card to the inventory (can be implemented using the List ADT operation `add`).
- Sell (can be implemented using the List ADT operation `remove`).

Obstetrics

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Description

Obstetrics is the branch of medicine concerned with pregnancy and childbirth. Originally its sole concern was extraction of the child when labor became obstructed and its main objective was to preserve the mother’s life. The twentieth century, however, saw the introduction of



antenatal care, which treated maternal disease during pregnancy, and, in the second half of the century, techniques like amniocentesis and ultrasound scanning and fetoscopy which enabled obstetricians to examine and treat the fetus before birth. The subspecialty is now concerned as much with the baby as with the mother.

In developed countries, pregnancy has become very safe, but elsewhere, it carries high risks to mother and baby. Worldwide 600,000 women die because of pregnancy every year (AbouZahr and Wardlaw 2004) and in the poorest countries, particularly where there is conflict, the risk can be as high as 1 in 50 births. Almost all these deaths could be prevented by standard obstetric care. Many agencies including the World Health Organization are trying to address this problem (World Health Organization 2004), but the solution is more political than medical.

In developed countries, cesarean section rates are rising. Rates of over 20% are now common and are causing concern. Other recent developments include screening to detect fetal abnormalities, using ultrasound examination and maternal blood tests. In future, it may be possible to assess the fetus's genetic makeup by examining fetal cells in maternal blood (Kumar and O'Brien 2004). Fetal surgery is an option for only a very small number of conditions and medical treatment also has limited applications, so screening often leads to abnormal fetuses being aborted.

Self-identification

Science

Obstetrics self-identifies as a science although in some ways it is a craft, like surgery. It has elements of epidemiology, with its focus on rates of maternal mortality, perinatal mortality, cesarean section, etc. Techniques such as ultrasound scanning and prenatal diagnosis are based on sciences such as physics and molecular biology. With the rise of evidence-based medicine in the 1990s (see below), obstetrics in Western countries has

become concerned that all treatments should be justified by randomized controlled trials. This is important in countries such as the UK and the USA where there is now a backlash against what is seen as excessive medicalization of childbirth.

Characteristics

In obstetrics, there are two patients to consider and sometimes their interests conflict. For example, cesarean section may be safest for the baby but involves some risk to the mother. More than most medical specialties, obstetrics involves watching a natural process and deciding whether or not to intervene. Unlike many specialties – brain surgery, for example – nonmedical people feel they have a good understanding of the subspecialty and may have firm views about what the practitioner ought to do.

Relevance to Science and Religion

The subdiscipline is concerned with the beginning of life, and this raises ethical questions which demand practical answers. Science provides information such as the genetic makeup and gender of the fetus, the presence of abnormalities, and the risk of future disease which may affect the quality of life of the child, parents, and siblings. The parents' wishes may conflict with the doctor's religious principles. Conversely, the religious principles of the patient and her relatives – for example, refusal of blood transfusion – may put a woman's life at risk and cause great distress to her doctors.

Sources of Authority

For most of its history, the subdiscipline has relied on teaching passed on from senior practitioners through textbooks, lectures, and day-to-day instruction. The first obstetric textbook was *Der Schwangeren Frauen und Hebammen Rosengarten*, known as “the Rosengarten,”

written by Eucharius Rosslin, and published in Germany in 1513. It restated the obstetric teaching of the ancients, including Soranus of Ephesus. At that time childbirth was the responsibility of midwives and in the sixteenth century the French surgeon Ambroise Pare founded a school for midwives in Paris. In the seventeenth century, “accoucheurs” (man-midwives) became fashionable in France. In 1752 a Scotsman, William Smellie, practicing midwifery in London, published his *Treatise on the Theory and Practice of Midwifery*, including a description of obstetric forceps. He has become known as “the master of British midwifery” but was violently opposed by the London midwives (Drife 2002). Tension between the professions still continues.

In Britain, “midwifery” became a compulsory subject for medical students in the nineteenth century and university chairs were established. For example, James Young Simpson, who introduced chloroform anesthesia, was appointed Professor of Midwifery in Edinburgh in 1840. In the twentieth century the main sources of authority were professors and other senior practitioners. Although their opinions were not always in agreement, their teaching was respected because obstetrics had developed through a process of trial and error, and practitioners had learned through bitter experience. Juniors were naturally anxious to avoid repeating the errors of their predecessors.

At the end of the twentieth century, with the rise of evidence-based medicine, this style of teaching was ridiculed as old-fashioned. Evidence-based medicine involves rigorously designed clinical trials with precautions to exclude bias and achieve objectivity. It has been widely accepted in Western obstetrics. One difficulty is that large numbers of subjects are required if a trial is examining risks which are already low. This has led to the technique of “meta-analysis,” in which the results of several trials, each inconclusive, may be combined to give a statistically significant result (King 2005).

It has become impossible for individual practitioners to assess the evidence on every question,

and obstetricians are relying increasingly on guidelines produced by their professional bodies, such as the American College of Obstetricians and Gynecologists and, in the UK, the Royal College of Obstetricians and Gynaecologists (Royal College of Obstetricians and Gynaecologists and Royal College of Midwives 1999). These are well respected internationally. In many countries, guidelines are produced by state-controlled bodies including, in post-Soviet countries, the Ministry of Health. Such guidelines may still be based on traditional teaching rather than evidence.

Ethical Principles

Like other medical specialties, obstetrics is guided by the Hippocratic Oath and the Declaration of Helsinki but this guidance is not absolute. The Hippocratic Oath includes the promise “I will not give a woman a pessary to cause abortion” but even obstetricians who disagree with abortion may feel it is justified in a case of lethal fetal abnormality.

The principles that underpin modern medical ethics (Beauchamp and Childress 2001) are: “Respect autonomy,” “Maximize beneficence,” and “Act Justly.” Respecting autonomy means that decisions are made by the woman herself. For example, a woman cannot be forced to have a cesarean section even if her refusal means that the fetus will die. However, the three principles may conflict with one another – for example, when a woman demands an intervention which puts her or her baby at risk. Balancing autonomy, beneficence, and justice is the job of each obstetrician.

Specific guidance on ethical matters is set out in some countries by bodies that govern the medical profession, such as the General Medical Council in the United Kingdom (General Medical Council 2006). Professional bodies such as the British Medical Association also offer ethical guidance which is not binding on members.



Key Values

Preservation of the life and health of the mother is the most basic aim of obstetrics (Lewis 2007), and in the last analysis it takes precedence over the life and health of the baby. The emotional quality of the birth experience is becoming increasingly important in developed countries. Sometimes the aim of minimizing risk can conflict with the aim of optimizing the ideal birth experience.

Conceptualization

Nature/World

Obstetricians try to work with nature and to ensure that their interventions, if required, mimic nature as much as possible. Nevertheless, the purpose of medicine is to combat nature when natural processes, such as infection, are harmful to humans. The process of combating or manipulating nature begins by understanding it as fully as possible.

Human Being

Obstetricians have the privilege of observing the creation of human beings from a cell that develops into an embryo, then into a fetus, and finally a baby. The point during this process at which the term “human being” can be applied is debatable. The heart begins to beat about 3 weeks after conception but the brain’s cerebral cortex is still developing during the second half of pregnancy. Obstetricians are conscious of the potential of the embryo from the earliest stages of pregnancy but generally take the view that the embryo and fetus gradually acquire the characteristics and rights of a human being.

Life and Death

The law defines birth as the origin of life but biology sees life as a continuum in which DNA inhabits many forms – in sperm or eggs, in the embryo, and so on. Where life came from in the first place is a question on which the subspecialty has no fixed opinion.

Reality

Obstetricians are firmly connected to the realities of life and death. Sudden emergencies demand practical action and small errors can have major consequences, so the subspecialty tends to be strong on practicalities and weak on philosophy.

Knowledge

A distinction is often made between information, knowledge, and wisdom. Much scientific information is now available to obstetricians, who increasingly use the internet to access it. Knowledge is the ability to put this information into context. Some patients want only knowledge, to help them make their own decisions. Others want the benefit of the doctor’s wisdom, which means interpreting knowledge in the light of experience, and understanding the needs of the individual patient.

Truth

Nature’s unpredictability means that obstetricians are suspicious of the concept of truth. Scientific “truth” is still very limited. Religious “truth” is more comprehensive but may be compromised by reality.

Perception

Perception may be a physical or an intellectual process. Perception of risk, for example, varies widely among different people. Perceptions of obstetrics itself vary, with some people perceiving obstetricians as doctors who save lives while others see them as interfering needlessly with a natural process and motivated by power or profit.

Time

Daytime and nighttime are the same for obstetricians – indeed, left to themselves, more babies are born at night than during the day. Time can pass very slowly when an obstetrician is practicing the important art of doing nothing, but when intervention is required, action may need to be very prompt. Much expensive litigation is concerned with determining the exact time-course of events around birth and trying to decide whether or not delivery a few minutes earlier may have prevented brain damage.

Consciousness

For the mother, awareness of her surroundings is important and if cesarean delivery is required every effort is made to use regional analgesia rather than general anesthesia. Fetal consciousness is hard to define. It requires a functioning cerebral cortex but even in late pregnancy, the fetus has few stimuli to interpret or learn from. Nevertheless there is evidence that the fetus at term can learn in the womb (Van Heteren et al. 2000).

Rationality/Reason

During pregnancy obstetricians and their patients discuss facts, options, probabilities, and risks in a rational and reasonable way. During labor, it can be harder for women and their partners to think rationally. This makes it important to discuss options in advance if possible, so that valid consent for interventions can be given.

Mystery

The more we know about human development, the more questions emerge. Creation of a human being from a single cell in only 9 months, without any outside help apart from the uterine environment, is arguably the greatest mystery imaginable. In spite of the down-to-earth practicality of their job, obstetricians retain a sense of wonder at this process and are profoundly aware of how little they understand it or can control it.

Relevant Themes

Obstetrics is a “broad church” which includes diverse views on science and religion. If there is a relevant additional theme, it is that of harmony. Obstetricians with divergent and indeed opposing views generally work easily together, accepting that both science and religion are necessary and seeing them as complementary and not opposing forces.

Cross-References

► [Surgery](#)

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Occupation

► [Occupational Therapy](#)

Occupational Health Psychology

► [Behavioral Medicine and Health Psychology](#)

Occupational Science

► [Occupational Therapy](#)

Occupational Therapy

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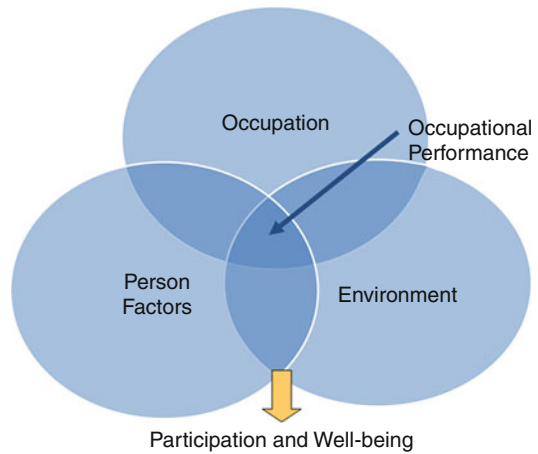
Related Terms

Health science; Occupation; Occupational science; Therapy

Description

Occupational therapy (OT) is a profession concerned with promoting health and well-being through occupation. The primary goal of occupational therapy is to enable people to participate in the activities of everyday life (World Federation of Occupational Therapists 2008). Founded in 1917, occupational therapy is a well-established profession internationally that uses everyday activities with people to improve or regain the capacity to participate in a meaningful and satisfying life. The term “occupation” means engagement in life activities and includes, activities necessary to care for self and others, education, work, play, leisure, and social participation. Occupational therapy is practiced in a wide range of settings, including hospitals, health centers, mental health centers, community centers, homes, workplaces, schools, and housing for seniors. Clients are actively involved in the therapeutic process, and outcomes of occupational therapy are client driven and measured in terms of participation or satisfaction derived from participation (World Federation of Occupational Therapists 2008; Townsend and Polatajko 2007).

Occupational Performance Model



Occupational Therapy, Fig. 1 Occupational Performance Model: The concept of occupational performance has become mainstay in the development of models of occupational therapy. It operates as a means of connecting the individual to roles and to the sociocultural environment (Reed and Sanderson 1999, p. 93). Occupational therapists practice from an occupational performance perspective which requires the practitioner to know: what do people do in their daily lives, what motivates them, and how their personal characteristics combine with the situations and environments in which their occupations are undertaken

Recent advances include: development of models of occupational performance (Fig. 1) (Reed and Sanderson 1999; Christiansen et al. 2005) and enabling occupation (Townsend and Polatajko 2007); adoption of client-centered approaches; movement away from interventionalist to self management strategies; endorsement of the World Health Organisation International Classification of Functioning, Disability and Health (World Health Organization 2001); and focus on activity participation and ongoing challenges to productive lifestyles. There are currently over 50 member countries of the World Federation of Occupational Therapists (WFOT).

Self-identification

Science

Occupational therapy has over the past decades achieved the criteria of a science discipline. It has established its own literature focused on testing

of theoretical underpinnings of the profession, such as occupation, as well as empirical studies of the practice using scientific methods. The science of occupational therapy also draws from the neuroscience, biomedical, social psychology, environmental, and occupational sciences, and is applied at medical, community, and population levels. The integration of these sciences and the context of application in daily life place the profession in a key position to contribute to translation of science to its point of use. The profession has produced evidence-based guidelines for general practice, and in relation to specific practice areas e.g., neurological rehabilitation, hand therapy, mental health. The theories and skills behind the practice are taught in accredited colleges and universities throughout the world. The discipline runs regular scientific meetings and has its own scientific journals.

Religion

The discipline recognizes the value of religion, particularly the meaning associated with spirituality in people's lives.

Characteristics

Occupational therapy is distinctive among other disciplines in that it provides a unique contribution to understanding occupational performance, i.e., the dynamic interaction of person factors, such as cognitive, affective, motor, sensory, and spiritual, and environmental factors such as social support, technology, and culture. This understanding is used in the context of what individuals want and need to do to achieve their home, work, family, and community activities. The discipline uses the medium of everyday activities, with detailed task analysis, as a major tool to facilitate change (Law et al. 2005). The process of change is facilitated by learning-based models. The models underpinning occupational therapy are unique in that they include person, environment, and occupation together in the one model, with the goal to maximize the fit between those factors.

Relevance to Science and Religion

The discipline of occupational therapy is interested in the scholarly area of "Science and Religion." While OT is strongly founded in the sciences, with its own literature and education within university/academic settings, the foundation models of occupational therapy recognize the important role religion and spirituality plays in the lives of individuals. In particular, how those life experiences and values are important in the process of recovery and change and quality of life.

Sources of Authority

The day-to-day practice of occupational therapy is guided by the self-appointed World Federation of Occupational Therapy (WFOT) (World Federation of Occupational Therapists 2008). All schools worldwide must meet minimum standards established by WFOT. Many countries have additional standards and some have registration standards that must be met by therapists. There are also self-appointed national and international bodies, such as the American, Australian, and Canadian Associations of Occupational Therapists. Authoritative texts on occupational therapy include: *Occupational Therapy: Performance, Participation, and Well-Being* (Christiansen et al. 2005); *Conceptual Foundations in Occupational Therapy* (Kielhofner 2004) and *Enabling Occupation II: Advancing an Occupational Therapy Vision for Health, Well-Being & Justice Through Occupation* (Townsend and Polatajko 2007).

Ethical Principles

Occupational therapy is guided by the Occupational Therapy Code of Ethics (American Occupational Therapy Association 2005). Members are committed to promoting inclusion, diversity, independence, and safety for all recipients in various stages of life, health, and illness and to empower all beneficiaries of occupational



therapy. Based on set principles, it is expected that occupational therapy personnel shall: demonstrate a concern for the safety and well-being of the recipients of their services; take measures to ensure a recipient's safety and avoid imposing or inflicting harm; respect recipients to assure their rights; achieve and continually maintain high standards of competence; comply with laws and Association policies guiding the profession of occupational therapy; provide accurate information when representing the profession; treat colleagues and other professionals with respect, fairness, discretion, and integrity (American Occupational Therapy Association 2005).

Key Values

The discipline holds a number of key values, in particular belief in the positive relationship between occupation and health and its view of people as occupational beings. "All people need to be able or enabled to engage in the occupations of their need and choice, to grow through what they do, and to experience independence or interdependence, equality, participation, security, health, and well-being" (Townsend and Polatajko 2007). Occupational therapists are directed to focus on performance of occupations that result from the dynamic interaction of the client, the context and environment, and the client's occupations (Christiansen et al. 2005; Townsend and Polatajko 2007). Occupational therapy practitioners understand engagement from a holistic perspective and address all aspects of performance when providing interventions.

Conceptualization

Nature/World

Nature and the world are conceptualized in the context of the environment which is a core element of the model for human performance and occupation (Fig. 1). The world is viewed in its multicultural context and as an extension of the environment in which individuals interact.

Human Being

Fundamental to the practice of occupational therapy is the conceptualization of the human as an occupational being. A human being is viewed as a goal-directed being, who "is" in the context of his/her capacities, actions, and environment (Reilly 1962). A human being has multiple levels of need and means of interacting with the environment, exists and grows because of his/her actions, and is a central to the model of human performance and occupation.

Life and Death

Life is the context in which the human being functions and experiences meaningful activities and life roles. Health and engagement in life roles and quality of life are viewed as important. Death is an "end of life" experience that has meaning. OTs may work with individuals who experience life-threatening experiences and terminal illnesses.

Reality

Reality is the "state of things as they actually are." An individual's perception of reality is impacted through engagement in tasks and life roles. People may experience different levels of reality.

Knowledge

Cognition is viewed as a foundation to understanding, acquiring, and using knowledge in everyday life. Knowledge is acquired in different ways and in different environments.

Truth

Truth is linked with reality and meaning. It may be viewed as agreement with fact or reality.

Perception

In psychology and the cognitive sciences, perception is the process of attaining awareness or understanding of sensory information. Perceptions change with life experiences and are interpreted and organized to produce meaningful experiences of the world.

Time

All human activity is temporal. Occupational therapy recognizes the need to adopt a lifespan approach and tailor its practice accordingly.

Consciousness

Consciousness is influenced by self-awareness and ability to perceive relationships between self and environment. Consciousness and self-awareness is sometimes altered by disease or disability. Occupational therapists seek to increase self-awareness through engagement in activity.

Rationality/Reason

Rationality or reason is a trait characterized by an individual's display of sound judgment and good sense in the context of life roles and practical environments.

Mystery

The discipline realizes that aspects of people's being and experience may not be explainable but may have context and meaning for the individual, and that this is real and potentially meaningful to that person and their life experiences.

Relevant Themes

Occupational therapists believe individuals can support their own health through meaningful and purposeful activities and occupations. Further, a basic assumption is that occupation affects health and well-being and brings meaning to life (Townsend and Polatajko 2007). Absence of engagement in occupation may lead to physiological decline and negatively impact health (Townsend and Polatajko 2007; Kielhofner 2004). Importantly, occupation has the potential to be therapeutic.

While it may appear that interventions that use everyday tasks are simple, in fact they are complex, requiring strong theoretical and science foundations as well as skill in task analysis and problem solving. Occupational therapists are trained to enable engagement in everyday living.

Cross-References

- Cognitive Neuroscience
- Perception
- Philosophy of Religion
- Philosophy of Science
- Time

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Oculomotor Control

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Description

The foveal region of the eye allows vision at high spatial resolution. Accordingly, humans are required to move their eyes to bring objects of



interest into the *fovea*. Such foveating eye movements are classified as *saccades*, *smooth pursuit*, or *vergence eye movements*. Fixation is accompanied by microsaccades, tremor and drifts, avoiding the fading of the visual image. The Vestibular Ocular Reflex (VOR) and the Optokinetic Reflex (OKR) aim at stabilizing the retinal image of the outer world during self-motion. Traditionally, eye movements have also been studied for medical purposes. Lesions of specific brain structures as well as cognitive or developmental deficits can cause pathological oculomotor behavior.

Self-Identification

Oculomotor research has become a discipline on its own within the Neurosciences. Traditionally, anatomical and lesion studies were used to determine the neural circuits underlying normal oculomotor behavior. With the advance of new experimental techniques, dynamics of eye movements could be characterized in greater detail. Thereafter, eye-movement measurements were combined with neurophysiological recordings in experimental animals, mostly macaques. These studies allowed to determine the functional role of specific brain regions for different eye movements. In recent years, ► [fMRI](#) has been applied for the same purpose in humans.

Characteristics

The eye is easily accessible for researchers as well as for physicians and hence makes it probably the best understood moveable part of the body. In recent years, eye movements were also studied to quantify the sensory-motor course of action or cognitive processes like ► [attention](#) and decision-making.

Relevance to Science and Religion

Eye movements are employed at various levels, from student training to basic research.

Hence, oculomotor research has to be considered an integral part of today's most relevant disciplines of the Neurosciences.

Sources of Authority

Over two centuries, a number of scientists have contributed most important work that has changed ideas or opened new pathways for research. Listing was the first to explain the physical rules that govern the *torsion* of the eye (Listing 1845). von Holst and Mittelstaedt proposed that perceptual stability during eye movements is based on the re-afference (or efference copy) of the outgoing motor commands sent to the sensory systems (von Holst and Mittelstaedt, 1950). Yarbus was among the first to investigate cognitive aspects that govern eye movements (Yarbus, 1967). Finally, Wurtz and Goldberg initiated neurophysiological studies on the functional properties of eye-movement related brain structures in awake monkeys (Wurtz and Goldberg, 1971).

Ethical Principles

Neurophysiological experiments on oculomotor control have to be permitted by local ethics committees and to be in accordance to international published guidelines on the use of animals in research (European Communities Council Directive 86/609/ECC). The same holds true for psychophysical experiments on humans which have to be performed in accordance to the *Declaration of Helsinki* of 1971.

Key Values

The key value of oculomotor research is the identification of the neural networks involved in generating different forms of eye movements. Once these networks are fully understood, this knowledge might be used for the development of new medical treatments but also for a better understanding of other sensorimotor systems.

Cross-References

- [Attention](#)
- [fMRI](#)

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Off-Line Simulation Theory

- [Simulation Theory](#)

Oneness Churches

- [Pentecostalism](#)

Online Religion

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Related Terms

[Cyberspace and religion](#); [Internet and religion](#);
[Online ritual](#); [Virtual worship](#)

Description

In the year 2000, more people were using the Internet for religious and spiritual activity than

for online-banking or online-dating services. The first large-scale studies examining Internet usage patterns in the United States found that 21% of the users went online to undertake some form of religious activity. Within 1 year the number had increased to 25%, from two million people a day using the Internet for religious or spiritual purposes in 2000 to over three million a day in 2001. Despite the continued increases in total overall Internet users, the most recent study, conducted by the Pew Internet and America Life Project, has found that “64% of wired Americans have used the Internet for spiritual or religious purposes” (Pew 2004). This demonstrates that religion on the Internet is becoming a common aspect of the new communications medium. This technology is being utilized by individuals and organizations for a variety of forms of religious activity that range from basic information-seeking behavior to complex forms of ritual engagement in three-dimensional virtual reality environments.

The first manifestations of online religion appeared on the early BBSs (Bulletin Board Systems) that were accessed by the public with dial-up modems in the late 1970s, the first Usenet group established specifically for religious-based activity was created in February of 1983 (Helland 2007). By 1990, there were over 300 different religious-based discussion groups online, with tens of thousands of religious-based postings. These early BBS systems were used for a number of activities, including posting online prayer requests, discussing beliefs and practices, uploading sacred scriptures, providing information about organizations or activities, criticizing various religious groups and practices, and even conducting online ritual activities (Helland 2005). A number of List-Serves were also developed by the 1990s for religious-based activities – many of which became well-developed online networks (Campbell 2005a; O’Leary 1996).

With the creation on the World Wide Web, online religious activity flourished. Religious-based interactions had been primarily limited to discussion threads and L-serves in the past; with websites, individuals and organizations began to



utilize the new technology in a variety of creative ways to allow for and encourage religious activity. Heidi Campbell observed that different groups and individuals began to utilize this new communications medium in different ways, based upon their perception of how they believed the technology should be used to facilitate religious activity. She argues that through certain discourses, the Internet can be viewed by members of a religious tradition as “a spiritual medium facilitating religious experience, a sacramental space suitable for religious use, a tool promoting religion or religious practice and a technology for affirming religious life” (Campbell 2005b, pp. 9–10). These varying levels of perception have impacted upon a number of organized religious groups, influencing how they structure their online presence. From an institutional perspective, the Internet is a relatively inexpensive mass-communications tool that allows for one-to-many communication and networking on a scale that had never before been imagined. For example, the Vatican (www.vatican.va) has developed one of the most impressive websites in existence. It is available in eight languages, contains a massive and expanding archive, digitized books and documents, information on doctrine and beliefs, the church’s history, saint’s lives, a “virtual tour” of the Vatican Museums, and just about everything one might want to know about the Catholic tradition. Recently they have also created a “Vatican” channel on the popular website YouTube that offers news coverage of the main activities of the Holy Father Pope Benedict XVI and even live broadcasts from the CTV (Vatican Television Center). The Vatican website is extremely dynamic and clearly demonstrates how a religious organization can embrace Internet technology for communicating information.

In other instances, religious organizations may use Internet technology to provide people with an experience of a particular religion. This can be seen in cases where the World Wide Web has been utilized to facilitate “virtual” pilgrimages at sacred sites (Beckerlegge 2001; Helland 2007; McWilliams 2004). For example, Lourdes France has an official website that proudly announces

they are “Live 24/7,” with virtual tours of the sanctuary, live stream webcams, and video on demand. They also allow for people visiting the website to submit a prayer petition that will be stored at the Grotto of Lourdes. Other cases include the wiring of temples in India so that people can login from across the globe to request specific rituals to be conducted for them (e.g., www.saranam.com); the “Window on the Wall” where a live stream webcam shows the Western Wall in Jerusalem and provides the opportunity for people to send prayer requests that will be placed in the wall (www.aish.com/w); and churches created in virtual reality environments like Second Life and Alpha World, where people can participate in virtual ritual activities (see Radde-Antweiller 2008).

Online religion is also playing an important role in connecting members of geographically dispersed religious groups, allowing for networks to be developed and maintained. This has become particularly predominant between immigrant and diaspora religious members that have been located throughout the world. A primary example of this type of activity can be seen at the websites for BAPS Swaminarayan Sanstha (www.swaminarayan.org). This group promotes a “Global Network” for their religion based upon the view that the mandirs and centers they have developed maintain a strong connection with each other and their headquarters through the Internet. This online presence acts as a net for their own membership and their website is a dynamic and complex environment that offers everything from an online teaching area, to daily inspirational pictures, video clips, and words of wisdom.

As computer costs continue to decrease, Internet access becomes less expensive, and more people become trained to use computers and the Internet at an earlier age, more people will turn to this medium for various religious and spiritual activities. Preliminary studies of online religion are showing that this form of religious praxis is not becoming a substitute for “off-line” religious engagement; rather it is becoming an important supplement for many people’s religious activities.

Cross-References

- [Cyberethics](#)
- [Cyborgs](#)
- [Globalization, Sociology of](#)
- [Media Studies](#)
- [Pilgrimage](#)
- [Religion, Sociology of](#)

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Online Ritual

- [Online Religion](#)

Ontic Evil(or Physical, Nonmoral, or Premoral Evil)

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As used mostly in Catholic moral theology, and influenced by Thomas Aquinas, ontic evil refers to the lack of perfection that exists in the created order and in human social structures by virtue of the reality of sin that permeates everything. Ontic evil, including natural disasters, accidental harm or damage, or even the potential negative effects of all human actions, including those whose intent was good, reflects the moral ambiguity of the universe, where notwithstanding humanity's best intentions, suffering does happen and is endemic to the human condition. Contrary to moral evil, however, the evil or suffering that is caused is not directly intended, even if a proportionate reason i.e., the intent of a greater good makes us tolerate it. For example, the effects of a surgery always include pain and discomfort, but that negative effect or ontic evil is to be preferred to the greater harm of disease or even death.

Ontological Arguments

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Related Terms

[A priori arguments](#); [Arguments from necessary being](#); [Arguments from perfection](#)

The term “the ontological argument” was introduced by Immanuel Kant as a name for an argument for the existence of God that can be traced back to Anselm of Canterbury of the eleventh century. It is nowadays generally recognized



that talk of the “ontological argument” is misleading, since what the term is commonly used to designate is rather a family of similar but non-identical arguments. The term “ontological arguments” is less misleading and is accordingly increasingly preferred in the contemporary literature. Arguably the most discussed family of arguments in the history of Western philosophy, ontological arguments have been defended by a long list of first-rate thinkers, including René Descartes, G.W. Leibniz, and in the twentieth century the logician-mathematician Kurt Gödel. The most well-known ontological argument in classical philosophy is no doubt Anselm’s, and the most well-known in contemporary times is probably that of Alvin Plantinga. In this entry, we focus on these two arguments.

Anselm’s ontological argument is found in *Proslogion*, Chap. II (see Anselm 1998). Anselm there says that even the fool can conceive of something than which nothing greater can be thought, and if so, then the fool must also concede that the thing thought of exists in the mind. Now suppose the thing existed only in the mind. It would then be possible to conceive of a greater, namely, that than which nothing greater can be thought existing in the mind and in reality. So if the thing only existed in the mind, what the fool conceives of would be both greater and not greater than that than which nothing greater can be thought of. But this is contradictory, and so the supposition that what is conceived of exists only in the mind must be false, in which case even the fool must concede that the thing conceived of exists not only in the mind but also outside of the mind.

Anselm’s argument has been both praised and criticized. Two famous critics are Anselm’s contemporary Gaunilo of Marmoutiers and Immanuel Kant. Gaunilo argued that if the argument were correct, then parallel arguments could be developed which establish the existence of such fantasies as the most perfect island. Kant argued that the argument is flawed since “exists” cannot function as “a determining predicate” (Kant 1781, p. 504), existence being a necessary precondition for objecthood rather than a property objects could have or lack. Against Gaunilo, it

has been objected that such fantasies as the most perfect island lack intrinsic maximums and thus cannot function as things greater than which cannot be conceived, which bars the possibility of developing the parallel arguments. And against Kant, it has been objected that predications of existence can indeed characterize objects; the phrase “Kant exists but Santa Claus does not,” for example, specifies a characteristic that Kant has but Santa Claus lacks. Responses to these counter-objections have been developed, along with counterresponses to these further responses, and so on down to the present day.

We turn next to what is probably the most discussed ontological argument in modern times, namely, Plantinga’s argument in *The Nature of Necessity*, Chap. X. Plantinga’s argument draws on modal principles pertaining to necessity and possibility and is therefore often called a modal ontological argument.

Plantinga’s modal ontological argument can be seen as a further development of a similar argument developed by Charles Hartshorne a few decades earlier. Let “maximal greatness” designate the conjunction of attributes ascribed to God in, say, classical theism. Hartshorne’s argument is now roughly this: (1) it is possible that there exists a being with maximal greatness; (2) a being has maximal greatness only if it exists necessarily; hence, (3) there exists a being with maximal greatness. The argument can be translated into a formalism that renders it logically valid in standard modal logic. (2) is true given the concept of God endorsed in classical theism. So the main questions are whether (1) is true and whether (3) is equivalent to the claim that God exists.

Plantinga accepts (1) as true, but denies that (3) is equivalent to the claim that God exists, the reason being that (3) is compatible with the further claim that although God exists in the actual world, he nevertheless lacks maximal greatness in it. It might be, say, that the being spoken of in (3) exists but lacks all knowledge, almightiness, and moral perfection. If this is so, then (3) is arguably not equivalent to the claim that God exists, at least not on a common usage of the word “God.”

Plantinga's attempt to overcome the above shortcoming leads to his own modal ontological argument. Let a "possible world" be a complete way in which the world could be. Let us moreover understand "has maximal excellence" as equivalent to "has all knowledge, almightiness, and moral perfection," and "has unsurpassable greatness" as equivalent to "has maximal excellence in every possible world." Plantinga's argument can now be given as follows: (4) there is a possible world in which unsurpassable greatness is exemplified; (5) a being has unsurpassable greatness if and only if it has maximal excellence in every possible world; hence, (6) unsurpassable greatness is exemplified in the actual world. This argument too can be translated into a formalism that renders it valid in standard modal logic, and (5) follows from the specified understanding of "unsurpassable greatness." So the main questions – granting standard modal logic – are whether (4) is true and whether (6) is equivalent to the claim that God exists.

Plantinga takes it for granted that (6) is equivalent to the claim that God exists. This could perhaps be doubted, for (6) is strictly speaking equivalent only to the claim that "an all knowing, almighty, and morally perfect being exists," and this claim is compatible with the further claims that the being in question lacks the attribute of uniqueness (i.e., there may be two or more such beings) or lacks various other attributes ascribed to God by, say, classical theists, for example, eternality, thus rendering (6) nonequivalent to the claim that God exists in the classical theistic sense of "God." These problems can be overcome, however, by modifying our understanding of "has maximal excellence" such that it becomes equivalent to something like, for example, "has the Divine attributes recognized by classical theists." Thus modified, (6) is equivalent to the claim that God, thus construed, exists.

The main question, then, is whether (4) is true. Plantinga is aware that some people deny or doubt (4), i.e., deny or doubt that unsurpassable greatness is possibly exemplified. Plantinga, qua theist, believes that (4) is true: "I think this premise is true. Accordingly, I think this version of the Ontological Argument is sound" (1974, p. 220).

And this would seem to be the position all theists are bound to take, for it would take a highly unlikely theist to believe both that God exists and that it is not possible that God exists. In line with this, Plantinga says that "What I claim for this argument, therefore, is that it establishes, not the *truth* of theism, but its rational acceptability" (1977, p. 112).

Plantinga's claim that his argument establishes the rational acceptability of theism has attracted much criticism. But the claim has often been misunderstood (see Plantinga 1980, pp. 383–384, for a clarification of some misunderstandings). A common objection, traceable to Peter van Inwagen (1977, p. 392) but repeated by many others, has it that Plantinga fails to show that "one may rationally accept" (4) since no "epistemically interesting feature" of (4) has been pointed out. A problem with this objection, however, is that it seems to assume that Plantinga's aim is to establish the rational acceptability of belief in God from the vantage point of a prior agnosticism, whereas Plantinga in reality aims at establishing the rationality of belief in God on the part of the theist. To the theist, it at the least *seems* that there is a God, and so the theist is evidently rational in believing that God's existence is at least possible and so rationally believes that the crucial premise of the argument is true. Given that the theist is rational in believing that God's existence is possible, it follows that the theist's belief in the actual existence of God is likewise rational, for the former entails the latter. As regards the agnostic, the argument shows no more than that the agnostic who affirms the theist's rationality in believing that it is possible that God exists must also concede the theist's rationality in believing that God exists in the actual world and conversely that the agnostic who denies the theist's rationality in believing that God exists in the actual world must also deny the theist's rationality in believing even that it is possible that God exists. But that the agnostic must in fact affirm or deny either of these two things is no part of what Plantinga aims at showing.

There are various interesting corollaries of Plantinga's modal ontological argument. One is



that the atheist who accepts standard modal logic must, to be consistent, believe not simply that there is no God but that it is impossible that there is. Another corollary is that if it is conceded that it is possible that God exists, then it must also be conceded that God necessarily exists.

Cross-References

► [Natural Theology](#)

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Ontology

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Related Terms

[First philosophy](#); [Metaphysics](#); [Philosophy of being](#); [Theory of what there is](#)

Description

The subject of ontology has had a renaissance in contemporary analytic philosophy, especially in American academia. This chapter will survey the

field of ontology as it is pursued in the analytical tradition, with an emphasis on the work of key analytic philosophers and on central ontological debates, such as debates concerning numbers, sets, propositions, properties, relations, states of affairs, and God.

The History of the Terms “Ontology” and “Metaphysics”

We start with some history. In current classifications of philosophical subjects, the term “ontology” is usually used to denote a subfield within metaphysics. Historically, however, the term “ontology” has been used more or less as synonymous with “metaphysics.”

The term “metaphysics” emerged in the Aristotelian tradition in classical times. In the first century B.C., Andronicus of Rhodes, the eleventh leader of the Peripatetic School in Rome, gathered Aristotle’s works into an organized *Corpus Aristotelicum*. In this corpus, the book that was placed after (*meta*) the book on physics (*physica*) was on this account called *The Metaphysics* (*ton meta ta physica*). In this book, Aristotle introduces a subject which he calls “first philosophy” (*prote philosophia*), “wisdom” (*sophia*), and “theology” (*theologia*) alternately. This discipline, he says, studies “being qua being” (*to on he on*), that is, being insofar as it is being, or being under the aspect of being. In Aristotle’s view, knowledge of being qua being includes knowledge of such things as that the ultimate constituents of the universe are particular “beings” or “substances” (*ousiai*), each of which have an essence (*to ti en einai*), qualities (*poion*), and a purpose (*telos*); are composed of form (*eidos*, *morphe*) and matter (*hule*); and are maintained in natural motion by a supreme Unmoved Mover or God (*akineton kinoun, theos*). Aristotle’s contributions to this subject were by later generations of readers of *The Metaphysics* referred to as Aristotle’s “metaphysics” (*metaphysica*), which term subsequently came to be used as the standard term for the subject in view, largely supplanting Aristotle’s own terms “first philosophy,” “wisdom,” and “theology.”

The term “ontology” (*ontologia*) arrived on the scene in early seventeenth century Protestant Europe. It was originally introduced by the Protestant philosopher Jacob Lorhard (1561–1609), rector at the gymnasium in St. Gallen in Switzerland, in his book *Ogdoas Scholastica* (1606) and was shortly thereafter picked up by Lorhard’s more famous colleague Rudolph Goclenius (1547–1628), professor at Marburg University, who listed it in his *Lexicon philosophicum* (1613). The term derives from the Greek word for “being” (*on*) and was used by Lorhard as a synonym for “metaphysics.” Goclenius offered the first definition of the term “the philosophy of being” (*philosophia de ente*).

About a century later, the term “ontology” was popularized by the influential German metaphysician and natural theologian Christian Wolff (1679–1754), who used it in his book *Philosophia prima sive Ontologia* (1730) as synonymous with “first philosophy” (as can be seen from the title), and defined it as “the science of being in general” (*scientia entis in genere*). This definition, perhaps more than any other, could on account of Wolff’s influence be considered the standard definition of “ontology” in traditional philosophy.

The term “ontology” was introduced into mainstream analytic philosophy by Harvard philosopher W. V. O. Quine (1908–2000) in the 1940s. Quine used the term, in continuity with what he called “traditional metaphysics,” in the sense of a theory or set of claims or assumptions as to “what there is,” a sense which he claimed has been nuclear to its usage all along. Through Quine’s work and in particular his seminal and programmatic paper “On What There Is” (1948), the term became part and parcel in the analytical philosopher’s terminological repertoire.

More recently, Peter van Inwagen (1998) has introduced the term “meta-ontology,” which he proposes as a name for the subject that seeks to answer the question “What are we asking when we ask ‘What is there?’” Given this term, much of what Quine says in “On What There Is” falls under the rubric of “meta-ontology” rather than “ontology.” Many philosophers have thought that van Inwagen’s new coinage clarifies an important distinction between two kinds of inquiry, namely,

inquiries into what there is and inquiries into what it is to inquire into what there is.

Criteria of Ontological Commitment

One of the earliest meta-ontological criteria of ontological commitment to be proposed in analytic philosophy is that of Bertrand Russell (1872–1970) in *The Principles of Mathematics* (1903). According to Russell, one is ontologically committed to the being or whatever one can *think of* or *refer to*, for whatever can be thought of or referred to must obviously *be* something, that is, have some sort of *being*, and moreover be something distinct from the act of thinking or referring. Says Russell: “Whatever can be thought of [or referred to] has being, and its being is a precondition, not a result, of its being thought of” (1903, 451).

A more famous meta-ontological criterion of ontological commitment has been proposed by Quine (1948). As this proposal amounts to a watershed contribution to ontological discussions, it is worth taking a look at it in greater detail.

According to Quine’s proposal, the ontological commitments of a theory or body of claims can be determined via translating the sentences of the theory or body of claims into the idiom of first-order logic. The values of the variables in the resulting first-order sentences will then count as the ontological commitments of the theory or body of claims thus translated. To clarify what this amounts to, one needs some knowledge of elementary first-order logic. First-order logic makes use of two so-called quantifiers, the existential quantifier “ $\exists x$ ” (“there exists/is an x such that”) and the universal quantifier “ $\forall x$ ” (“every x is such that”), to represent ordinary language’s “there is/exists” and “everything is/exists” idioms. The statement “there are souls,” for example, can by means of the existential quantifier be represented as “ $\exists x(x \text{ is a soul})$.” The variable x within brackets in this formula is said to be “bound” by the quantifier of the formula. In order for the formula to count as true, there must be a value of the variable x that satisfies the formula



in question, that is, there must be at least one soul. Accordingly, the statement translated above will in line with Quine's criterion of ontological commitment require an ontology consisting of at least one soul. This is the essence of Quine's criterion.

An informal version of Quine's above criterion can be obtained by replacing talk of the values of bound variables with talk of the objects of quantification in a natural language. Thus, a person who says "there are souls" will be ontologically committed to an ontology of souls, and the same goes for all other things with regard to which the person says that they "are" or "exist." A disadvantage with this informal version of the criterion as opposed to the formal version, as Quine sees it, is that a speaker is always free to disagree as to whether what *he* (or *she*) means by "there is" that coincides with "there exists," such that imputations of ontological commitment may misrepresent the speaker's intention. This freedom to disagree is not available with regard to the antecedently defined quantifiers " $\exists x$ " and " $\forall x$ " of first-order logic, however, hence the advantages of the formal version of the criterion.

There are two underlying philosophical assumptions of Quine's criterion of ontological commitment that are worth making explicit. First, it is assumed that quantification involves being, in the sense that to say that "there is" something is to imply that it "has being." And secondly, it is assumed that existence and being amount to the same thing. To say that something "is" is no different from saying that it "exists," and to say that something "exists" is the same thing as to say that it "is."

An underlying rationale for Quine's criterion of ontological commitment can be provided against the background of the above assumption and consists in the observation that it cannot consistently be said of anything that it both is (or exists) and is not (or exists not), so that whatever is said to be, cannot not be, on pain of contradiction. Thus, for example, to say that "there are souls, but they don't exist," or "there is a number which is the sum of two plus two, but numbers nevertheless do not exist," is considered self-contradictory. Given this, it seems rather obvious that whatever one is prepared to

countenance as a value of a bound variable of one's first-order sentences must exist in order for the sentence to be true.

Criticisms of the Foregoing Criteria

Russell's criterion of ontological commitment has been endorsed by relatively few analytic philosophers. It is not difficult to see why the feasibility of the criterion depends either on a relational understanding of thinking (to wit, to think of something is to enter into some sort of relation to it), or else on a theory of reference which precludes the possibility of referential failure. But not all philosophers have thought that this relational model of thinking is warranted, or that referential failure is impossible.

Quine's criterion, by contrast, has been widely received, and questions pertaining to the ontological commitments of a given theory or body of claims are often cast in terms of what objects the theory or body of claims quantifies over. But Quine's criterion has also had its critics, as we shall see.

A first objection to Quine's criterion, found, for example, in Graham Priest's *Towards Non-Being* (2005), targets the formal version of the criterion and urges that the standard reading of the existential quantifier " $\exists x$ " as "there is/exists an x such that" is not at all necessary to the apparatus of first-order logic. One could just as well read the quantifier as "for some x , it is the case that" and then introduce a one-place predicate " x exists" for expressing existential claims, and nothing of the utility or expressive power of first-order logic will hereby have been lost. On this variant reading of " $\exists x$," to be counted as the value of a bound variable is not considered a sufficient criterion for ontological commitment.

Although the above objection only threatens the formal version of Quine's criterion, it pushes the discussion back to the informal version of the criterion, preparing the way for further and more serious objections. One such further objection has been urged by Richard Routley (1935–1996) in *Exploring Meinong's Jungle and Beyond* (1980) and, following him, by Priest (2005) and

proceeds from the observation that there are plenty of things that can be quantified over without any concomitant ontological commitments as to the existence of the things in question. This claim is taken to be supported by numerous examples, such as “there are fictional characters,” “there are twelve gods in the Homeric pantheon,” “there are lots of things that could have been done but never were done,” and so on. None of these things (fictional characters, gods, things that never were done) need be assumed to exist by persons who make these sorts of statements, and hence, it is wrong to think that the mere act of quantification entails ontological commitment. Since this sort of objection relies essentially on examples and on intuitions as to when a statement can be regarded as carrying ontological commitments or not, it could be classified as a commonsense objection and is so classified also by its proponents.

Not all philosophers have been impressed by the commonsensical appeal of the objection, however, for it seems to entail the less than commonsensical further idea that something can be a “thing” (or “object” or “item”) but nevertheless not exist or have any being, which might seem odd. Is it not part of the nature of a thing (object, item) that whatever is a thing also exists and that it has some sort of being. Routley and Priest deny this, claiming that some things (objects, items) are beyond existence and being altogether, for example, fictional characters. It is possible to go along with Routley and Priest’s examples of ontologically neutral quantification even without endorsing their claim that there are things beyond being, however. Thus, some metaphysicians have developed theories according to which there are objects that do not exist – for example, fictional characters – but which nevertheless remains neutral as to whether these objects have some other sort of being or no being at all.

Another sort of objection to Quine’s criterion is due to Hilary Putnam and is inspired by Wittgenstein’s famous dictum that meaning is use. In *Ethics without Ontology* (2004), Putnam argues that the meaning of the existential quantifier “ $\exists x$ ” of first-order logic and of corresponding

natural language locutions such as “there is/exists” are at least in part functions of the contexts in which they occur, such that occurrences of “ $\exists x$ ” and “there is/exists” in, say, mathematical contexts have in part different meanings from their occurrences in other contexts such as, say, biology. In mathematics, says Putnam, there is no need whatsoever to interpret quantification over such things as numbers as involving ontological commitments to abstract objects, but for quantification over such things as mammals in biology, things are different. If Putnam’s functional interpretation of quantification is correct, then Quine’s criterion is in trouble, for the criterion assumes that the existential quantifier always involves ontological commitment and that it remains univocal from context to context.

“Unactualized Possibilia”

The issues of the foregoing section are brought to the fore in a central ontological dispute in modern analytic philosophy, namely, the dispute over so-called “unactualized possibilia,” a class of alleged objects that are nonexistent but at the same time possible (“possible” in the sense that if they had existed, this would entail no contradiction as such). A well-known example of an alleged possible object, introduced into discussions by Quine (1948), is “the possible fat man in the doorway.” Is there such an object as the possible fat man in the doorway?

There are four main responses to this question in the literature. According to a first response, known as *possibilism* and endorsed, for example, by Russell (1903), there are indeed such things as merely possible objects. The possible fat man in the doorway is a merely possible object and has some sort of being, although it fails to exist; the early Russell spoke of such objects as “subsisting,” subsistence being distinct from existence. This position was taken to be supported by the pair of ideas that unactualized possibilia can be thought of and referred to and that whatever can be thought of and referred to must be something.



According to a second response, known as *actualism* and endorsed, for example, by Quine (1948) and Alvin Plantinga (1974), there are no unactualized possibilia. All objects exist, or are “actual,” and there is no such thing as an object that does not exist. Proponents of actualism have often sought to defend this position by pointing to difficulties in possibilism. Thus, Quine, for example, argues that possibilism is unable to provide clear identity conditions for the objects that it posits. Is the possible fat man in the doorway identical to the possible bald man in the same doorway? Quine believes that possibilists are unable to provide satisfactory answers to these sorts of questions, and this he takes to undermine possibilism and thereby to further the credentials of actualism. As for the above pair of ideas that are believed by possibilists to provide evidence for possibilism, actualists typically respond by analyzing the subjects of statements that appear to refer to unactualized possibilia in ways that do away with any such reference. Thus, Quine, for example, proposes that a statement such as “the possible fat man in the doorway is late” be analyzed as “there is an x such that x is a possible fat man and x is late,” in which the burden of ontological commitment is carried not by any alleged referent of “the possible fat man” but by the value of the bound variable x .

A third response is that of *noneism*, endorsed, for example, by Routley (1980) and Priest (2005). Noneists reject both possibilism and actualism; contrary to possibilists, they hold that unactualized possibilia lack any sort of being whatsoever, and contrary to actualists, they hold that there indeed are such objects as nonexistent, merely possible, objects. Priest argues that Quine’s above identity-condition objection to unactualized possibilia can moreover be met: roughly put, the possible fat man in the doorway can be known to be identical to the possible bald man in the doorway if and only if they share all the same properties in all possible worlds. If the possible fat man in the doorway has all and only the same properties as the possible bald man in all possible worlds, then they are the same possible object, otherwise not.

Numbers and Sets

Whereas ontologies comprising unactualized possibilia have been endorsed by relatively few modern philosophers, ontologies comprising numbers and sets have attracted a wider following. Still, the ontological status of numbers and sets has been a disputed issue throughout most of the history of analytic philosophy.

Numbers (e.g., the series of natural numbers 0, 1, 2, ...) and sets (e.g., the set {0, 1, 2}) were understood by Russell (1903) as abstract objects constituting part of “what there is.” Inspired by Gottlob Frege’s work, Russell proposed to define (natural) numbers in terms of sets – roughly put, a natural number is a set of sets satisfying a certain condition – but this was not thought of as effecting an elimination of numbers in favor of sets but rather as a means of showing that numbers were independent of intuitions of time (contrary to what had been claimed by Immanuel Kant). Quine (1948) and Hilary Putnam (1971) – this was before Putnam defected from Quine’s meta-ontology – take the same position on the reality of numbers and sets as the early Russell, a position typically referred to as *Platonism* or *realism* with respect to mathematical objects.

Russell’s reason for thinking that there are numbers and sets parallels his reason for accepting unactualized possibilia: numbers and sets can obviously be thought of and referred to, and whatever can be thought of or referred to must obviously be something. Quine (1948) and Putnam (1971) offer a different reason. Taking the Quinean criterion of ontological commitment as a starting point, they proceed to note that mathematics is replete with quantification over numbers and sets and hence involves ontological commitment to the existence of numbers and sets. In a second move, it is noted that mathematics plays an indispensable role in modern physics, a most impressive and authoritative branch of contemporary scientific theory. Given this, it is in a final step concluded that an acceptance of contemporary scientific theory requires acceptance of mathematics, which in turn carries ontological commitments to numbers and sets.

This is the famous “Quine–Putnam indispensability argument,” which many philosophers have found thoroughly persuasive.

Among opponents of mathematical realism, one can discern positions that concede that there “are” numbers and sets but construe them as in some sense dependent on the noetic activity of human mind or action (e.g., *intuitionists*, *formalists*, *constructivists*, and *fictionalists*), and positions for which the question of the ontological status of numbers and sets arises only as a result of conceptual confusion (e.g., *Wittgensteinianism*). Both of these sorts of positions come in a variety of sophisticated and less sophisticated forms, but have in common a rejection of the hypostatization of mathematical objects countenanced by Platonism or realism.

Propositions

Another class of alleged objects of disputed ontological status is propositions. The notion of a proposition was introduced into analytic philosophy in large part by Russell (1903). Russell understood propositions to be the proper bearers of truth-values (i.e., truth or falsity) and to be the objects of propositional attitudes such as believing, disbelieving, doubting, and so on. Thus, for example, if someone believes that angels exist, then *that angels exist* is taken to be the propositional object of the person’s belief.

Russell held, in his early writings, that propositions are complex abstract objects subsisting independently of the human minds that can take them as the objects of their propositional attitudes. He supported this view via the considerations that propositions can be thought of and that whatever can be thought of must be something distinct from the act of thinking itself. Moreover, since different people can think the same proposition, the proposition must be independent of particular human minds and hence, presumably, be independent of human minds altogether.

In the 1910s, Russell abandoned the above theory of propositions, mainly due to its implication that there are in reality such things as subsistent falsehoods, a consequence considered by

Russell to be strongly counterintuitive. Later on, in the 1950s and 1960s, Quine castigated the theory of propositions repeatedly, arguing that there are no clear identity conditions for such alleged objects and, hence, that they should not be admitted into one’s ontology. On Quine’s view, sentences can do all the work that propositions are invoked to do, including most importantly that of being the bearers of truth-values, and hence, the theory of propositions becomes a superfluous hypothesis in any case.

From roughly the 1970s and onward, the theory of propositions has made a comeback in analytic philosophy, however, especially among analytical metaphysicians, and propositions may well be the chief contemporary candidates for the role of truth-bearers. This change of attitude was precipitated in part by endorsements of the theory of propositions in the work of influential American philosophers such as Roderick Chisholm (1916–1999).

Properties, Relations, and States of Affairs

Further central ontological disputes in analytic philosophy have concerned the ontological status of properties, relations, and states of affairs.

Properties are an alleged class of objects that other objects can have and which are typically expressed by means of predicates in subject–predicate statements. Examples are the property of having a location, the property of being a human being, the property of being mortal, and so on. Relations are an alleged class of objects that relate objects to other objects or to themselves and which are typically expressed by terms that correspond to two-place predicates. Examples are the relation of *x* admiring *y*, the relation of *x* being the parent of *y*, the relation of *x* admiring *y*, and so on. States of affairs are an alleged class of complex objects consisting in a sort of configuration of objects, for example, *the Earth’s being in motion*, *Russell’s having read Frege*, and so on. Some writers, for example, Plantinga (1974), take states of affairs to be capable of obtaining (e.g., *Russell’s having read*



Frege) or failing to obtain (e.g., *Russell's not having read Frege*). Others, for example, David Armstrong (1997), take states of affairs to be simply facts, all of which obtain.

Philosophers, who endorse ontologies comprising properties, relations, and/or states of affairs, often do so for reasons similar to the reasons given in the foregoing in favor of unactualized possibilities, numbers, sets, and/or propositions. Either it is held in Russellian fashion that these objects can be thought of or referred to and hence must be something, or else it is held in Quinean fashion that one is ontologically committed to the existence of these objects by virtue of accepting theories or bodies of claims in which these things are quantified over.

God

Analytic philosophers have also been concerned with questions pertaining to the ontological status of God. God differs from such alleged objects as numbers, sets, propositions, properties, relations, and (on one interpretation) states of affairs by virtue of being, if existent, not an abstract object but a concrete, particular, intentional, conscious, and personal being.

With regard to God, one line of discussion has been whether ordinary talk about God carries ontological commitments to his existence, a second line of discussion has been whether there are any cogent arguments for the existence or nonexistence of God, and a third line of discussion has been whether the theistic belief that God is the creator of all things apart from himself is consistent with an ontology comprising abstracta.

The first line of discussion, whether our ordinary talk about God carries ontological commitments to his existence, has proved to be a more difficult question than might at first sight seem to be the case. The Russell of *The Principles of Mathematics* was an atheist, but in this book, Russell nevertheless endorses a criterion of ontological commitment which entails that there is such a being or object as God, since God can be thought of and referred to. This is no contradiction, however, since Russell's atheism can be

construed as the disbelief that God *exists* (and not merely *subsists*; recall Russell's distinction between existence and subsistence mentioned above), but it may nevertheless seem odd that an atheist should acknowledge that there is such a being as God. It is accordingly not surprising that Russell's so-called theory of definite descriptions, which construes most proper names and other denoting expressions as concealed definite descriptions, is in the long introduction to Russell's *Principia Mathematica* (1910) explicitly applied to the perfect being: "the most perfect being exists," Russell there says, has the logical form " $\exists!(x)(x \text{ is most perfect})$," that is, "there is exactly one x such that x is most perfect," and the burden of objective reference is hereby lifted off the referent of "the most perfect being" and placed squarely on the value of the variable " x ." By this means, Russell believed he had provided a way for talking about God without assuming that there is a God.

Like Russell, Quine – also an atheist – believed that there were difficulties for the atheist who wished to talk about God without simultaneously acknowledging God's existence. Quine's analysis of statements about God is more subtle than Russell's, however, and for good reason. Russell's analysis has the drawback that the denial of the existence of a most perfect being is perfectly consistent with the affirmation of the existence of two most perfect beings. In §27 of *Mathematical Logic* (1951), Quine offers an analysis which avoids this drawback: construe "God" along Russellian lines as a definite description, but assign truth-conditions to the statement "God exists" in such a way that if the statement is false, then it is identical to the empty set. Hereby, Quine can analyze "God exists" in a way which is consistent with both theism and atheism, but which does not allow atheism to be consistent with polytheism.

Not all philosophers have been content with Quine's analysis of statements about God. Routley (1980), for example, has argued that Quine's analysis falls victim to the Quinean criterion of ontological commitment, such that Quine ends up ontologically committed to the existence of God after all.

With regard to the second line of discussion, that is, whether there are any cogent arguments for the existence of God, there are analytical philosophers who argue that there indeed are such arguments, and there are others who argue that there are not. Plantinga (1974), for example, argues that there is a cogent modal version of the so-called ontological argument. On the other side, philosophers like Howard Jordan Sobel (1929–2010) argue that Plantinga's argument fails (see Sobel 2004).

With regard to the third line of discussion, the theistic doctrine that God is the creator of absolutely all things apart from himself has been taken by some philosophers to be inconsistent with an ontology comprising abstracta, for abstracta are typically taken to be incapable of entering into causal relations and creation is a causal relation. Thus, van Inwagen (2009) argues that God should, properly speaking, only be held to be the creator of those objects that can enter into causal relations. Many theists find this view unacceptable, however, and have sought instead to resolve the problem either by positing abstracta as thoughts in God's eternal mind, or by holding that abstracta depend on causally conditioned concrete things for their existence.

Cross-References

- [Naturalism, Ontological and Methodological](#)
- [Space and Time](#)

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Operational Research

- [Operations Research in Applied Mathematics](#)

Operations Research in Applied Mathematics

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Related Terms

[Operational research](#)

Description

Operational research (O.R.), also called operations research in USA, has been defined as the discipline of applying advanced analytical methods to help make better decisions. It can be described, according to the International Federation of Operational Research Societies (IFORS), as a scientific approach to the solution of problems in the management of complex systems. It relies in a methodology mostly based in the use of mathematical models.

The name “operational research” is quite ambiguous and does not really describe the nature



of the discipline. It was coined during World War II, when the British Army requested a group of scientists to analyze military operations through a scientific approach. The experiments made with the newly developed radar system showed its technical possibilities but also proved the operational limits within its use. Therefore, it was proposed that research into the operational (as opposed to the technical) aspects of the system should be developed. This operational research was extended to other systems and, after the end of the war, moved to the civilian world.

O.R. is usually considered as a branch of applied mathematics, characterized by its broad applicability and by its interdisciplinary nature. The systems under study are such that human behavior plays an important role. O.R. focuses on developing models to make optimal decisions, where optimization is understood in a broad sense, as choosing a decision alternative with the property to be better than any other in some way to specify.

The models developed are usually quantitative, and in their development, operations researchers use general mathematical language, such as functions or inequalities, but also graph theory, random variables, decision trees or fuzzy logic, among others. Techniques and tools to solve the models include mathematical optimization (also known as mathematical programming), probability and statistics, graphs and networks optimization and neural networks, dynamic programming, simulation, multicriteria decision analysis, metaheuristics, game theory, etc.

Problems addressed include assignment and distribution of resources, location, production and inventory, sequencing and scheduling, routing, waiting lines, reliability, decision problems, optimal search, supply chain management, humanitarian logistics, etc. For an extensive account on problems and techniques, see Gass and Harris 2001.

Its growth in the last decades has consisted of both technical developments and increase in the type of problems in which it is applied. Advances in computer technology have greatly contributed to this growth, parallel to new advances in algorithms.

Among the methodologies developed in O.R. a major role during the first decades has been played by mathematical optimization: problems are modeled by means of an objective function to maximize or minimize under the restriction of a set of constraints, and to solve the problem consists on finding the constrained optima. When all the functions that appear in the model are linear, the problem is known as a linear programming problem, and it can be solved with the simplex method, introduced by G. Dantzig in 1947. The simplex method has been selected as one of the ten most relevant algorithms in the development and practice of science and engineering during the twentieth century. If any decision variable has to take integer values an integer programming problem has to be solved, if any function appearing in the model is not linear, a nonlinear programming problem is at hand and so on.

In the last decades, these methodologies have been extended in several directions, either by the incorporation of uncertainty into the models (stochastic optimization), either by explicitly considering multiple criteria in the decision-making environment (multiple-criteria decision-making), either by the use of sophisticated approximate searching methods (metaheuristics), among others.

Self-identification

Science

This discipline self-identifies as a science. Its aim is the application of the scientific method to the management of complex systems. The methodology used relies on the development of mathematical models that represent the systems under study, which are optimized using quantitative methodologies.

Characteristics

Operations research is distinguished from other disciplines by its focus on models and analytical techniques that can be used to make optimal

decisions on complex systems where human behavior plays an important role.

Relevance to Science and Religion

Even though the links between mathematics and religion are evident along the history (“Mathematics is the language in which God has written the universe,” Galileo Galilei (1564–1642)), few interest can be found in the area of “Science and Religion” among operations researchers, as the object of their work is to help making good decisions concerning managerial problems. Nevertheless, ethic questions commonly arise, as their work is concerned with human decisions.

Despite the foregoing, in the field of decision-making, some research has been done regarding the treatment of the influence of religious or moral beliefs when making decisions.

Sources of Authority

The sources of authority in operations research are the results published in peer-reviewed journals with a relevant impact in the area on *Operations Research and Management Science*. Operations research societies play also an important role. Both sources are clearly interrelated: the first O.R. journal, “Operational Research Quarterly” was published in United Kingdom in 1950 by the Operational Research Society (and renamed afterward as “*Journal of the Operational Research Society*”). It was followed in 1952 by the “*Journal of the Operations Research Society of America*,” renamed as “*Operations Research*” in 1955. The first international conference on O.R. was held in England in 1957 and was followed in 1959 by the founding of the International Federation of Operational Research Societies (IFORS), an umbrella organization for operational research societies worldwide, representing approximately 50 national societies.

Nowadays, the leading scientific journals in the area are *Omega*, *Management Science*, *European Journal of Operational Research*, *Decision*

Support Systems, *Transportation Research*, *O.R. Spectrum*, *Operations Research*, *Computers and Operations Research*, *Journal of Global Optimization*, *Mathematics of Operations Research*, *Journal of Optimization Theory and Applications*, *Networks*, *Methods of Operations Research*, *Mathematical Methods of Operations Research*, *Queuing Systems*, *SIAM Journal of Optimization*, etc. It gives an idea of the growth and potentiality of O.R.

It is practically impossible to cite the most important mathematicians working on O.R. a discipline from the 1940s of the last century. A key personality is George B. Dantzig, who introduced in 1947 the simplex method and who is considered the father of linear programming. Other pioneers of the field are personalities such as John von Neumann, Leonid Kantorovich, Lester Ford, Delbert Fulkerson, Tjalling Koopmans, Wassily Leontieff, Richard Bellman, Albert Tucker, Harold Kuhn, David Gale, John Nass, Arnold Charnes, William Cooper, E. Martin Beale, Harry Markowitz, Egon Balas, Saul Gass, Pierre Huard, Philip Wolfe, Roger Wets, among many others. Today, there are more than 30,000 operational researchers affiliated to the many O.R. societies distributed all along word included in IFORS.

Ethical Principles

O.R. as the science which provides tools for helping decision-making processes, has an impact on people’s lives and on society. Contrary to the trend that claim that science and technology are value neutral, nowadays, there is a growing awareness that science cannot be considered above or beyond the realm of value judgments and hence of ethics (See Gallo 2004).

One of the main principles which should guide the discipline, as pointed out by G. Gallo, in following the philosopher Hans Jonas, is the responsibility principle: we have a responsibility toward the other, be it humankind (past, present, and future generations) or nature. Applied to O.R. this could be understood as taking into account not only the point of view of the “client” but also



the point of view of the ones directly or indirectly affected by the decisions. This can lead in O.R. to the use of multicriteria management, because the optimality criteria may be different for the different actors involved and in most cases, operational researchers should look for compromise solutions, not absolutely optimal ones, as the optimum would differ for different objectives. This could include the use of social choice theory to measure individual interests, values, or welfares as an aggregate toward collective decision.

Regarding the research activity (see Wallace 1994), operations researchers generally agree on some aspects of ethical conduct, such as the need for model builders to be honest, to represent reality as faithfully as possible in their models, to use accurate data, to represent the results of the model as clearly as possible, and to make clear to the model user what the model can do and what its limitations are.

Another principle which should guide the discipline, as it has been traditional in science, is the open distribution of the results of the research activity, so that knowledge can advance building on the contributions of others. Sharing and cooperation among researchers should be an ethical principle guiding operations researchers.

Nonmaleficence is also an ethical principle guiding a discipline that tries to make human life better.

Key Values

Some key values are the same as in any field in mathematics: rationality, curiosity, and honesty. Efficacy and efficiency are also key values in the area. As an applied field concerning human beings, bettering the human condition is a key value too, attached in this case through helping make better decisions.

Conceptualization

Nature/World

As physics is modeling natural real-world situations, O.R. is modeling human systems. So, for

operations researchers, world can be considered as the environment in which systems are defined. Sometimes they would use the term “nature” to indicate the aspects of the system that are not under the control of the decision-maker and which will present a concrete state independently of the decisions taken.

Human Being

In the context of O.R. the human being is mainly the decision-maker. Human systems depend not only on the real world but also on the decision-maker, whose preferences have to be included in the models.

The understanding of the human being, especially of the way humans make decisions, is very relevant to the field.

Life and Death

In decision analysis, life-and-death decision-making is a broad field of research, appearing in O.R. works related to clinical or disaster management decisions, among others. Due to the gravity of the decision and the severity of making the wrong choice, the models to be constructed have special characteristics. In this context death is considered the absolute loss, and no trade-off is possible with other possible gains. On the other hand, concepts related to the origins of life are not considered in O.R. research.

Reality

Reality in O.R. is the (human-machine) system under study, with all its complexity. The main task of the operations researcher is to formulate the real world problem and to develop a mathematical model from it. The model is a collection of logical and mathematical relationships that represents aspects of the situation under study. The model is always an abstraction from reality, simpler than the real situation. The aim of the researcher is to make the model include the most relevant information about the system, so the solution obtained with the model has value with regard to the original problem. Once the mathematical model is solved (optimized, in a broad sense), the solution goes back to the real world, and it has to be validated against reality.

Knowledge

Knowledge can be defined as understanding gained thorough experience or study. In that sense, knowledge conceptualized in O.R. as understanding can be viewed in a double way: when constructing O.R. models, understanding (knowledge) of the system under study is required. As an interdisciplinary science, O.R. needs the knowledge of experts coming from the areas related to the problem under study. In the other way, a model, as a simplified representation of a system, is intended to promote understanding (knowledge) of the real system. Then, through creating a model, operation researchers will gain knowledge about the system studied.

A type of models that gives understanding through experience in O.R. are the simulation models. Instead of representing the system through an analytical model, they reproduce in the computer the functioning of the system, allowing to understand how the system works and evolves in time.

Truth

While using the scientific method, truth is what has been proved, under specific assumptions and hypothesis. It can also be considered as the statements than do not contradict the information available. Truth ensures that our beliefs are not self-contradictory.

Regarding O.R. models, they are not “true” but simplyfied representations of the system, and the solutions obtained can be considered “true” for the mathematical abstraction developed but not necessarily for reality. These solutions can be useful once validated against reality.

Perception

In decision-making, perception can be considered as the subjective description of reality made by the decision-maker, which can influence his/her choices. This perception can be incorporated to an O.R. model when determining relevant criteria to be considered or when assigning weights to the criteria, for example.

Time

Time is usually conceived as the planning horizon along which decisions have to be taken. As there are systems whose conditions do not change over the planning horizon and others that do, regarding the influence of time, O.R. models can be static or dynamic. Static models are concerned with determining an answer for a particular set of fixed conditions that will not change significantly during the planning horizon (e.g., linear programming deals with static models). Instead, dynamic models are subject to the time factor, which plays an essential role in the sequence of decisions. Control theory, through dynamic programming, deals with dynamic models, among others.

Time is a key feature in O.R. problem solving, too. The models developed, to be operative, have to be solved in reasonable times, and the execution time of an algorithm marks the goodness of the approach. Computer theory of complexity plays an important role (see Garey and Johnson 1979).

Consciousness

(see section “[Human Being](#)”)

Rationality/Reason

Rationality is a key topic in decision-making. There is much literature in different areas of knowledge discussing rational decision models versus intuitive decision models. Different schools argue in the role that both reason and intuition can play in the decision process, and disciplines as psychology or neurology, among others are researching in the subject. O.R. as a discipline whose aim is the application of the scientific method to the decision process, proposes rational decision-making models. Rational thinking is understood as providing a structured and sequenced approach, where the different alternatives are evaluated and the best strategy is chosen. The idea of “best” is an attribute of rationality. O.R. models assume that decision-makers are rational and that implies that preferences are consistent and a better option will always be preferred.



Some authors, as H. Simon, postulate that rationality has boundaries, because most of the times it is not possible to consider all alternatives, predict all its consequences, and evaluate them. Then, the objective rationality, that chooses the decision which maximizes some values in a given situation, is very difficult to reach. This gives rise to the Simon's theory of satisficing, which is not accepted by other schools of thought but which is in the base of some O.R. techniques, such as ► [goal programming](#).

Mystery

Mystery is an unusual concept in O.R. As in other branches of mathematics, the still unknown will be considered as an open problem.

Relevant Themes

The study of the subjective aspects of the decision-making and, especially, of the importance of the religious beliefs in the decision-making process and how those aspects can be incorporated to the quantitative models O.R. proposes is an open field of study regarding "Science and Religion."

Cross-References

- [Ethics](#)
- [Game Theory](#)
- [Graph Theory](#)
- [Mathematics and Religion](#)
- [Simulation Theory](#)
- [Statistics and Probability](#)

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Optical Observations in Astronomy and Meteorology

- [Optics in Islam](#)

Optical Sciences

- [Electromagnetism and Optics](#)

Optics

- [Electromagnetism and Optics](#)

Optics in Islam

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Related Terms

[Anatomy of the eye](#); [Catoptrics](#); [Dioptrics](#); [Optical observations in astronomy and meteorology](#); [Physiology and psychology of visual perception](#); [Theory of vision](#)

Description

The science of optics studies the nature of vision and investigates the principles of the propagation, reflection, and refraction of light. This discipline

preoccupied numerous mathematicians and physicists in the history of science and philosophy in Islamic civilization. Its applications were also fundamental in guiding studies in astronomy, meteorology, and surveying, in addition to the examination of the anatomy of the eye, and the investigation of the physiological and psychological aspects of visual perception.

The foundations of the classical science of optics were set in Euclid's elementary treatise (Euclid 1999), the *Optika* (ca. 300 BCE), which was later systematized and expanded by Ptolemy (d. ca. 165 CE). According to both mathematicians, vision results from the emission of actual light rays from the eye, which take the shape of a physical cone of light, with its apex at the center of the eye and its base intersecting with the surfaces of visible objects. This optical theory was based in conceptual terms on Plato's thesis in the *Timaeus*, wherein he stated that vision is attributable to the soul's nonconsuming fire, which is emitted from the eyes into the surrounding air in the form of subtle light rays that meet the lit visible surfaces of objects of vision. This account was also affirmed in the medical examination of the anatomy of the eye by Galen (d. ca. 200 CE) who held that vision occurs due to the eye's spirit, which passes through the luminous channels of the optical nerve, and is radiated onto the external ambient environment as light rays that travel at infinite velocities. These mathematical *emission* theories of vision contrasted the physical *intromission* accounts of visual perception as set in Aristotle's *De anima* (*Tract on the Soul*), whereby he argued that vision results from the introduction into the eye of the *form* of a visible object as abstracted from its matter, precisely when the ambient transparent air is actualized as a perceptual transmitter of such *form* due to the presence of light (Lindberg 1976).

Although the channels of the textual transmission of Euclid's Greek *Optika* into classical Islamic scholarly circles were indeterminate, its Arabic version was preserved under the title *Kitab Uqlidus fi ikhtilaf al-manazir*. As for Ptolemy's text, it is known from its Greek source, and its Arabic rendition is recoverable from fragments of Latin translations. One of the earliest

engagements with optics in classical Islamic civilization may be traced back to the Galenic studies of Hunayn ibn Ishaq (Johannitius; d. ca. 873 CE) on the anatomy of the eye and to the commentaries of al-Kindi (d. ca. 870 CE) on Euclid's *Optika*, which survived in Latin under the title *De aspectibus*. Moreover, the mathematician Abu Sa'd al-'Ala' Ibn Sahl (d. 1000 CE) systematized the science of dioptrics (namely, the study of the geometrical principles and instruments of the refraction of light in its passage across different transparent media), and he established a formula that calculates the refraction index of light as it passes across transparent media that have differing refractive properties (namely, a principle conventionally known as *Snell's Law of Refraction*; named after the seventeenth-century mathematician Snellius Willebrord, and also investigated by Thomas Harriot and Descartes (Rashed 1992, 1996)). However, the most remarkable accomplishment in the science of optics, from the times of Ptolemy to those of Johannes Kepler, is ultimately achieved by al-Hasan Ibn al-Haytham (Alhazen; d. ca. 1041 CE) in his monumental and groundbreaking opus: *Kitab al-manazir* (*The Optics*; composed ca. after 1028 CE), which was translated into Latin as *De aspectibus* or *Perspectivae* (ca. 1270 CE), and had a significant impact on the unfolding of the perspective tradition in the history of European medieval science and Renaissance art and architecture (El-Bizri 2005).

Ibn al-Haytham originally worked under the patronage of the Fatimid Dynasty in Egypt. Gathering the findings of the Ancients, he was able to overcome the main antique dispute over the nature of vision between the Greek mathematicians and physicists. Rejecting the claim that vision occurs by way of the emission of a light ray from the eye, Ibn al-Haytham demonstrated that seeing results from the introduction of the rays of light into the eye in the structuring shape of a virtual geometric cone (Ibn al-Haytham 1989). He moreover supplemented his *Optics* with a *Discourse on Light* (*Risala fi al-daw'*), which investigated the radiating dispersion of light across transparent media in terms of rectilinear propagations. His optical writings did



also incorporate catoptrical explorations of the reflection of light on planar, spherical, cylindrical, parabolic, and conical mirrors. He also integrated the study of lenses and magnification within the science of optics (with the subdiscipline of dioptrics), and this also assisted him in his scientific explorations in astronomy and meteorology. He also verified his theoretical hypotheses in terms of controlled tests and experimental installations that were guided by mathematical models and geometrical constructs (Rashed 1992, 1996).

Although Ibn al-Haytham's optical tradition was comprehensively studied and integrated within the European medieval and Renaissance scientific *milieu*, it confronted a period of long interruption in transmission within classical Islamic civilization (Ibn al-Haytham 1989; Sabra 1976; El-Bizri 2005). A parallel historical engagement in ocular investigations is set in the writings of the eminent polymath Ibn Sina (Avicenna; d. 1037 CE) and his critical espousal of a reformed version of the Aristotelian theory of vision, which also classified optics as a branch of physics rather than mathematics. Diverging from Aristotle's *Meteorology*, Ibn Sina ultimately advanced an alternative explanation of the phenomenon of the rainbow. Following his tradition, the mathematician and astronomer Nasir al-Din Tusi (d. 1274 CE) composed a commentary on Euclid's *Optika*; albeit, it did not show signs of awareness of the revolutionizing optical writings of Ibn al-Haytham. And, yet, the most notable progress in optics in history of science in Islam, following Ibn al-Haytham's pioneering legacy, is laudably attributable to *Tanqih al-manazir* (*The Revision of [Ibn al-Haytham's] Optics*) by Kamal al-Din al-Farisi (d. 1320 CE). Informed by Ibn Sina's studies in meteorology, and Ibn Sahl's research in dioptrics, al-Farisi revised Ibn al-Haytham's explication of the nature of the rainbow and the halo. Using geometrical constructs to demonstrate how the rainbow results from refraction and reflection of light falling on individual raindrops, al-Farisi further substantiated his hypothesis by experimentally modeling this process on the passage of light through a spherical vessel filled with water, proposing eventually a *wave* theory of

light in contrast with the corpuscular *particle* theory of Ibn al-Haytham (El-Bizri 2005). Taqi al-Din Ibn Ma'ruf (d. ca. 1585 CE), the Syrian astronomer at the Ottoman court, may have been the last among the distinguished scholars in Islamic civilization to competently build on the research of Ibn al-Haytham and al-Farisi in optics. Following that period, the study of vision and light in the Muslim world did not progress beyond the reproduction and sustainability of acquired knowledge, instead of displaying innovation and inventiveness as witnessed in earlier epochs in Islamic intellectual history (Rashed 1992).

Self-identification

Science

Optics is an established scientific tradition in mathematics and physics that is oriented by experimental studies and geometrical models, as well as being partly informed by studies in physiology, the examination of the anatomy of the eye (Gul 1996), and the investigation of the psychological aspects of visual perception, in addition to the design and production of optical instruments.

Characteristics

What makes the science of optics distinctive among other scientific disciplines in Islamic civilization is its reliance on combining mathematics with physics in the context of experimentation and controlled testing, in terms of investigating the properties of light and vision, in addition to its connection with physiology and psychology in studying the particulars of visual perception. It also had important implications regarding observations in astronomy and meteorology, and in terms of establishing the foundational geometrical models of lenses and reflective instruments.

Relevance to Science and Religion

Optics *indirectly* furnished the scientific foundations for selected theological and mystical

reflections on the nature of vision and light and on their speculative implications in reference to cosmology. It also *implicitly* reinforced certain philosophical doctrines that rested on investigating the epistemic and veridical conditions of visual observations and the associated reliance on the senses in the acquisition of knowledge.

The experimental observations in optics, which were guided by mathematical models, supported the explication of the data of astronomy and meteorology and were ultimately useful in terms of practical applications in material culture, in timekeeping, and spatial measurement. Graeco-Arabic optics had also an important impact on the adaptive assimilation and interpretive appropriation of classical theories of vision within Renaissance scholarship, which resulted in the invention of perspective as a pictorial order of artistic representation and as a method of organizing architectural space.

Sources of Authority

The sources of authority of optics in antiquity were Aristotle, Euclid, Ptolemy, and Galen, with connections also to selected mathematical works by Archimedes and Apollonius of Perga. The most remarkable reform of the classical science of optics took shape in Islamic intellectual history through the research of al-Hasan Ibn al-Haytham (Alhazen; d. ca. 1041 CE), followed by the revisions of Kamal al-Din al-Farisi (d. 1320 CE). Other authorities in Islamic civilization include figures like al-Kindi (d. ca. 870 CE), Hunayn Ibn Ishaq (Johannitius; d. ca. 873 CE), Abu Sa'd al-'Ala' Ibn Sahl (d. 1000 CE), Ibn Sina (Avicenna; d. 1037 CE), Nasir al-Din Tusi (d. 1274 CE), and Taqi al-Din ibn Ma'ruf (d. ca. 1585 CE). The Graeco-Arabic traditions in optics eventually had a lasting influence on thirteenth- and fourteenth-century European medieval scholars, like Robert Grosseteste, Roger Bacon, John Peckham, Witelo, and Theoderic of Freiberg, and it also impacted the research of Renaissance theorists like Biagio Pelacani da Parma, Leon Battista Alberti, and Lorenzo Ghiberti, up to the times of Johannes

Kepler in the seventeenth century (Ibn al-Haytham 1989; El-Bizri 2005).

Ethical Principles

The science of optics aimed at securing the veridical conditions of experimental research and mathematical modeling in view of explaining the nature of vision and light (Beshara 1977; Sabra 1976; Rashed 1992, 1996; El-Bizri 2005). It had multiple epistemological concerns in terms of seeking to disclose the truth and rational understanding of the principles of visible reality.

Key Values

The science of optics seeks coherence and exactitude in its experimentations and mathematical modeling in the verification of hypotheses, data and observations, and the substantiation of theories and their truth conditions.

Conceptualization

Nature/World

Nature and the world constitute the visible reality, which is structured in terms of mathematical and physical ultimate principles and laws that are investigated by the science of optics.

Human Being

Based on the science of optics, the human being is endowed with the intellective *cum* rational faculties of discernment, imagination, and memory, and is capable of knowing reality by way of perception and as guided by science.

Life and Death

Life is grasped from the standpoint of the science of optics as being the existential condition of worldly beings that are subject to decay, and it is itself studied in connection with the investigation of the physiological, neurological, and psychological determinants of visual perception



and the anatomy of the eye (Sabra 1978; Gul 1996; El-Bizri 2005).

Reality

Based on optics, reality constitutes the visible and phenomenal realm of bodily experience, which is governed by mathematical and physical principles, and knowable by way of the human rational faculties as guided by science.

Knowledge

Knowledge consists of theoretical and applied rational understanding that is guided by mathematics and physics in reference to experimental observations and verifications.

Truth

Truth consists of agreement with reality as determined in mathematical and physical terms and as verified experimentally.

Perception

Perception is one of the principal faculties by which human beings are able to understand reality and disclose its truth. It is the basis of the science of optics in relation to vision and in terms of experimental observations and verifications.

Time

Time is the horizon of visual perception and of spatial displacement. It is the principal factor in the propagation of light at an extremely high velocity and in the sequential appearance of the manifold visible aspects of the objects of vision to a given observer. It also conditions the verification of observational data and experimental controlled testing.

Consciousness

Consciousness is a process that involves visual perception in a phenomenal field of perceptual and bodily lived experiences.

Rationality/Reason

Rationality/reason constitutes the ability of the human being to acquire knowledge about reality, and it is the main epistemic conditioning ground of visual perception.

Mystery

Mystery is not relevant to the science of optics, even though it may be connected with mystical symbolic interpretations of vision and light in relation to doctrines in cosmology and theology.

Relevant Themes

The science of optics can be best grasped in connection with the wider scientific *milieu* of classical traditions in mathematics and physics within Islamic civilization. It is also relevant to orienting studies on the indirect impact it had on selected philosophical, theological, and mystical *interpretations of vision and light* in Islam, including reflections on Neo-Platonist cosmological and metaphysical accounts of *emanation* and the conception of the functions of *illumination* in determining the acts of consciousness.

Cross-References

- ▶ [Astronomy in Islam](#)
- ▶ [Geometry in Islam](#)
- ▶ [Mathematics in Islam General](#)
- ▶ [Medicine in Islam](#)
- ▶ [Optics](#)
- ▶ [Perception](#)
- ▶ [Philosophy in Islam](#)
- ▶ [Physics, Science in Islam](#)

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Organic Evolution

- [Evolution, Convergent](#)

Organization of Science

- [Science in Islam, Classification](#)

Organizational Behavior

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Related Terms

[Business psychology](#); [Industrial psychology](#);
[Organizational psychology](#)

Description

Organizational behavior is the scientific study and application of knowledge of individual and

group behavior in formal organizational settings. This includes the behavior of the organization itself and the interface of the individual with the organization. What is implied in this definition is that the organization imposes a structure or behavioral pattern on individuals, usually understood and governed through a guiding set of values and normative behavioral standards in the form of roles (Katz and Kahn 1978). Though such patterned activity can be applied to many groups, such as individuals on a given plane flight or workmates who meet at the bar for happy hour, the discipline generally restricts its study to formal organizations, that is, to organizations with an explicitly stated purpose that is often written in a formal document and that tends to outlive its founding members.

Self-Identification

Science

Organizational behavior identifies itself as a science in that it employs scientific methodology common to the social sciences. Research in organizational behavior is empirical, ranging from simple observations to elaborate quasi-experimental field-based studies.

Religion

The discipline of organizational behavior does not identify itself as a religion. However, since many religions involve organizational structures (denominations; parachurch organizations; churches, mosques, or synagogues; etc.), the principles and knowledge gained from organizational behavior may be applied to religious contexts.

Characteristics

The intellectual root of the study of organizational behavior is the discipline of psychology, particularly social psychology. Organizational behavior (and its closely allied term, organizational psychology) applies the principles of social psychology specifically to the context of formal organizations.



Relevance to Science and Religion

Organizational behavior sees itself as relevant to “science and religion” only to the extent that the application of knowledge may apply to religious organizations.

Sources of Authority

As a science, the field of organizational behavior stresses the importance of theoretical grounding of ideas, operationalization of concepts, quantifiable measurement (though some research may also involve qualitative methodologies), experimentation based on the accepted rules of science, replication of such research, and scholarly publication. Authority is granted to the method itself and to the peer-review process in scholarly publication to determine the extent to which scientific methodology was followed.

Ethical Principles

As a psychological discipline that involves human subjects, research must conform to a set of ethical guidelines established by the American Psychological Association (2002). Research conducted by individuals who are members of organizations (such as a college or university), particularly if funded through public agencies, must be approved by an ethics committee established by the organization, commonly referred to as institutional review board (IRB), whose primary purpose is to safeguard the rights of human subjects in research.

Key Values

One key value is the quality of life and, in particular, the quality of organizational life. To the extent that the organizational environment is favorable, individual responsibility within the organization is more enriching which, in turn, may lead to personal growth, better task

performance, more intrinsic motivation, higher job satisfaction, less absenteeism, etc., that also benefit the organization and society. The organizational environment can be made more favorable by providing individuals with greater autonomy and sense of personal control over task responsibilities, providing meaningful and differential feedback (i.e., praise for a job well done, but also constructive feedback demonstrating how one can do better when a task is not performed well), demonstrating the significance of a task, and coordinating responsibilities that might require a gradual increase in task skill.

Conceptualization

Nature/World

As in the case of its parent discipline, psychology, organizational behavior holds to modernistic science’s naturalistic view of the world; for some who study organizational behavior, this requires an atheistic view of no Supreme Being while others maintain a more deistic view that though a Supreme Being may exist, it does not impose a direct influence on the universe. Still others hold a theistic view in abeyance; they believe in a Supreme Being but suspend that belief as they study organizational behavior.

Human Being

As a science, organizational behavior maintains that the human being, particularly human behavior, is caused by forces beyond human control, such as the structure or behavioral pattern imposed by organizations. However, not all scientists who study organizational behavior are radical determinists and instead argue for some role of human agency (i.e., the capacity to choose and regulate behavior) within the limits set by biological and environmental influences.

Life and Death

This is not an issue to which organizational behavior speaks directly. It is assumed that life and death exist as matter in space and time.

Reality

Organizational behavior assumes that the universe is real and can be accurately perceived and understood.

Knowledge

Only sensory experience provides humans with a reliable source of knowledge. Behavior in the organizational context involves a series of interactive levels including the physical, biological, psychological, and sociological, all of which must therefore be measured and quantified.

Truth

Truth is something that cannot be fully attained. At best, we approximate truth through empirically derived knowledge.

Perception

Organizational behavior assumes a critical realist position. That is, there is an external world of real objects, events, and properties that is accurately reflected through sense-data, but not uncritically so. Such sense-data must also pass through an interpretive lens that is limited in scope. Thus, all seeing is “seeing as” – perception is governed by the structure or behavioral pattern imposed upon the individual by the organization.

Time

Time is a relevant dimension (of the individual, the organization, or the interaction of the individual and the organization) to change, growth, maturation, or other specific psychological or sociological processes (motivation, fatigue, depersonalization, etc.). Changes over time may or may not be predictable for either organizational structures or individuals within those structures. Time intervals may also vary in organizational behavior, ranging from seconds (as in communication patterns) to decades.

Consciousness

Understood primarily as a higher mental state that involves self- and other-awareness, consciousness is an important dimension of organizational behavior with implications for self-evaluation and self-esteem. Such higher

mental functioning allows one to see how he or she fits into the broader organizational structure.

Rationality/Reason

The use of reason is inherent in scientific methodology. It is also assumed to be part of the object of study (i.e., behavior in organizations), though it is recognized that individuals may also employ irrational (or rational) tendencies, such as the use of self-enhancement biases to feel good about one's self (e.g., the overattribution of success to personal ability and failure to situational constraints).

Mystery

Organizational behavior is complex and much of it is still not well understood. Though scientific empirical methods are highly respected, it is recognized by many who study organizational behavior that a complete understanding of this discipline is beyond what can be reasonably expected from science.

Relevant Themes

Spirituality in the organizational context has emerged as a topic of interest for the field of organizational behavior. For example, how one finds meaning in one's work or through volunteering one's time in community, civic, or church organizations is a potentially fruitful avenue for research. At what point does an organizational responsibility go from being a job or obligatory responsibility to being a vocation or avocation? Posing questions such as these is critical to the field in that the underlying processes being investigated may enhance organizational enrichment which, in turn, may increase both personal satisfaction and organizational efficiency.

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Organizational Psychology

- [Organizational Behavior](#)

Orientalism

- [Buddhism in the West](#)

Orphism

- [Mysticism](#)

Orthodox Christian Theology

- [Orthodox Theology](#)

Orthodox Christians

- [Eastern Orthodox Christianity and the Sciences](#)

Orthodox Theism

- [Theism, Classical](#)

Orthodox Theology

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Related Terms

[East orthodox theology](#); [Eastern orthodoxy](#);
[Orthodox Christian theology](#)

Description

Orthodox theology is an existential expression of the spiritual life of the Eastern Orthodox Church. It is an expression of the experience of the Church in its permanent effort to maintain the dogmatic continuity of the Christian faith from the apostolic times, through the present, up to the future and the end of times. This is the experience of the life of the Church as an experience of Heaven on Earth in accordance with the ultimate Divine purpose of the universe. Orthodox theology is taken to be an experience of Divine-human communion within the liturgical assembly of the community of all believers and the spiritual life of each of its individual members. The experience of the faith is a liturgical and ascetical assimilation of the power of the Holy Spirit who descends into human hearts: “But when the time had fully come, God sent forth his Son, born of woman, born under the law, to redeem those who were under the law, so that we might receive adoption as sons. And because you are sons, God has sent the Spirit of his Son into our hearts, crying, ‘Abba! Father!’” (Galatians 4:4–6). A theologian is one who prays truly, and the one who prays truly is a theologian; however, prayer, or theology, is impossible without the presence of the Holy Spirit in the human heart. It is a Divine gift and revelation. The Eastern Orthodox Church does not make a distinction between theology and worship, since the words of prayer are an expression of the apophatic knowledge of God, a knowledge that cannot be expressed in words in isolation from the experience of worship. According to Eastern Orthodoxy, to understand the content of Orthodox theology, one must personally participate in the Church’s experience of worship.

Conciliarity and Locality

Orthodox theology has been articulated in the course of time as an ecclesiastical experience. All of the dogmatic formulations were provoked by the challenges associated with the fight to recover the initial conditions of the universe. The so-called dogmas or doctrines are not systematically developed statements, but contain the

concrete answers to concrete questions raised within the Church throughout the centuries. These doctrines are shaped and accepted by the Church councils (ecumenical or local ones) which gather together the Bishops of the local Orthodox Churches from all over the world. The conciliar assembly of the Holy Bishops is not a democratic but a charismatic gathering. The criterion for Orthodoxy is that *"It seemed good to the Holy Spirit and to us"* (Acts 15:28). Thus, the leading principle of the Eastern Orthodox Church and its theology is a "conciliar" one. Another closely related principle is based on the Apostle Paul's practice of founding local churches. That is why the Orthodox Church nowadays could exist only in local churches which are neither "national" nor "confessional". However, the Ecumenical Patriarchate of Constantinople (the "New Rome," present day Istanbul) is the leading in honor of local Eastern Orthodox Churches. The Patriarch of Constantinople is the first Bishop among the rest of the Bishops who are equal in honor (first among equals).

Sources of Orthodox Theology

The source of Orthodox theology is believed to be Divine revelation. Orthodox Christians believe that there is an overflowing stream of Divine manifestations or Theophanies (θεοφάνειαι) revealing the Divine intervention in the history of the universe. At the same time, this history is a history of salvation because it is an expression of the Divine economy (θεία οἰκονομία) – God's handling or management of the fallen state of the world and of humankind. God created man out of nothing for the purpose of uniting his creation to himself. He therefore undertakes an economy of creation and salvation independently of man but entirely into man's benefit. Thus, the entire focus of the Divine economy is humankind. This divine plan for salvation is described in the Holy Scriptures (the books included in Old and New Testaments). They are the best fruit of the Holy Tradition, conceived as a specific way of holy life within the community of God's chosen people. Eastern Orthodoxy believes that before the coming of Christ, the chosen people were Ancient Israel

and after his advent, it is the Church – the New Israel. All of mankind is called to partake in it.

This specific way of life in the Church's community is described also in other documents – liturgical, patristic, canonical, and historical. All of them describe this specific experience of God's chosen people. In Orthodox theology, living according to the Holy Tradition means the adoption of the specific hermeneutic approach that was used by the Holy Fathers to interpret the experience of the Church and the documents of the history of salvation. This exegetical method is based on the person of Jesus Christ, who is the Messiah – promised to the Jews in the Old Testament and of whom the Prophets spoke. He is the One who appears in a great number of Old Testament Theophanies (θεοφάνειαι). He is the agent of creation whom the first chapter of Genesis refers to. He is the image of the Father. Humankind, man and woman, are created in his image, thus becoming the image of the Image. He created the world and appears over and over again in it. He was incarnated, and became man in order to heal human nature from the consequences of sin.

Sin and Savior

Orthodox Christians take themselves to follow the Apostle Paul in his understanding of the economy of salvation. Man is not responsible for the ancestral sin; he bears however the consequences of sin, i.e., weaknesses, passions, death. This is what brings man into a condition of darkness in relation to the Divine. Human beings forgot their authentic humanity and ultimate destiny – to be in communion with God. This is the reason for human beings being under the condition of sin. Sin protracts the curve of death, and death starts dominating human beings. Christ's coming, i.e., his incarnation, death, and resurrection, offers the only solution to this horrible condition. By becoming one of us, he embraces everything that is human. By his death, he conquers death because by his resurrection, he offers the resurrection to all humanity. This is what Orthodox Christians celebrate on Holy Pascha – Easter. This is not only a commemoration of Christ's resurrection. It is the joy flowing from the



anticipation of our own resurrection. This is taken to be the good news that the Gospel is talking about. This is believed to be what the Apostle Paul is talking about when he says: “Jesus came that He might deliver those who through fear of death were subject to slavery all of their lives” (Hebrews 2:15).

In his God-man person (ὑπόστασις), the Lord Jesus Christ assumes all of human nature in order to heal it. In the Church, a chance is given – after repentance, a man can deal with the consequences of sin and heal. Thereby, in Orthodox theology, there is an opposition between life and death in the human existence (and in the framework of the created universe). Christ is the second person of the Divine Trinity; he became man and therefore, death could not penetrate his being. It is absolutely impossible for death to embrace him who created the universe. Therefore, Christ rose from the dead on the third day in the tomb. He descended into hell to bring out the Old Testament righteous men, and to set human nature free from death.

According to Orthodox theology, Jesus Christ, the Son of God, is not anybody else than the second person of the Holy Trinity, which is one substance (οὐσία) and three persons (ὑποστάσεις): Father, Son, and Holy Spirit. The Son is not separated from the Father and the Holy Spirit. The three hypostases are consubstantial and equal in honor: The Son is born from the Father and the Holy Spirit eternally originates from the Father; in time, on Pentecost, the Holy Spirit was sent by the Son into the Church. The three divine hypostases are identical in everything but in their personal (hypostatic) attributes. According to the gospel, the Father is “unbegotten,” the Son is “begotten,” and the Holy Spirit “originates” from the Father. These are the “ways of existence” (τρόποι ὑπάρξεως) of the divine substance.

Uncreated Energies

Orthodox theology confesses the divine grace as a divine energy. God as Trinity is above time and space, but he enters in the created universe through His energy. God intervenes in the Old Testament epoch – through his Theophanies, but

also hypostatically in the incarnation, in events of the New Testament. In addition, he abides with us after his ascension and after Pentecost, when he sent the Holy Spirit to his disciples to abide in the Church. For Orthodox Christians, the Spirit is present not only in the sacramental (liturgical) life of the community of God’s chosen people, i.e., the Church, but also everywhere in the universe. His miraculous power and energies (activities) have created and sustain the existence of the universe. Without this power, the universe could not endure under the destructive effect of the evil one. The created universe has no reason and sustaining power from itself and in itself. For its existence, it needs the superabundant power (or energy) of its Creator.

The distinction between essence and energies is a methodological distinction emerging from, on the one hand, the exegetical experience of the paradoxical events of God’s revelation, and his constant involvement in human society and in the whole universe, and on the other hand, as a continuous Scriptural confirmation of the Divine inaccessibility. The terminology is an invention of Aristotle; however, it was reloaded with a different connotation by the Holy Fathers within the context of revelation. In this context, substance does not coincide with being (as it does in Ancient philosophy). The being of God which is described as power, grace, spirit, strength, kingdom, glory, light, life, etc., is often called energy or energies (ἐνέργεια), whereas his inaccessibility is called “substance” (οὐσία). It is clear that in the mystical experience of the saints, those terms are not very strict as terminology. Here we encounter the use of a philosophical terminology for the articulation of a framework describing the sacramental experience of the Church. This is an experience which does not allow for a rational systematization.

The distinction between substance and energy (ἐνέργεια) has played a significant role since the fourth century A.D. It was probably St John of Damascus (c. 676–749) who defined it in a most straightforward way: “... energy is the natural force and activity of each substance: or again, natural energy is the activity innate in every

substance: and so, clearly, things that have the same substance have also the same energy, and things that have different natures have also different energies. For no substance can be devoid of natural energy" (*De fide orthodoxa* 2.23). St John of Damascus makes a careful distinction between four related terms:

"But observe that energy and capacity for energy, and the product of energy, and the agent of energy, are all different. Energy is the efficient and substantial activity of nature: the capacity for energy is the nature from which proceeds energy: the product of energy is that which is effected by energy: and the agent of energy is the person or subsistence which uses the energy. Further, sometimes energy is used in the sense of the product of energy, and the product of energy in that of energy, just as the terms creation and creature are sometimes transposed. For we say 'all creation,' meaning creatures." (*De fide orthodoxa* 3.15)

This text was used as a reference for the criterion of Orthodoxy used during the Byzantine Church Council in Constantinople, 1351. The Council confirmed the orthodoxy of the theology of St Gregory Palamas (1296–1359) – a monk of Mount Athos in Greece and later the Archbishop of Thessaloniki who became known as a preeminent theologian of the Divine energies. The distinction between substance and energy in God is a fundamental epistemological premise of the theology of St Gregory Palamas. For Palamas, the energy differs from the substance but is not separate from it. The substance refers to the immanent, self-identical being of God, while the energy means that God does something and he does it willingly. The energy does not denote something other in God than his substance but is the same Divine being as active *ad extra*. This activity *ad extra* includes God's works such as creating, sustaining, providing, deifying, etc. God's works represent his activity or energies in relation to his creatures and God, as he is in himself, should be distinguished from God as he is related to something other than himself. The Divine energy is what manifests that God is, while the substance is what he is. If there was no distinction between Divine substance and

Divine energy, the fact that "God is" would have remained unknown. It is important to underline the personal dynamic nature of the Divine energies. Although God affects things and persons on each occasion through a particular energy or operation, it is always him personally acting and wholly present in it.

Salvation and Deification

The concept of deification (θέωσις) is closely related to the teaching about the Divine substance and energies. The salvation of human beings is understood as deification (θέωσις). Under the graceful help of God, a human being is called to pass through repentance, purification, and illumination of the mind through the grace of the Spirit in prayer and asceticism, eventually reaching deification, i.e., a condition of partaking in the divine energies. In Orthodox theology, deification could be considered as the process of being filled more and more with God's presence. This is a process that could begin even in this present life. In a more strict sense, however, Deification refers to a full union with God which goes beyond any human faculty. It could also be experienced even in this present life, but only in the highest moments of pure prayer, when the mind is ecstatically swept away and is united with the Divine uncreated light. This union is a free gift of God and experience of the Divine love. A human being could only receive and accept such grace and cannot contribute anything from its own powers.

According to Orthodox theology, the state of Deification will be the permanent state of human existence in the future age. The true witnesses of the process of deification are the saints. Their life in grace leads them to salvation. Therefore, the Lives of Saints are very popular reading among Orthodox Christians and an authentic source for Orthodox theology. It is not just a moral literature. In contrast to the popular concept of the "historical Christ," Jesus Christ in Orthodox theology is not just a moral example for the believers; He actually is inimitable: He is the God-man. Moral examples are the saints as



human beings who are truly in the image and likeness of God.

It is very difficult to describe Orthodox theology in a systematic way. It is obvious that in its doctrinal articulation and historical unfolding, it uses scientific methods and sources, but all the same its basic inspiration comes from the mystical experience of the saints (Prophets, Apostles, and Holy Fathers), which lies beyond the reach of scientific methodology.

Cross-References

► [Christianity](#)

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Orthodoxy

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Refers to normative beliefs and doctrines as defined by Christian authorities. In their struggle against Gnostic trends and ideas among early Christian believers the church fathers gradually defined an orthodoxy centered on the incarnation of God in Jesus. The Gnostics had maintained Jesus was not God incarnate, but an “enlightened” being who provided his followers with secret knowledge, or *gnosis*.

Oscillations

► [Magnetoencephalography \(MEG\)](#)

P

PA

► [Philosophical Anthropology](#)

Paediatric Surgery

► [Child Surgery](#)

Paideia

► [Humanities](#)

Pain (Suffering)

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Pain is a set of neurophysiological responses in complex organisms. Pain evolved because it enabled organisms to process noxious stimuli. As such it is an essential part of those organisms' interaction with their environment. Human babies born without the capacity to feel pain rarely live more than a year.

Suffering may be defined as: acute or prolonged physical or mental distress caused by

trauma or disease. Suffering is particularly acute when the organism perceives no possibility of release. There are forms of suffering that are peculiar to humans – the crushing of hope associated with a diagnosis of infertility or terminal cancer, also the suffering that attends lost love, prolonged imprisonment, systematic torture, or mental illness. But observations in other animals suggest they are also capable of suffering (Southgate 2008).

This entry will concentrate on the problem that suffering poses to the Christian understanding of a creator God who is all-loving, and how conversation with science affects this debate. This is a problem in *theodicy* – consideration of the goodness of God in the face of evils. Christianity has had an ambiguous relationship with suffering: some New Testament texts suggest that suffering in the believing community engenders virtue (Rom. 5.3; 1. Peter 4.13). Suffering endured for the faith can in certain circumstances ennoble the sufferer and enrich the community. But suffering can also destroy human selves and relationships without any sign of a redemptive element in the experience.

The literature distinguishes *moral evil* – suffering engendered by freely chosen human action – from *natural evil* – suffering from other causes (such as disease, earthquakes, etc.). Suffering from natural disasters often contains an element of human neglect (moral evil) as well as natural evil. The classic responses to moral evil are the free-will defense and an “Irenaean” theodicy. The former postulates that moral evil is

a necessary consequence of God endowing humans with authentic free will. The latter supposes that a world of suffering is a training-ground for human virtues. Southgate and Robinson (Murphy et al. 2007) have categorized these as “property-consequence” and “developmental” approaches, respectively. For an evaluation of these approaches see Surin (1986). He and Phillips (2004) are very critical of any response to suffering that seeks to explain it in terms of a balance of goods and harms, rather than attending to the voice of the sufferer.

The science-religion debate influences the question of moral evil mainly insofar as its reflection on humans’ evolutionary inheritance suggests that we might be programmed to behave in selfish, cruel, and violent ways. For recent explorations see de Waal (2004), and Bennett et al. (2008).

Great natural disasters such as the Indian Ocean tsunami of 2004 intensify questions of natural evil as they apply to humans. Polkinghorne offers a “free-process” defense (Polkinghorne 2005/1989) – God created the world by certain processes (including tectonic activity) – processes that give rise to new possibilities for the biosphere as well as to suffering – and God allows those processes to continue to be themselves. This can only be a partial response – God must have love and care for the individual as well as for the system. Reflection on the tsunami also shows the difficulty in speaking of God’s providential activity in the world – whenever we speak of God’s alleviating the suffering of an individual we intensify the problem of when God seems *not* to act. Clayton and Knapp have recently debated this issue in conversation with Wildman (Murphy et al. 2007).

Where the sciences are most influential on current theology is in relation to the suffering of nonhuman creatures. Science shows us the implausibility of the ancient Christian answer that nonhuman suffering is all caused by human sin (Southgate 2008). Further, it suggests that competition and predation are essential to the way evolution by natural selection “works” (Rolston 2003) – the suffering they cause is *intrinsic* to the process. They cannot therefore

be attributed to some cosmic “fall” of creation (Southgate 2008). Rather it may be that this was the only way that God could create creaturely selves (Southgate 2008; Attfield 2006). By itself, however, such an “only way” argument is not adequate. Again, God loves every individual creature, so an argument at the level of the overall system cannot do full justice to that love. Southgate has proposed not only that God suffers with the suffering of every creature, but that at least some creatures, whose lives know no fulfillment, will experience that fulfillment in a redeemed life (Southgate 2008; Edwards 2006).

Cross-References

- [Divine Action](#)
- [Eschatology](#)
- [Evil, Problem of](#)
- [Evolution](#)
- [Free Will](#)

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Pain Medicine

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Related Terms

[Chronic pain](#); [Physical suffering](#)

Description

Pain research contains two major elements: investigating basic mechanisms of pain transmission, modulation and plasticity; and searching for novel drugs to treat chronic pain. Traditionally, the first part is performed in academic institutes, while the latter is mostly done by pharmaceutical companies. Due to recent progresses in genetic, biochemical, and brain imaging technology, integrative and translational pain medical researches have been seen in both environments, and the reduced gap between academic institutions and pharmaceutical labs may bring new insights into pain mechanisms, increasing searches for novel pain medications.

Self-identification

Pain research has always been a key component of basic neuroscience. Like other sensory studies such as vision and hearing, neuroscientists have systematically mapped relatively selective neuronal pathways that convey noxious information from the periphery to the brain (Kandel et al. 2000; Wall and Melzack 1999; Zhuo 2007). For example, the identification of selective proteins/receptors that transmit heat or cold is a major progress in neuroscience. Furthermore, pain reaches higher brain structures such as the pre-frontal cortex, and imaging pain and pleasure in conscious humans may provide a new window to explore questions such as consciousness and self.

Characteristics

Differing from other neurological diseases, chronic pain can happen to any normal human. It is caused by physical injury, not by gene mutation or stressful environments. It is not a hereditary disease. Everyone experiences pain at least once in his or her lifetime. This differentiates pain research from other medical sciences.

Relevance to Science and Religion

Pain research can be divided into different sub areas: At the single protein level, where unique sensory proteins have been identified to code sensory information such as temperature and touch; at the synaptic level, where synaptic potentiation and depression are found to be involved in chronic pain; at the systemic level, where pain triggers emotional fear, anxiety, memory, depression, and the usage of addictive drugs. It also affects attention, decision making, sex desire, sleep, and many other key brain functions.

Sources of Authority

The articles published in the open-access journals such as *Molecular Pain*, *Journal of Pain* or *Pain*, which can be seen on PubMed, are the major source of authority on pain research. Conducted by those in the field, they contain the most up-to-date research information. Additionally, a few textbooks that consolidate the available information are available, such as the *Textbook of Pain*, *Molecular Pain*, etc.

Ethical Principles

As noted by International Association for the Study of Pain (IASP), investigators should make every effort to minimize pain whenever possible. Anesthetics should be used when conducting surgical procedures to eliminate sensory awareness, and analgesics should be used as long as they do not interfere with the aim of the investigation.

Investigators should adopt an attitude where an animal is regarded not as an object for exploitation, but as a living individual. All investigators engaged in pain research should follow the explicit guidelines of their institutions, which weigh the importance of the investigation and the potential benefit of such experiments to our understanding of pain mechanisms and pain therapy, to the severity and the duration of pain involved. The duration of the experiment must be as short as possible and the number of animals involved kept to a minimum, and measures should be taken to provide a reasonable assurance that the animal is exposed to the minimal pain necessary for the purpose of the experiment.

Key Values

The key value of pain research is providing pain relief throughout the world, not only for humans, but for pets and animals. Toward that end, investigators seek to understand the underlying mechanisms of pain, and to develop new pharmaceutical agents that are able to alleviate or eliminate pain with as little side effects as possible.

Conceptualization

Pain, including physical and psychological pain, affect vital meaning of life. It influences our decision making, pleasure, consciousness and the willing to live.

Relevant Themes

Understanding of pain mechanisms provide additional potential insights for several key brain functions such as consciousness, memory, emotion, and sleep.

Cross-References

- Depression
- Gene

- Memory
- Neurophysiology
- Self

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Pan-Buddhist Core Themes/Terms Relevant for Buddhist Psychology

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1. The *4-Ennobling Realities* (Propositions, Experiences, Facts, Data, or Hypotheses)
2. The *8-Fold Balancing Path* (a Middle Way of balanced savvy, virtue, and meditation)
3. The *5-Skandhas* (psychological modalities of mind or self: feeling-thought-interaction)
4. The Buddha's *Dependent Origination* (causality hypothesis of feeling-thought-interaction)
5. The "provisional self" and ultimate *Not-self* (no soul, thus no reincarnation)
6. The notion of *Karma* (intentional feeling/thought and concomitant relational action)
7. The state/trait of *Nirvana* (contentment/emptiness as unwholesome affects extinguish)
8. The *3-Poisons*: greed (anxiety, sadness), hatred (anger, depression), and ignorance

9. The *4-Immeasurables* (social meditations, augmenting kindness, compassion, and joy)
10. The *3-Empirical Marks of Existence* (*dukkha*, impermanence/imperfection, and non-self)

Panentheism

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Panentheism is a concept which addresses the theological issue of God's relationship to the world by proposing that the world is "in God." The term is derived from the Greek *pan-en-theos* and means "all-in-God." The term is often understood as a third option over against the alternatives of pantheism ("all is God") and classical theism ("God is absolutely separate from the world"). Over against these two alternatives, panentheism emphasizes the closeness between God and the world (God's immanence), as well as maintains that God is more than the world (God's transcendence). The controversies over the term are often associated with the understanding of the preposition "in," for example, what it means that the world is "in" God and with discussions of God's changeability and dependence on the world.

Coinage of the term is attributed to German philosopher, influenced by German idealism, Karl Christian Friedrich Krause (1781–1832). However, the term did not gain widespread use until after it was implemented into process theology by Charles Hartshorne (1897–2000). Today, it plays a central role within the field of science and religion where it is presented by its proponents as a Christian understanding of God compatible with modern natural science because it does not propose supernatural interventions in the natural system.

There is a variety of panentheistic positions both historically and in contemporary thought. The history of the idea of panentheism, if not the term, takes its departure in Plato and Neoplatonism and continues through Christian theological thought and Western philosophy. The philosophies of Spinoza,

Hegel, and Schelling are often accentuated as key elements in the development of modern panentheistic thinking. Contemporary panentheism is not a clearly unified school of thought but can be viewed as a variety of theologians and philosophers interested in rethinking the relationship between God and the world by emphasizing God's immanence over against what is perceived as the overemphasis on transcendence by classical theism.

The concept of panentheism is linked to central Christian theological themes, such as creation, incarnation, and Trinitarian theology. In relation to the understanding of God, the main themes which are debated in relation to a panentheistic position concern the classic understanding of God as immanent and transcendent and God as omnipotent, omniscient, and omnipresent. In its contemporary form, panentheism can be seen as part of the criticism of late modernity against classical theism and the metaphors used in the understanding of God formulated within feminist and liberation theologies in the twentieth and twenty-first centuries.

The theological debate on the issue of panentheism is primarily concerned with whether panentheism can be viewed as part of a Christian understanding of God or not. Proponents of Christian panentheism point to the connection to Western theological and philosophical tradition, especially German idealism, thereby emphasizing its continuation with Western Christian thought. Proponents within a science and religion context often point to its compatibility with natural science while maintaining a potential for Christian theology (Clayton 2000; Clayton and Peacocke 2004; Brierly 2006). Opponents of panentheism on the other hand deem the notion, or at least some varieties of it, as incompatible with a Christian understanding of God due to the challenges to a more traditional understanding of God. Critics also argue that it is possible to stress God's immanence in the world without adopting a panentheistic position (Cooper 2007; Gregersen 2004). The broad spectrum of positions which may be placed under the common denominator of panentheism has been a source of debate concerning the usefulness of the terminology

(Thomas 2006; Brierly 2006). There is also a debate concerning who should be considered as panentheists (Cooper 2007; Brierly 2004).

Within Christian theology, a variety of positions have developed in the twentieth century, which can be considered in relation to panentheism. German Protestant theologian Jürgen Moltmann (1926–) presents a perichoretic panentheism, linking the internal relationship between the three persons of the Trinity to the relation between God and the world, and between creatures. Moltmann proposes a view of God's relation to the world, where God has created the world within Godself. In *The Crucified God: The Cross of Christ as the Foundation and Criticism of Christian Theology* from 2002, Moltmann stresses the theological notion of the suffering God in his understanding of the interdependence of God and creation. Also, the theology of Protestant theologian Paul Tillich (1886–1965) could be connected to panentheism in relation to his notion of God as the ground of being, a notion which stresses the close relation between God and creation, as can be seen from his work in 1952, *Courage to Be*. The theology of German Protestant theologian Wolfhart Pannenberg (1928–) is also mentioned in the theological discussions on panentheism, although Pannenberg clearly in *An Introduction to Systematic Theology* in 1991 denies holding a pantheist position (see Cooper 2007 p. 259 for a presentation of Pannenberg's position and criticism). The work of Jesuit priest and philosopher Pierre Teilhard de Chardin (1881–1955) has also had an impact on the development of panentheism within science and religion through his understanding of the relationship between God and the world. Contemporary panentheism is linked to the development of process theology or relational theology. Process theology is inspired by Alfred North Whitehead's (1861–1947) process philosophy and was developed into process theology by, among others, Charles Hartshorne (1897–2000) and John Cobb Jr. (1925–). Initially, the primary source of discussion of panentheism in science and religion has been within Western Christianity, but panentheistic ideas are also a part of Eastern Orthodox Christianity as well

as the religious traditions of, among others, Hinduism and Islam.

The position of panentheism is expressed in variety of ways with an array of reservations among its proponents. There have been various attempts to categorize these variations of panentheism. Michael Brierly offers what he describes as a “continuum of metaphors” in order to capture the various forms of understanding God's relation to the world, including classic theistic positions, pantheism, and variations of panentheism in the same spectrum (Brierly 2006). Niels Henrik Gregersen offers a tripartite typology of panentheism: soteriological panentheism, expressivist panentheism, and dipolar panentheism. In relation to Gregersen's typology, soteriological panentheism is an understanding of the relationship between God and the world in an eschatological perspective, emphasizing the future completion of the union of God and the world in the final redemption of the world. Expressivist panentheism designates those panentheistic ideas which are centered on the concept of the Spirit, which expresses itself through the development of the world. The Spirit is understood as originating and returning to God after influencing and being influenced by world history. Dipolar panentheism holds a twofold notion of God, stating at the same time God's transcendence and God's closeness to the world even to the extent where the world has influence on God and that God cannot exist without a world. Thereby, dipolar panentheism can be seen as the most extreme position in relation to the emphasis on God's immanence and God's dependence on a world. In relation to this typology, Gregersen continues his presentation utilizing a terminology of generic, strict, and qualified panentheism in order to discuss the relation between panentheistic ideas and Christian thought (Gregersen 2004). Cooper has used the terminology of implicit panentheism to be able to follow the notion from Plato to the current discussions within science and religion (Cooper 2007).

The issues raised by panentheism have been discussed by key figures within science and religion from early on, as can be seen by the work of Ian Barbour (1923–), John Polkinghorne (1930),

and Arthur Peacocke (1924–2006), with the latter as the most deeply involved in expressing a contemporary panentheistic position. Ian Barbour has utilized process thought in his presentation of an optimal model for the relation between science and religion as well as in relation to a critique of classical theism, as can be seen, for example, in his book *Religion in an Age of Science* from 1990. Arthur Peacocke presented a sacramental panentheism, utilizing a Christian concept of sacrament to emphasize God's presence in the world. Peacocke was inspired by the Lutheran sacramental notion that God is present "in, with, and under" the elements of the Eucharist to express the same kind of presence by God in the world (Peacocke 2006). Both Barbour and Peacocke, however, hold reservations concerning panentheism in regard to the complete integration of the world and God expressed in more radical panentheistic notions. John Polkinghorne also expresses concerns with a radical panentheism and leaves the notion of panentheism to the eschatological dimension of God's relation with the world and rejects it as a description of the current relation in his 2002 book *The God of Hope and the End of the World*.

In recent years, Philip Clayton has been one of the strongest voices proposing panentheism within the field of science and religion. Clayton offers a list of seven possible reasons in support of why panentheism should be adopted and has been involved in a number of publications and academic symposiums dedicated to the presentation and discussion of panentheism (Clayton and Peacocke 2004). For Clayton and others, panentheism is a source for a Christian understanding of God compatible with modern science. Panentheism in this perspective offers an understanding of divine action which holds that God is active in the world, thereby avoiding the passive God of deistic responses to science, while at the same time avoiding statements which are in contradiction with the natural laws as understood by modern science (Clayton 2000, 2004).

Clayton uses a body-person analogy to describe the relation between the world and God and links this notion to the concept of emergence. He affirms a notion of the necessity of God versus

the contingency of creation compatible with panentheism, but which also draws on thoughts affiliated with a more traditional, theological understanding. Other key representatives from within science and religion, who have been or are still involved in the discussion of panentheism from various perspectives and with a variety of points of criticism in relation to the concept, are Niels Henrik Gregersen, Celia E. Deane-Drummond, Keith Ward, and Paul Davies.

Cross-References

- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Emergence, Theories of](#)
- ▶ [Feminist Philosophy of Religion](#)
- ▶ [Liberal Theology](#)
- ▶ [Process Theology](#)
- ▶ [Theism, Classical](#)
- ▶ [Theistic Naturalism](#)
- ▶ [Transcendence and Immanence](#)

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lands, it became clear to the indigenous groups that they needed to find strength in unity. With the increasing importance of intertribal affiliations and religious practices, Pan-Indianism has become a typical feature of contemporary Native American cultures and their politics.

Pan-Indian Movement

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This is a scholarly term used to designate the emergence of a strong movement, especially among urban American Indian communities but also among many reservation communities, that American Indian people have important shared core values as well as the shared history and ongoing experience of colonialism and its realities. Pan-Indian organizations emerged in the early twentieth century with the birth of the National Congress of American Indians and similar organizations, but the shared sense of "Indianness" gained considerable momentum starting in the 1960s.

Pan-Indianism

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The promotion of unity and shared identity across tribal affiliations. Tribal identity was all important in a precolonial context but as the United States federal government took control over all native

Papal Infallibility

► [Catholic Church and Science](#)

Pāramitā

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Abbreviations

Bv	Buddhavaṃsa
BvA	Buddhavaṃsa-aṭṭhakathā (Commentary to Bv)
CpA	Cariyāpiṭaka-aṭṭhakathā (Commentary to Cp)
Dhp	Dhammapada
M	Majjhima-nikāya
PTS	Pāli Text Society
S	Saṃyutta-nikāya
SA	Saṃyutta-aṭṭhakathā (Commentary to S)
Sn	Sutta-nipāta
v	verse

Related Terms

[Bodhisattvabhūmi](#); [Highest point](#); [Perfection](#)

Pāramī or *pāramitā* in Buddhism plays the central role in the path of a *bodhisattva* (Pāli: *bodhisatta*) in both traditions, Theravāda and Mahāyāna. He fulfills them (ten in Theravāda and six in Mahāyāna) for the attainment of enlightenment to become a "*Buddha*" (awakened one).

Etymologies of the word “*pāramitā*” have been controversial (Hotori 2006). There seem however two popular etymologies: (1) *pāram* + *ita* (pp. < √i to go, reach, attain) (the state of having gone or reached the other shore) and (2) *pāramitā* derived from “*parama*” (adj. superlative of *para* – beyond, higher, further, etc.) As found, for instance, in the *Bodhisattvabhūmi*, it means “highest condition, highest point, best state, perfection.” (Dayal 1999) Both etymologies can also be seen in Theravāda Buddhism of the commentarial period, though they are often seen in Sanskrit literature. In early canonical texts, the meaning is “having gone to the other shore” in the sense of “having reached liberation” as in “one who has gone to the other side” (*pāragū*) (S I, 195; Dh, 348; etc.) and “one who has gone to the opposite shore” (*pāraṃ gato*) (M I, 135; S II, 277; Sn 803; etc.). The Commentary to the *Samyutta-nikāya* makes this meaning clear when it states: “‘Having gone to the other shore’ means ‘having reached *nibbāna*’” (*pāraṃ gato ti nibbānaṃ gato*) (SA I, 89). *Pāramī* or *pāramitā* as a derivative from “*parama*,” on the other hand, gained steady support by many. The PTS Pāli-English Dictionary subscribes to this view (PTS *Pali-English Dictionary*, 454.). In the Pāli tradition, the word “*pāramī*” (f) is taken as an abstract noun from “*parama*” in the same dictionary. Since the canonical texts have quite often the form of “*pāramī*” – the form of “*pāramitā*” came to be employed in postcanonical texts, and thereafter, the Theravādins may have been influenced by other Buddhist schools in adopting this term in later times.

The *pāramī* in its technical sense of “perfection” in Theravāda Buddhism is found for the first time in one of the late texts in the *Khuddaka-nikāya*, the later addition to the five collections, collectively known as the *Sutta-piṭaka* (Bv I, v 77; II, vs 117 ff (Here they are referred to as “*bodhipācana*”)). Another text belonging to the same group too elucidates some of the *pāramī*-s (Of the ten “perfections,” the text relates only seven; namely, *dāna*, *sīla*, *nekkhamma*, *sacca*, *adhiṭṭhāṇa*, *mettā* and *upekkhā*). They are otherwise referred to as “the things that make

(an aspirant) a Buddha” (Bv II, v 116) and, according to its Commentary, are said to be ten (in number) such as “the perfection of giving (*dāna-pāramī*).” (BvA, 104. Cf. CpA, 277) They are also called “ripening of knowledge” (*bodhipācana*) (Bv II, vs 121, 126, etc.). These references show that *pāramī*-s are the things every *bodhisatta* (Buddha-to-be) must fulfill (See Bv I, v 79). However, the Commentary to the *Buddhavaṃsa* interprets “*bodhipācana*” to mean either “ripening of the path” (*maggaparipācana*) or “ripening of omniscient knowledge” (*sabbaññutañāṇaparipācana*) (BvA, 105). Here its meaning includes the general sense of “ripening of knowledge” that is applicable to both arahants and Buddhas. This sense of *bodhi* became a stepping-stone for further development of the doctrine of *pāramī* in the Pāli commentaries (See Endo, T. op.cit., 227 ff).

The Theravāda tradition lists ten *pāramī*-s: (1) *dāna* (generosity, giving, liberality), (2) *sīla* (virtue, morality, righteousness), (3) *nekkhamma* (renunciation), (4) *paññā* (wisdom), (5) *virīya* (energy), (6) *khanti* (patience/forbearance), (7) *sacca* (truthfulness), (8) *adhiṭṭhāṇa* (determination), (9) *mettā* (friendliness/loving-kindness), and (10) *upekkhā* (equanimity). The general list of *pāramitā*-s in Sanskrit literature on the other hand includes (1) *dāna* (generosity, giving), (2) *sīla* (virtue, morality), (3) *kṣānti* (patience, forbearance), (4) *vīrya* (energy), (5) *dhyāna* (meditation), and (6) *prajñā* (wisdom). Four additional perfections are added to this list: (7) *upāya* (skilful means), (8) *prañidhāna* (aspiration), (9) *bala* (power), and (10) *jñāna* (knowledge). These ten are integrated into the ten stages of the *bodhisattva* path called the “*bhūmi*” (stage) as in the *Daśabhūmika-sūtra*. A slight difference is observed between the two lists, Pāli and Sanskrit – the Pāli list gives “*nekkhamma*” instead of “*dhyāna*” of the Sanskrit list. The number of *pāramitā*-s underwent several stages of development until the final formation of the list of six in Mahāyāna was reached (Dayal, H. op.cit., 168).

The six *pāramī* / *pāramitā* are the outgrowth of several basic concepts of early Buddhism. But in Mahāyāna Buddhism, great importance is attached to them because of their relation to the

Bodhisattva Ideal. The *pāramitā*-s are a progressive scheme to follow in the spiritual path to attain Buddhahood. It is sometimes considered to be necessary to remain in the cycle of births (*saṃsāra*) for the *bodhisattva* to practice compassion (*karuṇā*) for weal and happiness of the many and finally guide them to the yonder shore of suffering. Mahāyāna advocated this compassion to the highest. They lead to welfare, happy rebirths, serenity, unremitting spiritual cultivation, successful concentration, and the highest knowledge (Dayal H. op.cit., p. 171).

Like Theravāda Buddhism of the commentarial period which advocates thirty *pāramī*-s (perfections) with each *pāramī* having three levels of intensity, namely, ordinary perfections, higher perfections, and the highest or ultimate perfections; the *Laṅkāvatāra-sūtra*, a Mahāyāna text, too classifies them according to the three levels of practice, i.e., ordinary, extraordinary, or superlative (The *Laṅkāvatāra-sūtra*, edited by Nanjio, 1923, 237 ff.). This text demonstrates that “perfection” is ordinary if practiced by the ordinary worldly people for happiness in this life or the next, it is extraordinary if practiced by the Hīnayānists for the attainment of personal enlightenment, and it is superlative if practiced by the Mahāyānist *bodhisattva*-s for the welfare and liberation of all beings. Thus, in Mahāyāna, emphasis is laid more on others’ welfare, happiness, and liberation while Theravāda, though some ideas are common to both, aims at the attainment of three different kinds of liberation as Buddha-s, pacceka-buddha-s, or *sāvaka* (arahants) (Endo 1997, 2002, 225 ff.).

“*Prajñā-pāramitā*” (perfection of wisdom) is considered to be most important, and it is believed that the remaining five *pāramitā*-s show a progressive training culminating in the attainment of “*prajñā*” at the end. In this is seen a clear systematization of the concept in Mahāyāna. The *Prajñāpāramitā* literature in particular places the utmost emphasis on this. Like in early Buddhism, Mahāyāna gives “*prajñā*” as the opposite of *avidyā* (ignorance) or *moha* (delusion). The *Bodhisattvabhūmi* classifies three kinds of “*prajñā*”: that which depends on hearing the teaching from another person and on

the study of Scripture, that which arises from reflection, and that which is developed by cultivation and realization (Dayal, H. op.cit., 236). Further, the Yogācāra school of Buddhist thought explains that “*prajñā*” is “the Knowledge of the supreme Good or the supreme Truth” (*paramārthajñāna*) or simply “Knowledge.” It is thus “perfect knowledge” in all aspects. The Mādhyamika school, on the other hand, understands “*prajñā*” as the knowledge arising from the comprehension of “emptiness or void” (*sūnyatā*) of the phenomenal existence. It is thus called that “it is greater than all the other *pāramitā*-s; all the other *pāramitā*-s should be sublimated into the *prajñā-pāramitā*. It is the essence of the Mahāyāna” (Dayal, H. op.cit., 237).

The order of “*pāramitā*-s” became a focal point of discussion in Sanskrit literature. The Buddhist practices are often classified into three stages of spiritual path to enlightenment, namely, *śīla* (virtuous conduct), *saṃādhi* (concentration), and *prajñā* (wisdom). It is believed that the first six (as in the list of the Mahāyāna tradition) appears to be original, as it ends with the attainment of full knowledge or wisdom *prajñā*, (Thomas 2006, 211) or that the first six are the chief factors in a *bodhisattva*’s discipline, and the four additional *pāramitā*-s are merely supplementary in character (Dayal, H. op.cit., 167). The Mahāyāna list is generally represented with “*prajñā*” as the final culmination of spiritual path while the Theravāda list does not show such a progressive path, and instead it is placed in the middle (See for instance Dayal, H. op.cit., 168–9; Thomas, E.J. op.cit., 211; etc.). The Pāli list must therefore be examined in a different light from that of Buddhist Sanskrit literature. However, both lists begin with *dāna* and *śīla* which are the first steps into a higher realm of religious training commonly accepted in Buddhism.

The practice of *pāramī/pāramitā* for the attainment of the supreme enlightenment culminated its importance particularly after the rise of Mahāyāna, though, historically speaking, earlier stages of development of its concept in relation to the apotheosis of the Buddha cannot be ignored. On the way to the final acceptance and establishment of this concept, both traditions, Theravāda

and Mahāyāna, may have influenced each other, and the former in particular came under the tangible influence of the latter, which fact can be detected in Dhammapāla's commentaries (See Bodhi, Bhikkhu 1978; Katsumoto 2006, 173-192).

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Particle Physics

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Related Terms

[Elementary particle physics](#)

Description

Particle Physics is the name of the branch of Physics that, as the name suggests, studies

composite and non-composite (“elementary”) particles, that are the most fundamental components of our Universe. Studies in this field are carried out both theoretically and experimentally, in order to explain the properties and the behavior of such particles and to gain a better understanding of Nature. Particle Physics typically addresses microscopic lengths, of order of 10^{-15} m (approximately the size of a proton) or smaller, and high energies: the Large Hadron Collider (LHC) experiment at CERN laboratories is now testing the TeV scale – $1 \text{ TeV} = 10^{12} \text{ eV}$ where approximately $1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$ – by comparison, the energy of nuclear radiation is usually between 10^3 and 10^6 eV and chemical bonds are of the order of a few eV; for this reason, Particle Physics is also called High Energy Physics (HEP). Despite the small length scales, Particle Physics enters the study of the cosmos too: in fact models such as the Big Bang theory use the laws of Particle Physics to describe the early state of our Universe and its evolution; moreover, the very existence and the evolution of stars and even larger structures like galaxies and cluster of galaxies are tightly connected with the properties of particles.

It is important to notice that one should not think of a “particle” as a little sphere neither as a point-like material object: the theory of Quantum Mechanics (QM) in fact did shed light on the concept of particle as an object which presents both behaviors of classical material particles and of waves, and unify these behaviors in the notion of probability (density) wave, called “wavefunction.” This duality was clarified with the help of the de Broglie relation $\lambda p = h$, where h is the Planck constant, λ is the wavelength of the particle, that can be related to its size, and p is the particle momentum, related to its energy. An interpretation of this formula is that, when higher and higher energies are employed, smaller length scales are probed. For this reason, in order to uncover the fundamental laws ruling our Universe, very high energies are needed. The current description of particles, the Quantum Field Theory (QFT), formulated in the framework of A. Einstein's Special Theory of Relativity, encompasses QM and allows to address both

microscopic lengths and high energies; it predicts the existence of an antiparticle for every existing particle (the two can in case coincide), both with the same mass, as P.A.M. Dirac first theorized in his famous work on the electron in 1931. In QFT particles are mathematically described as “fields” and are classified according to the way they change under some symmetry transformations, for example, spatial or temporal translations and rotations. Quantities that are linked to these symmetries but that do not change under any of such transformations are then particularly useful, and are used in the description of a particle: for example, its rest mass or its spin. Other symmetry transformations, called “internal” because they do not involve transformations in space-time, are considered as well since it is found that the known particles all fit in certain symmetry patterns according to their properties; some of these symmetries, that are “local” since the transformation depends on the space-time point, are particularly important, because the requirement that the physics should instead not change from one point to another forces to assume the existence of new particles. These particles are called “gauge bosons” and are the carriers or mediators of a new interaction, intimately connected to the local symmetry, alternatively also called “gauge symmetry.” An example of gauge symmetry at low energies is found in classical Electromagnetism in J.C. Maxwell formulation (1864), where the electric and magnetic fields and the forces they induce are described by mean of another more essential quantity A (thus this theory unifies the two forces). The theory is invariant under a local redefinition of A , hence under the gauge symmetry generating this transformation. While in Maxwell’s view this new quantity described the propagation of light as oscillation of electric and magnetic fields and their effect on the electrons in terms of forces, the quantization of his theory (named Quantum ElectroDynamics (QED)) describes in more modern terms the propagation of the photon (described by the field A) and its interaction with the electron field. Therefore the macroscopic forces felt by a particle are described in QFT by its interaction with the mediator field, in this case the photon; so for example

an electron can absorb or emit a photon, or it can exchange a photon with another electron, producing in this way something that at the macroscopic (“classical”) level we call a force acting on the two electrons. (By “quantization” of a classical theory we mean a procedure, described by QM and QFT, which modifies the theory in order to make it hold in the quantum regime, i.e., at small distances.)

Maxwell’s formulation of Electromagnetism is the first and simplest case of gauge theory, from which the study of such theories arose. Moreover these theories introduce a remarkably simple conceptual setting to introduce interactions between particles in quantum theories, which is until now the only consistent setting known. Symmetries then turn out to be very useful not only in our description of Nature as powerful tools for calculations and settings, they are also intimately connected to our description of interactions between particles, and in this framework give powerful predictions, for example the number of existing gauge bosons, given the gauge symmetry group, and that all such gauge bosons must have spin 1 and mass 0 unless the related symmetry is broken.

The present quantum field theoretical model describing our knowledge of Particle Physics is a gauge theory called the “Standard Model” (SM), whose particle content is listed in [Tables 1](#), [2](#), and [3](#): the so-called matter particles are six leptons and six quarks (together with their antiparticles), sorted in three generations or families, moreover there are the gauge bosons mediating the interactions, namely, the photon, the massive Z , W^+ and W^- , and eight massless gluons. The status of the Higgs boson, the last particle predicted by the model, is not yet established. A particle with similar properties has been observed at the LHC in 2012 but further investigation is still needed to confirm the identification. The SM is divided into two gauge sectors, the Electroweak sector and Quantum ChromoDynamics (QCD). The former, including also the Higgs sector (i.e., the Higgs boson and its interactions), encompasses the QED and hence describes, among the rest, the electromagnetic interaction bounding electrons to the nucleus thus forming

Particle Physics, Table 1 The six leptons divided into three families (As per the data in Beringer et al. (2012))

Name: electron	Name: muon	Name: tau
Symbol: e	Symbol: μ	Symbol: τ
Mass: 0.5 MeV	Mass: 106 MeV	Mass: 1,777 MeV
Name: electron neutrino	Name: muon neutrino	Name: tau neutrino
Symbol: ν_e	Symbol: ν_μ	Symbol: ν_τ
Mass: <2 eV	Mass: <0.2 MeV	Mass: <18.2 MeV

Particle Physics, Table 2 The six quarks divided into three families (As per the data in Beringer et al. (2012))

Name: up	Name: charm	Name: top
Symbol: u	Symbol: c	Symbol: t
Mass: 2.3 MeV	Mass: 1.27 GeV	Mass: 173 GeV
Name: down	Name: strange	Name: bottom
Symbol: d	Symbol: s	Symbol: b
Mass: 4.8 MeV	Mass: 95 MeV	Mass: 4 GeV

Particle Physics, Table 3 The gauge bosons (As per the data in Beringer et al. (2012)) and the tentative mass for the Higgs boson as measured in 2012

Name: photon
Symbol: γ
Mass: 0
Name: W bosons
Symbols: W^+ , W^-
Mass: 80 GeV
Name: Z boson
Symbol: Z
Mass: 91 GeV
Name: gluons
Symbol: g
Mass: 0
Name: Higgs boson
Symbol: h
Mass: 125 GeV

atoms; the Higgs boson is responsible for the generation of the masses of all the other particles in the model – for this reason it is sometimes naïvely addressed as “God’s particle”; anyway this is just a nickname, mainly used by nonspecialists fans of the subject and by popular

literature, without any religious meaning or any assumption about the existence of God. Moreover, despite it is the more elusive particle of the model and it has special features, it does not mean that it is more fundamental than the others.

The QCD describes instead the strong interactions between quarks, mediated by the gluons: contrary to what happens with the electroweak interactions, the force generated becomes in fact stronger with the distance causing a behavior known as “confinement,” that means that quarks and gluons tie together forming composite particles: actually no free quark or gluon has ever been directly detected, what we observe are only the composite states. At low energies then QCD tries to explain some of the observed particles, called “hadrons,” as composed by quarks; the hadrons, some of which are listed in Table 4, fall mostly in two categories: the “mesons,” composed by one quark and one antiquark like the pion, and the “baryons,” composed by three quarks or three antiquarks, like the proton and the neutron. It is worth noting that the hadrons are much heavier than the quarks composing them, as one can see comparing proton, neutron, and pions in Table 4 with the up and down quarks, of which they are composed, in Table 2. Actually, it is not exact to say that hadrons are composed by two or three quarks, rather those are the so called “valence” quarks that determine the properties of the particle. The internal structure of an hadronic state is better described as a quark-gluon “soup”, where a large number of gluons and short lived “virtual” quarks interact: they all contribute to the particle mass, which is said to be generated dynamically by the strong interaction. Restricting ourselves to the matter described by the SM, if one considers that the Universe is almost totally composed by hydrogen and helium and that the proton and the neutron are heavier than the sum of their valence quarks masses by roughly a factor 100 (the electron mass in comparison is negligible), one sees that circa 99% of the total mass is due to strong interactions, while the remaining part is given by the masses of the electron and of the lightest quarks, whose generation is attributed to the Higgs field as mentioned above.

Particle Physics, Table 4 The lightest hadrons divided in mesons and baryons (As per the data in Beringer et al. (2012))

Mesons	Baryons
Name: neutral pion	Name: proton
Symbol: π^0	Symbol: p
Mass: 135 MeV	Mass: 938 MeV
Name: charged pions	Name: neutron
Symbol: π^+ , π^-	Symbol: n
Mass: 140 MeV	Mass: 940 MeV
Name: eta	Name: lambda
Symbol: η	Symbol: Λ
Mass: 548 MeV	Mass: 1,116 MeV

The SM is a completely self-consistent theory, and provides an accurate description of almost all microscopic phenomena observed in collider experiments. Despite this, it suffers from both conceptual problems, notably in the Higgs sector, and the lack of explanations for some experimental evidences, like for instance the presence of Dark Matter. Moreover, the problem of unifying the gravitational force to all other interactions is still unsolved.

In order to address these problems a number of theories and models have been proposed, but none of them is still definitely convincing. Among the main ones not explicitly addressing the unification of Gravity we find: Supersymmetry (SUSY), based on the intriguing idea of an enlargement of the space-time symmetry (the only possible, as far as we know); Technicolor, which substitutes the Higgs sector or part of it with a new strongly interacting gauge sector; invisible extra space-time dimensions, other than the three known space dimensions and the only time dimension; Grand Unified Theories (GUTs), which generalize the gauge symmetries of the SM embedding them in a larger unified symmetry group.

Hints for physics Beyond the Standard Model (BSM) are being searched by means of particle experiments that exist at present in a variety of setups. Most of the experiments detecting particles from natural sources look for signals from astronomic sources: satellites experiments like,

for example, Planck and AMS are compact particle detectors studying, respectively, the Cosmic Microwave Background (CMB) and the cosmic rays, particles arriving on the Earth or nearby from the cosmos; ground-based telescopes like MAGIC or Auger look for the light coming from interactions of high energy cosmic rays with the atoms of Earth's atmosphere; underground radiopure detectors like DAMA/LIBRA and XENON look instead for signals of Dark Matter particles in the cosmos. Other experimental setups like LHC make focused beams of accelerated particles collide to produce and detect interesting events, for example the creation of new particles; contrary to the previous case, here the initial state is human-controlled, i.e., the properties of the particle beams are chosen and tuned in order to get the most convenient possibilities for the events one wants to study. Finally, modern neutrino experiments are a kind of their own: those looking at neutrinos coming from the Sun, from supernovae, from an accelerator beam, or from nuclear power plants consist usually of large sensitive detectors accommodated in deep caves (like, e.g., Super-Kamiokande) or under large mountains (OPERA) to screen out cosmic rays. Neutrino telescopes that look instead for neutrinos coming from astronomical sources, need to be much larger and are mounted, for example, deep under water (ANTARES, NEMO) or inside the Antarctic ice (IceCube).

Particle Physics, as a branch of Physics, is a full science, which theoretically relies on the language of mathematics to describe our Universe and whose statements are to be checked experimentally. Unlike every other branch of Physics, and potentially of every other science, assumptions in Particle Physics cannot be explained by other disciplines, because it addresses the behavior of the most fundamental “bricks” constituting our Universe and its most fundamental laws. In the reductionist belief that macroscopic behaviors could in principle always be explained (even if potentially with big difficulties) on the basis of microscopic laws, but not the contrary, Particle Physics arises as the most

fundamental between all sciences, since it addresses the smallest length scales existing in Nature. This means that particle physicists always look for a more general and broader description (“laws”) of Nature that would lead to a deeper understanding, trying to modify the assumptions of the old paradigm itself. Obviously, every model and theory relies on a number of theoretical assumptions that are not explained by the model or theory itself, but physicists always keep trying to understand by looking for more general models, based on additional fundamental assumptions, that can explain the previous ones. In this way, one will never get rid of a certain number of assumptions, but will be able to understand more and more and at a more fundamental level the behavior of Nature. One particular assumption that Particle Physics makes, as well as the whole Physics, from the birth of the modern scientific method with the work of Galileo Galilei in the seventeenth century, is that we are able to translate in the language of mathematics all the behaviors we discover in Nature, and that such a language is powerful enough to be used to describe all kinds of such behavior.

As for all natural sciences, the progress of Particle Physics relies on the curiosity of scientists including their theoretical as well as experimental efforts to provide an always better knowledge of Nature. In the last century, great financial efforts have been undertaken by the international community to enable the construction of new experiments, sometimes very expensive, like particle colliders or experiments mounted on satellites. Even if not immediately, with the progressing of time a number of discoveries and techniques from Particle Physics find socially useful applications beyond the purely theoretical interests. For instance particle accelerators of various sizes and energies are routinely used for the medical treatment of certain type of cancers through radiotherapy and hadron therapy; remarkable is also the development of technologies not directly related to scientific research: for example, the World Wide Web was invented at CERN.

Particle Physics does not make any statement related to human beings, except for regarding them as self-conscious beings that are able to observe Nature. Since quantum theories typically address the most fundamental bricks of our Universe, it is not possible to study such a small system with smaller probes, in order not to influence it with the measurement operation. Thus, while in classical physics it is possible to define a system that does not include the observer, in quantum theories the observer is always part of the system that he wants to study. To this end quantum physics needs to “define” an observer (inside the system), as one who perturbs the system in order to make measurements.

Explaining life and its origins on Earth, as well as death, is not an aim of Particle Physics, although physicists are interested in understanding why our Universe possesses the right characteristics to allow the form of life as we know it (i.e., carbon-based) to have developed. For example, a slight modification of light particles masses would make impossible the existing complex chemistry, thus changing in a crucial way the evolution of the Universe, making it unsuitable for the emergence of life. Some physicists find in these and similar arguments, called “anthropic,” the reasons to believe that the Universe in which we live was somehow fine-tuned to allow life. Others believe instead that this is a question of pure chance.

Knowledge and truth are values of the scientific community, but Particle Physics does not define them, since they are not objects of its study. Moreover, as pointed out by scientist and philosopher of science B. Russell, no theory can be proved to be true but at most it can be found to be incomplete, if in a certain moment it cannot explain some experimental observations, or false, if it is at odds with them. The claim to find an ultimate theory that can potentially explain everything is then pointless, even because, in the impossibility of proving that it really is the true ultimate theory, people will be continuing testing it, hoping to eventually find some hints of a new physics. Thus the *ultimate* truth, if there exists any, may just be impossible to be found

out; what one can always look for instead is an enlargement and generalization or enhancement of the old theory, to be regarded as a new approximate (“effective”) but more precise and encompassing theory, that would lead us to a deeper but not definitive understanding of the nature of reality.

Perception is what allows the human observer to make experience of natural phenomena; rationality and reason are observer’s tools in trying to understand such phenomena, sorting them out into categories, in the deterministic belief that from the same initial condition a closed system (closed with respect to the external environment) will always end up in the same final state, or that if the final state is different than an unseen modification of the system occurred at a certain point of the evolution. Once again, this is true in macroscopic regimes but not at the quantum level: as already stated above, QM and QFT are intrinsically probabilistic theories, which means that they waive from the outset the claim to predict the exact final state of a microscopic system, while only being able to determine the probabilities of the possible final states to occur. Indeed, it was a hard challenge for the physicists of the beginning of twentieth century to understand and explain this random microscopic behavior, because they first had to give up the habit to experience and try to understand Nature through the perceptions of their senses. They, however, succeeded and that’s why we continue believing and relying on our reason to unravel, understand, and elucidate, using logic and the language of mathematics, the mysteries of Nature. Mystery here is obviously a term used merely to address what we still do not know, especially if we have some hints of what could lie beyond our knowledge but without understanding how this is linked to what we already know.

Particle Physics, in its quantum field theoretical formulation, uses time as defined in the framework of Special Theory of Relativity, the theory that unifies space and time into the broader concept of (flat) space-time. Space and time are then treated on the same footing, without respect to the problem of why it is possible to travel back and forth in space but not in time

(or, if it is, why it is not as easy as it is for space). Thus time (as well as space) is an external object for Particle Physics used for the description of events but that is not described; in particular its unstoppable flow is accepted without any further investigation.

In the Sciences and Religions engagement a relevant issue addressed at present by Particle Physics is the understanding of what matter exactly is and the origins of mass. As Science goes deeper and deeper through this subject, Particle Physics is expected to provide the answers to important questions about our origins and the birth of the Universe itself.

Cross-References

- [Anthropic Principles](#)
- [Applied Mathematics \(Mathematical Physics, Discrete Mathematics, Operations Research\)](#)
- [Astrophysics](#)
- [Causality in Physics](#)
- [Cosmology](#)
- [Determinism and Indeterminism](#)
- [Energy in Physics](#)
- [Physics](#)
- [Quantum Theory](#)
- [Reductionism](#)
- [Space and Time](#)

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Passion

- [Emotion](#)
- [Love \(Affective, Sexual\)](#)

Passion and Emotion, Theories of

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Related Terms

[Affective attitudes](#); [Desires](#); [Feelings](#)

Description

Passions and emotions have been the object of sustained philosophical treatment from Ancient Greco-Roman times to the present. For the ancients, passion and emotion (principally the emotion of desire) can be dangerously in conflict with reason. This was a salient theme in Greek tragedy and it was a hallmark feature of the romantic approach to the emotions in the eighteenth century. Today, the emotions tend to be seen in three different ways. According to cognitive accounts, the emotions consist of judgments and are thereby seen as a species of reason. Affective accounts do not necessarily take emotions to be noncognitive, but they stress the sensory dimension of the emotions. Functional accounts, on the other hand, tend to diminish the first-person, conscious role of the emotions, and tend to see emotions as functioning in biological and cultural ways. A fourth account should be mentioned, though it is very little represented today, and that is a behaviorist account which treats emotions entirely as actual and dispositional ways of behaving. In this entry, passion will be treated as a kind of emotion.

Emotions, Reason, and Sensations

The starting point for some modern theorizing about the emotions is the extent to which the emotions may be treated as cognitive, evaluative states and the extent to which emotions are related to sensations or general affective states. One reason for thinking that the emotions involve judgments is because it seems that if the emotions were identified with sensations, then you could

not have the sensations without the emotion. Consider a case of a person who is angry with someone because he believes that the person is responsible for damaging his property. Right away in this description, we are assuming that there is some reason behind a given emotion, but imagine that the person is feeling the full set of feelings or sensations that we associate (or perhaps even identify) with anger. The person's blood pressure is raised, heart bounding, there is some sweat and anxiety. Now imagine that the person comes to realize that the person did not do such damage and that his property is fine. It still might be the case that all the sensations continue, but so long as the person has ceased to judge that he was wronged, there is no more anger. We might say that the after-effects of anger have persisted, but not the anger itself.

While the above case illustrates the appeal of the cognitive account, the affective account receives some support from the ostensible counterintuitive nature of the cognitive account. Imagine someone claims to be angry and has the requisite judgment, but is completely lacking in any of the expectant sensations whatever. Such a Stoical person may be thought of as more like the fictional character Mr. Spock from the world of Star Trek rather than fully human. The affective account may also receive some support from apparent cases of emotion when there seems to be no object of emotion. Some philosophers think emotions must always have an object, whether or not the object exists in reality. These philosophers treat emotions as intentional attitudes like belief and desire. You may hope that some state of affairs occurs, and yet the state of affairs does not occur. A challenge to this account is the apparent fact that persons may have a kind of nameless or seemingly objectless dread, anxiety, or joy. One may claim that the person's emotion does have an object such as life in general, but this claim may be strained.

One other reason for thinking that the emotions are distinct from or that they at least involve more than sensations is that sensations seem to have locations in our bodies. For example, one feels a pain in one's leg, but it would be a stretch to think one feels happiness in one's leg or

anywhere. Also, sensations appear to have organs. One sees with one's eyes. One's skin becomes itself an organ through which or by which one feels. But one does not feel happy with a specific organ, other than referring to the brain or the body as a whole as an organ (Solomon 1993).

The functional account tends to eschew first-person introspection and reports of what it is like to have emotions and passions. In this way, while functionalism is not behavioristic (for it allows that there is a feeling or a sense of what it is to have an emotion) but it analyzes emotions in terms of their causes and effects. To be angry, on this account, would be to be in a state that is customarily brought about by a perceived injury, which gives rise to blaming or resentful behavior toward the apparent wrongdoer.

Most thorough accounts of emotion and reason need to come to terms with the question of when emotion (or passion) can provide evidence of or be a source of values. When we respond with an emotion like revulsion to states of affairs that we describe as cruel or unjust, is that revulsion evidence that the state of affairs actually is cruel and unjust? Some moral realists are in the phenomenological tradition (such as Scheler), whereas those who are not realists such as the non-cognitivists (those who deny objective content to moral judgments) simply reduce moral judgments to *merely* affective responses. Realists, however, have developed a rich literature on how the moral life consists of a proper order of emotions, what has classically been referred to as the order of love or *ordo amoris* (Chisholm 1986). This literature is some evidence that more content is involved in our moral judgments like John Mackie (Lyons 1980; Nussbaum 2004).

The Emergence of Emotions

Some philosophers believe that emotions did not come into human history until the development of language; these are the same philosophers today who deny that nonhuman animals have emotions. The most common argument is that to have emotions requires having beliefs. To have beliefs, it is necessary to have language. Nonhuman animals do not have language, hence no beliefs, and thus no emotion (R.G. Frey 1987).

This argument does not have wide support, however. It implies that prelinguistic babies lack emotions, which seems at least counterintuitive. Moreover, it seems that consciousness and some capacity to form beliefs would have to be prelinguistic, otherwise it is more difficult to describe and explain how a human or nonhuman could acquire language (which would seem to involve the capacity to understand and have beliefs about sounds and events). But granting that at least some nonhuman animals have emotions (as Darwin did), it is not clear which animals have which emotions. The best case for animal emotions concern animals whose anatomy (especially brain and nervous system) seems analogous to our own and that the animals behave in ways that seem to be analogous to us when we are in emotional states (e.g., animals appear to act as we do when we grieve or are angry, joyous, and so on). On these grounds, it appears reasonable to think that the great apes have emotions, as do dolphins and the like. It is not as uncontroversial, however, when it comes to chickens, fish, worms, and so on. One reason for being unsure about the emergence of emotions involves the general question about subjectivity itself. In a famous 1974 essay, "What is it like to be a bat?" Thomas Nagel argued that even an exhaustive third-person knowledge of an animal's body and behavior could not yield knowledge of its subjective states.

So, it is evident that humans have evolved to have emotions and passions; it is evident that they play a key role in our lives (it would be hard to understand human history without understanding love and hate), but it is not obvious in human and nonhuman evolution at what point emotions emerged.

Emotions and Personal Identity

As noted earlier, moral realists contend that a person's moral character has been described in terms of the order of one's emotions. Arguably, if you are the sort of person who sorrows when the innocent suffer and have a passion to assist them, you are a compassionate person. And if you are someone who delights over the suffering of the innocent, you are a cruel person. Some interpreters of Kant hold (with good reason) that he

thought the moral worth of a person did not preside in the emotions, but in their act of the will.

In the history of ideas, there have been some figures and movements who regard emotions and passion with suspicion. This is true in the Buddhist tradition, but it may also be found in non-Christian and Christian forms of stoicism. For an excellent overview of the latter, see Sorabji 2003. There is more of a literature from Ancient Greco-Roman philosophy to today on how to control, or even whether we can control, emotions and passions. Some who adopt the cognitive account of emotions and who hold that beliefs are not under our voluntary control tend to believe that the emotions are not under our immediate voluntary control. A great deal of current work on the topic of forgiveness presupposes that persons can moderate emotions like resentment (Griswold 2007).

Emotions in Science and Religion

While the scientific method, as conceived by Francis Bacon in the seventeenth century, would seem quite free of emotions such as anger, greed, the desire for fame, and so on, there remained an acknowledgement of the vital role of the emotion of love when it comes to love of the truth, trustworthiness, and the like. Today, many scientists and philosophers of science acknowledge that aesthetic considerations can enter into science (the desire for the simplest or most elegant explanations, for example), and this has also been increasingly appreciated in the case of philosophical reflection on religious belief. To be sure, early modern philosophers such as the Cambridge Platonists, John Locke, Immanuel Kant, David Hume, and others were wary of what was called “enthusiasm,” a state of excessive emotion and passion that tended to distort rational judgment. But there is a growing literature on how emotions, such as awe, love, a sense of the sacred, and so on, can have a responsible and important role to play in the formation and sustaining of religious belief and practice (Taliaferro and Evans 2011).

Cross-References

- [Cognitive Psychology](#)
- [Epistemology](#)

- [Ethics](#)
- [Experience](#)
- [Phenomenology](#)

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Pastoral Theology, Roman-Catholic, Europe

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Related Terms

[Roman-Catholic pastoral theology in Europe](#)

Description

In Catholic theology, the term “practical theology” has a twofold meaning: On the one hand, the

term “functions” as a collective name for one of the four main branches of theology (the others being biblical, historical, and systematic theology) and contains the subdisciplines of pastoral theology, religious pedagogy, catechetics, homiletics, (theory of preaching) poimenics and liturgical theology, canon law, and still others. On the other hand, the term “practical theology” has been used for sometime now as synonymous with “pastoral theology.” This is the meaning primarily used in this entry.

As the term “practical theology” indicates, it is the discipline within Catholic theology that deals with the mediation between theory and practice in reference to the Christian faith. In a certain sense, the whole theology is a “scientia practica,” yet the practical theology under discussion differs from theology, in general, inasmuch as its material object is the actual practice of Christians and their Church. How the mediation between theory and practice is done depends on the kind of practice that is considered (the practice of pastors, of churches, of groups or individual Christians) and on the kind of theory that is employed (action theory, aesthetics, hermeneutics of culture or system theory). Until today there is no consensus among practical theologians in regard to these issues. The present development in practical theology is related to the changing presuppositions of Christian faith and ecclesial practice, and this not only in regard to the strictly religious sphere (torn between secularization and renewal), but also in regard to the historical factors that presently change the conditions of human existence.

Self-identification

Science

Thanks to a decree of the Empress Maria Theresia (1717–1780) that reformed the study of theology in the Austrian Empire, pastoral theology became an academic discipline at universities in German-speaking lands. This started an ongoing effort on the part of pastoral theology to present itself as a recognized, full-fledged discipline, at the same level as the other theological disciplines, with its own material and formal

object. In other parts of Europe, the integration of practical theology into academic theological studies occurred only in the second part of the twentieth century.

Whether practical theology (pastoral theology) should be considered an autonomous discipline besides the other theological disciplines is a question posed in practical theology itself and often answered negatively by the other disciplines. For a long time – in some regions until today – the place of practical theology is not the university, but the seminary. Its task over there is to instruct seminarians at the end of their theological studies about how to apply their theoretical knowledge to their pastoral activities. Here, pastoral theology is a form of apprenticeship, not an academic discipline.

At the center of attention of practical theology is the question how pastoral practices and ecclesiastical directives are to be determined, taking into account the various social contexts in which people live. This concern demands that the process of modernization, involving social, cultural, economic, and other factors, be analyzed and interpreted in the light of the gospel. It follows that the task of practical theology has three components: an analytical, a hermeneutical, and a praxeological one. Because the subject of practical theology is related to other theological disciplines as well as to humanistic disciplines, practical theology must engage in intradisciplinary cooperation within theology and in multidisciplinary cooperation with the adjacent arts and sciences.

For a long time pastoral theology (like the whole of theology) made use of the deductive method: here the principles and directives guiding pastoral practice were derived from one or several axioms of the Christian faith. More recently, especially since Vatican Council II (1962–1965), the preferred method has been deductive, inspired by the motto “see, judge, and act.” This calls for a systematic search for “the signs of the time,” that is, the most characteristic trends of the given historical and cultural situation, a process that takes into account the empirical findings of other disciplines (sociology, psychology, etc.) and adds to them empirical

research done by practical theology itself. Since the meaning of empirical research is not obvious, practical theology must situate these findings in a wider frame of reference, a task that makes use of hermeneutical methods. Moreover, since practical theology guides courses of action inspired by Christian faith and appropriate to people's social and personal context, this discipline must also take into account the social and pedagogical sciences. These three types of empirical research are closely interrelated and constitute a spiral-like process that must again and again start from the beginning.

In the course of the intense preoccupation with sociology and psychology, practical theology has generated the subdisciplines of pastoral psychology and pastoral sociology. In their inquiries, these subdisciplines follow the methodological and theoretical standards of the sciences on which they rely. The plurality of these standards has consequences for the whole of practical theology. In recent years, the spectrum of epistemological and science-theoretical foundations of practical theology has produced a number of distinct approaches, from the theory of communicative action through aesthetics to the idea of practical theology as "empirical theology."

Characteristics

Practical theology is part of academic theology. It relies on the research of other disciplines of theology, to the extent that it touches its own particular perspective. This perspective and the methods that flow from it differentiate practical theology from the other theological disciplines. Its central concern is research aimed at finding concrete possibilities for practical communication of the gospel that is plausible and relevant, given the present conditions of social and personal life.

Relevance to Science and Religion

Practical theology sees itself as belonging to the human sciences. Yet, since contemporary culture

is strongly affected by the natural sciences and the science of engineering, the central concern of practical theology obliges it to deal also with these sciences. Some practical theologians have actually studied the natural sciences, allowing them to use with competence the discourses of the natural and the human sciences. Subjects in the field of "science and religion" are of interest to practical theology if they deal with insights that have an effect on the self-understanding of human beings and on the form of their social existence, including their relation to nature. This begins on the thematic level with the question of the beginning and the end of human life, the theories of the origin and function of religion in phylo- and ontogenesis, and the possible contribution of religion to stem the tide of the present ecological disorder; and moves to the meta-theoretical level, such as the epistemological and science-theoretical aspects in the interrelation of the sciences and practical theology.

Sources of Authority

The judgments made by practical theology rely on two sources: the study of the Scriptures together with their interpretations and the history of their reception and, second, the theological interpretation of the "signs of the time." The particular competence of practical theology is to connect these two inquiries in a critical-constructive manner. In doing this research, practical theology follows the same criteria of validity and reliability that are respected in non-theological research. An additional criterion in the exercise of practical theology is whether its proposals actually prove themselves in real life. The reflection within practical theology has recently been enriched by extending it to the international level.

Ethical Principles

On the basis of the insights gained into the conditions of people's personal and social life,

practical theology wants to help making it possible for men and women to promote the well-being of church and society – a promotion to which this discipline has contributed – and thus increasingly enjoy “the fullness of life” (John 10: 10) promised in the New Testament. Implied in this fullness is a special relationship to oneself, to other humans, to nature, and to God, the special relationship to other humans is marked by esteem, respect, and, above all, an appreciation of others in their otherness – the opposite of a calculated relationship guided by self-interest and the drive for power. A preferential option calls for extending compassion and solidarity to all who are in need or suffer distress.

Key Values

Key values of practical theology are those that help human beings to enjoy a greater fullness of life, such as human dignity, human rights, solidarity, justice, peace, the integrity of creation, tolerance, compassion with those who suffer, or – in theological terms – the reign of God and shalom (salvation in the integral sense).

Conceptualization

Nature/World

Nature may be conceptualized first of all as the totality of the conditions of life at the disposal of human beings which they must use with care in view of preserving them for future generations. Nature is part of the world as God’s creation. Creation does not mean the beginning of the world as studied by the natural sciences, for example, biology or physics. Creation refers to the faith that God is the ultimate sustaining ground of the whole of reality. This faith also hopes that God will complete the world, overcoming and transcending the evil in it. This high calling should persuade believers not to desert the world altogether, despite its shortcomings, but rather to act in it, together with others, in an effort to reconstruct it in accordance with its divine destiny.

Human Being

Essential characteristics of human beings in (practical-)theological perspective are (a) that they are creatures of God and are called by Him to be his image, (b) that they are dispensed from being like God, though they are tempted to want to be like God – with devastating consequences, (c) that they are social beings, (d) that they are finite and thus unable to achieve their completion by themselves, (e) that they are not determined but free, free even to sin against their original vocation or turn away from it altogether, yet even as sinners they are accepted by God and offered the unmerited grace of having their sins forgiven and their broken lives healed. Human beings are called to accept the gift of salvation, to embrace it, and hand it on to others, thus making a contribution to the completion of the world. Practical theology has the task of exploring the preconditions of the possibilities for the practical realization of such a faith-inspired vision; its task includes the elaboration of scientifically established guidelines for pastoral action to educate believers and accompany them on their journey.

Life and Death

In light of faith, practical theology understands life as a gift created by God and received by humans with the imperative of developing and shaping this life. It follows from this that faith, in and by itself, is related to the enhancement of humans’ life on earth, especially where it is threatened or being destroyed. Faith in God with his unconditional option for life inspires the hope that death is not the absolute end of life, but that life will be transformed in a new creation. The task of practical theology is to reflect on how this view of life and death can find adequate expression in pastoral practice – from birth to burial.

Reality

Faith has an impact on reality. To study this impact with empirical methods is the task of practical theology (cf. [Nature/World](#)).

Knowledge

Knowledge is an indispensable capacity of practical theology that enables it to deal with the

issues and questions raised by pastoral practice. This knowledge is derived from insights that pastoral theology has produced by scientific research, yet it is also open to the insights of ordinary people (popular wisdom and popular piety) as possible sources of the truths of faith.

Truth

As every science, practical theology is dedicated to truth, the all-embracing knowledge of what is, even if this can only be reached in approximate and fragmentary fashion. Still, the dedication to truth is the protection against a relativism that does not recognize differences between diverse values and diverse perceptions (and their consequences in practice), but declares them all as equally valid.

Perception

The kind of perception and the methods and instruments used to gain it (empirical and/or hermeneutical) depend on the particular object pastoral theology deals with and the particular aim it pursues in its research. Despite the effort to do research with objectivity, the subjective factor inevitably plays a certain role—a factor that should be made transparent and lead to self-critical reflection.

Time

Time has a quantitative and a qualitative dimension. Time is not only an objectively measurable quantity that extends in continuous sequence from the past, through the present to the future. Time is also a quality experienced by persons in a variety of ways, including high point and low points. Christian faith itself is related to experiences and interpretations of events in time, in particular those constitutive of its being, such as the Exodus (the liberation of Israel from the slavery of Egypt) or the life, passion and resurrection of Jesus of Nazareth. Practical theology must turn its attention to qualitatively outstanding courses of events – in personal life or the life of society – which allow people to experience hints of salvation (escape from distress, hopeful new starts) and echoes of evil (illness, suffering, violence, war, etc.), experiences that will guide and sustain

their course of action. Vatican Council II has referred to such events as “signs of the time” to be interpreted in the light of the gospel. They offer Christians and their Churches norms and guidelines for the exercise of their co-responsibility for the well-being of the world. Important for practical theology is here the phenomenon of “the simultaneity of the non-simultaneous” in church and society which produces mutual incomprehension between different attitudes and thus causes conflicts. This phenomenon often occurs in the field of religion (e.g., reformers vs fundamentalists).

Consciousness

Of particular interest to practical theology is to inquire, in the light of contemporary theories of consciousness, whether there is a proper religious consciousness. If this is the case, then the following questions arise: What are the characteristics of this consciousness? What relation it has to other forms of consciousness and in what way does it develop phylogenetically and ontogenetically? From this inquiry emerges the practical question as to which level of religious consciousness should be aimed at if the purpose is to enable persons to deal creatively and not defensively with the challenges of the present. How should the learning curriculum be set up so that this level can be reached.

Rationality/Reason

As the whole of Christian theology, practical theology also tries to illuminate and justify Christian faith, in this case specifically Christian practice, in the light of reason. Conversely, faith invites reason to think new thoughts.

Mystery

Understood in theological terms, human beings are by their very nature creatures encompassed by the mystery of ultimate reality, named God, a mystery of the “whence” and “whereto” of all beings, which in its totality can never be grasped by human reason. The “knowledge” of this mystery is preserved and transmitted by the religious tradition. The task of practical theology is to explore ways of how people can be initiated and

made familiar with this mystery, and how they can live their lives in view of this incomprehensible horizon (mystagogy).

Relevant Themes

For sometime now the greatest challenge to religion or faith and thus, also to theology has been the so-called naturalism that claims to be able to explain and enlighten all phenomena in the world on the basis of theories demonstrated by the natural sciences, including the as yet scientifically unexplored phenomena, such as the brain, the regulating center of all human thinking, and action. The theory of naturalism is not confined to the realm of the sciences; it has been popularized and influences the mentality of the people today. Practical theology – and not only the systematic theology – feels the effect of this cultural development. What is urgently needed is a conversation between science and religion, exploring the range and limits of techno-scientific reason and implicit in it the different images of humans and the world (translated by Gregory Baum).

Cross-References

- [Ecclesiology](#)
- [Practical Theology](#)
- [Religious Education Theory, Roman-Catholic, Southern Europe](#)

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Pathological Science

- [Religion and Pseudoscience](#)

Pathology of the Nervous System

- [Neuropathology](#)

Paticca samuppāda (Pāli)

- [Dependent Arising](#)

Pavlovian Conditioning

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A conditioning procedure, originally developed by Ivan Pavlov, in which a stimulus which initially does not elicit a strong reaction (called the conditioned stimulus) is presented in conjunction with another stimulus (called the unconditioned stimulus) which has much greater biological impact from the outset of training. With repeated pairings of the two stimuli, the conditioned stimulus comes to elicit responses related to the unconditioned stimulus. For example, if a friend routinely wears the same cologne, the smell of the cologne comes to elicit positive emotions as a result of being associated with the friend.

PBUH (an Abbreviation)

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When writing the name of the Prophet Muhammad, Muslims often follow it with the

abbreviation “SAWS.” These letters stand for the Arabic words “sallallahu alayhi wa salaam” (may God’s blessings and peace be with him). Muslims use these words to show respect to one of God’s Prophets when mentioning his name. It is also abbreviated as “PBUH,” which stand for the English words of similar meaning (“peace be upon him”).

PC Games

► [Games, Computer](#)

Pediatric Gastroenterology

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Description

Pediatric gastroenterology is a specialty of pediatrics which is the clinical discipline concerned with the diseases of childhood (Walker-Smith 2003). It is now well developed in Europe but this is a recent development. It has a short history which is closely related with the development of the European Society of Pediatric Gastroenterology. Pediatric Gastroenterology began chiefly in University departments and this was reflected in the first council of the society. Western Europe led the way with representatives from the Netherlands, Sweden, Britain, Italy, and France as members of the first council (Walker-Smith and AllanWalker 2003). Yet Europe has the distinction of hosting the foundation of the first society of this discipline. This occurred in Paris in 1968 at the first meeting of the European Society for Paediatric Gastroenterology. Subsequently this society has flourished and has grown to encompass hepatology and nutrition.

The official organs are now the European Society of Paediatric Gastroenterology, Hepatology, and Nutrition. It is generally known by the acronym ESPGHAN. This society has fostered the development of this specialty both within Europe and the wider world. It holds annual scientific meetings which have been an important catalyst for scientific research into this field. This has been of significant importance for sick children. The Society now provides indications and guidelines to clinicians and health authorities that drive the care of children.

Self-Identification

Science

Pediatric gastroenterology is an applied form of clinical science. From its foundation, it has been rooted in science. Scientific research in this field became of major importance once it became possible to study small pieces of the tissue from gastrointestinal organs of living children in the laboratory. Small intestinal biopsy and liver were the first important techniques to be developed. Of course, the research was always a by-product of these procedures, which were developed solely for the benefit of children in order to make a diagnosis of specific disease entities in children. Once these procedures were established to be safe and causing minimal distress to children, there was a major expansion of knowledge concerning clinicopathological syndromes which affected children.

Characteristics

Pediatric gastroenterology arose from its sister discipline gastroenterology which is concerned with adult patients. Gastroenterology began in Europe at the end of the nineteenth century. Pediatric Gastroenterology may be seen either as a specialty in pediatrics or a pediatric branch of gastroenterology. However, the development of pediatric gastroenterology is closer to general pediatrics than to adult gastroenterology.

Relevance to Science and Religion

This discipline is not relevant to “Science and Religion.” It is a branch of clinical medicine.

Sources of Authority

The sources of authority in the discipline are the same as for any branch of medicine.

Historically, they will vary from country to country. There are international sources of authority in relation to knowledge throughout the world. Textbooks, international scientific, and medical journals, and international meetings, all play their part. ESPGHAN in association with its sister society in North America NASPGHAN publishes the *Journal of Pediatric Gastroenterology and Nutrition* (Guarino 2010). This is influential in terms of knowledge of the discipline. Several initiatives have been developed in the field of pediatric gastroenterology including traveling school for young physicians and scientists in developing countries that have gained reputation to the discipline. Health services in individual nations develop their own recommendations. However, guidelines and recommendations by ESPGHAN are carefully considered by physicians as well as European Health Authorities such as the European Centers for Disease Control, the European Commission, and the Codex Alimentarius.

Ethical Principles

As for the practice of medicine as a whole, pediatric gastroenterology follows the same ethical guidelines. Clinical practice and research may be regulated by individual ethical committees.

Key Values

Pediatric gastroenterology is fundamentally concerned with those disorders of children

which may damage the gastrointestinal tract and the liver (Walker-Smith 2004). It is also very much concerned with the secondary effects of such damage. These include major effects on the child’s nutrition, leading to severe malnutrition, i.e., undernutrition. This fact led to nutrition being a vital element of this discipline from the early days. This interest has extended to a concern with other aspects of nutrition, without gastrointestinal involvement. An important example of this is obesity.

A major concern of pediatric gastroenterologists has been to extend their interest to children of the developing world where on the one hand diarrhea and malnutrition related to poverty and increasing obesity related to rapid urbanization are both important issues. Collaboration with a wide range of other professionals interested in the welfare of children is vital. The discipline is also interested in the feeding of children well. Promotion of breast feeding has been a major matter. In addition, fostering the creation of special milk formulae for children with a range of disorders from cow’s milk allergy and celiac disease to older children with chronic inflammatory bowel disease has been very important.

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Pediatric Surgery

► [Child Surgery](#)

Pentecostalism

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Related Terms

[Apostolic churches](#); [Baptism in the spirit](#); [Neo-charismatic movements](#); [Neo-Pentecostalism](#); [Oneness churches](#); [Pentecostalism, Charismatic movements](#); [Pfingstbewegung](#)

Description

“Pentecostalism” is a comprehensive term used for a series of renewal movements within Christianity, initiated in the twentieth century, that emphasize the use of charismata and divine healing. Today these movements are estimated to encompass some 500,000,000 believers, thus representing one of the largest branches of Christianity. From an anthropological point of view, Pentecostalism is seen as the most extensive cultural transformation in the present-day world, together with the growth of Islam. (The movement is called *pentecostalismo* in Spanish, *Le mouvement pentecôtiste* in French and *Pfingstbewegung* in German.)

In the wake of revival movements within Christianity during the nineteenth century, like Pietism, the Moravian movement, Methodism, Holiness movements and the international Evangelical missionary crusade, there was a worldwide growing expectation of a spiritual renewal within the Evangelical churches. In this anticipation several different “outpourings of the Holy Spirit” occurred around the world. The most influential was the Azusa Street revival in Los Angeles from 1906 to 1909, where African-Americans synthesized several different

theological trends and forms of spirituality into what today is known as Pentecostalism (Robeck 2006).

The group at Azusa Street was neither first, nor the only one. In several parts of the southern United States there were similar movements among poor white workers. In Wales, there was a revival among miners in 1904–1905. In Mukti, in India, a similar revival took place in 1905–1906. Thus the rise of Pentecostalism should be seen as a successive and global phenomenon that is more related to the spirit of the time and the general developments within Evangelical Christianity rather than diffusion of a particular set of ideas from a single center.

The same goes for the Healing revivals in the 1950s and the Charismatic movement in the 1960s respectively. The latter movement, e.g., appeared in Colombia and the USA simultaneously in 1967. From this period and onward, Pentecostalism has become an increasingly globalized movement with intricate networks that has spread around the world.

There have been several attempts to define Pentecostalism theologically. In 1987 Donald Dayton based his search for Pentecostal roots on, among other things, the “Fourfold gospel,” inspired by i.a. A. B. Simpson of the Christian and Missionary Alliance in the United States. The four main points are: Jesus as savior, Jesus as baptizer in the Holy Spirit, Jesus as healer, and Jesus as the coming king. This fourfold Christocentrism is definitely a basic characteristic of many of the branches of Pentecostalism, but nowhere near a uniformly expressed creed (Dayton 1987).

In his 1994 book “Fire from Heaven” Harvey Cox approaches Pentecostalism from an entirely different angle. Instead of searching for theological roots, he argues that the particular form of spirituality found within these movements unconsciously resonate with so-called “primal” religion, i.e., basic religious traits that largely have been lost and now are threatened by globalization and modernization. This approach, he argues, would also explain why Pentecostalism

has become “a religion made to travel.” This would explain, e.g., the growth of Pentecostalism in South Korea because the Pentecostal emphasis on receiving spiritual gifts would correspond to the traditional shamanic experiences of spirits. In performing this “revival” of primal religiosity Pentecostalism would answer to the needs of people confronting a modernist or a rationalist view that threatens to alienate them from their traditional background. Instead Pentecostalism would bridge that gap and take the believer back to her or his spiritual roots (Cox 1994).

In his widely cited book on “The Pentecostals,” Walter Hollenweger offers yet another hypothesis that downplays the importance of theology. Instead, Hollenweger tends to emphasize the spirituality of Pentecostalism, especially its “oral structures.” He claims that the African American roots of the Azusa Street movement have promoted different characteristics that resonate well with many non-Western cultures. He mentions, e.g., narrative theology, the emphasis on personal testimonies, oral liturgy, the inspiration from visions and dreams in worship, and understanding the relationship between body and mind as it is revealed in healing through prayer.

Hollenweger also attributes the emphasis on antiracism, pacifism, and gender equality to the slave background of the predominantly African American leaders of Azusa Street, Lucy F. Farrow, William Seymour and others. In his view, Seymour represents the “reconciling Pentecostal experience” and “a congregation where everybody is a potential contributor to the liturgy (Hollenweger 1988).” The latter ingredient implicated a social revolution, considering that the year of 1906, when this was applied, saw the most ugly face of racism in the United States up until today. (That year the number of lynchings reached its peak in the US.) According to eyewitness Frank Bartleman “The color line was washed away in the blood” at Azusa Street (Bartleman 1980 (1925)).

When Pentecostalism spread over the globe, it retained some of this early radicalism. In the first country in Europe to be reached by missionaries from Azusa Street, Sweden, Pentecostalism

joined forces with the popular movement and became a refuge for the working class. In many other contexts, however, Pentecostalism was domesticated and evangelicalized perhaps due to different factors, like the denominational identity of the local gatekeepers (Kay and Dyer 2011).

Many scholars have aligned with Hollenweger in his analysis, especially when it comes to the ability of Pentecostalism to adapt to local conditions through the emphasis on practice of spirituality rather than on a particular theology. Juan Sepúlveda, for example, states that the reason for the dynamic growth of Pentecostalism in Chile is to be found in its ability “to translate the Protestant message into the forms of expression of the local popular culture.” Allan H. Anderson claims that the movement’s success in Africa is due to its ability to communicate with African spirituality: “a message that promised solutions for present felt needs like sickness and the fear of evil spirits.” He also claims that African Initiated Churches (AICs) are in the main churches of a Pentecostal type that have “contextualized and indigenized Christianity in Africa (Anderson 2004).”

Even though Christocentrism is a general feature among Pentecostals, most denominations are trinitarian. Already in 1913, however, at a camp meeting in California a dispute erupted as to the wording of the liturgy of baptism. The Baptist tradition implied a blessing “in the name of the Father, the Son and the Holy Ghost.” The revelation in 1913 was to baptize believers according to what happened at “the first day of Pentecost,” as described in Acts 2:38: “Repent, and be baptized... in the name of Jesus Christ,” i.e., only in the name of Jesus. This debate resulted in an early split of Pentecostalism and the extreme Christocentrics were called “Oneness Pentecostals.” This branch has established itself especially in North and South America. It has been estimated that some 10% of all Pentecostals belong to the Oneness branch (Anderson 2004).

Believer’s baptism, as in the Anabaptist tradition, was often present in early Pentecostalism, but was never emphasized as strongly as in that tradition. Depending on the theology of the

“receiving” church or the pioneers in each country, the mode of baptism varied. In Scandinavia, Pentecostalism was first spread among Baptists in Sweden by nondenominational Andrew G. Johnson in 1906. Thus believer’s baptism became the accepted mode. Around Christmas time that very year the same message reached also the neighboring country of Norway through Methodist pastor Thomas Ball Barratt. There, however, infant baptism was the natural outcome for many years. In Chile, the Methodist Pentecostals still practice infant baptism up until present. Nevertheless, the overwhelming majority of Pentecostal and Charismatic churches today practice believer’s baptism (Kay and Dyer 2011).

The Methodist idea of a two-stage pattern in Christian conversion, first “justification” and thereafter “sanctification” was readily transferred to Pentecostalism in the early twentieth century. Another feature, mentioned in the first tradition, but never really emphasized, was the “baptism in the Holy Ghost.” For the emerging Pentecostalism, however, this became a basic feature, in fact the most characteristic of all. Through this experience, differently configured among Pentecostals, new dimensions of spirituality opened up. According to the new believers, baptism in the Holy Spirit was the entrance into the world of charismata.

When William J Seymour of Azusa Street put this Methodist heritage into new, Pentecostal terms, he added the baptism in the Holy Spirit and created a three-stage pattern, still adhered to by, e.g., Church of God in The United States: (a) salvation by faith; (b) sanctification as a cleansing process of the spiritual being; and, (c) baptism in the Holy Spirit with the following sign of speaking in other tongues. The last stage was for long interpreted as xenolalia, i.e., speaking in another (foreign) language, in the main for missionary purposes. Later, around 1908–1909, “speaking in tongues” was reduced to glossolalia, i.e., speaking in a heavenly language unknown on earth, with occasional incidents of xenolalia.

Around 1910, William H. Durham, a Pentecostal pastor of Chicago, revised this pattern and comprised stage one and two into one. This meant that no other sanctification but the conversion

experience was necessary before receiving the baptism in the Holy Ghost, referring to, e.g., Acts 10:44. For Pentecostalism in Scandinavia, where Seymour’s three-stage model was introduced by Andrew G. Johnson, Durham’s influence meant a possibility to adapt to local conditions. In the Nordic countries Pietism had advocated a processive sanctification, stretching over the believer’s life span, and this view now supplanted the American Methodist-Holiness punctual experience of sanctification. Instead, especially in the Baptist-dominated circles in Sweden and Finland, baptism took the place of sanctification as the second phase of spiritual development. Here, the three-stage pattern became: salvation, believer’s baptism, and Baptism in the Holy Spirit (Anderson 2004; Dayton 2000).

When, what we may call the Healing revival struck, first the United States, and later Europe, in the late 1940s and early 1950s, healing became most central. Oneness Pentecostal William Branham had had a revelation in which an angel bestowed him with the gift of healing. Thereafter Branham was rapidly engaged in healing meetings and soon this emphasis became a trend in Pentecostal preaching and the “Healing revival” as well as the “Latter Rain revival” were results of this trend. Branham visited the Nordic countries in 1950 and had a deep impact there. The characteristic features of this wave, however, were not theological but more liturgical: dancing in the Spirit, clapping of hands, raised arms, laying on of hands, and prophetic messages in the meetings.

If the use of printed material – *The Apostolic Faith* of Azusa Street had a circulation of over 50,000 copies in 1906 – and extensive “flying ministry” (carried out by train, as it were) were characteristic of the first wave of Pentecostalism, this renewal was characterized by large revival campaigns, often in circus tents or sports stadiums, and the use of radio and television. Preachers like Oral Roberts and T. L. Osborn became well-known characters in North American mass media. This was the birth of what was later called “televangelism (Anderson 2004).”

But the revival did not limit itself to the northern hemisphere. In 1954 healing evangelist Tommy J. Hicks managed to meet the President of Argentina, Juan Perón, and obtained a permit to use the largest soccer stadium of Buenos Aires. In a few days the healing campaigns gathered some 200,000 people in the *Estadio Huracán*, indicating a breakthrough for Pentecostalism in the country. Crusades in West Africa led to similar results.

Up until this point Pentecostalism had had little impact upon “traditional” mainline churches like the Lutheran, Episcopalian, Anglican or Catholic churches. The rapid growth in the 1950s changed that and from that period we can see a successive “Pentecostalization” of sections of these mainline churches. In the United States, we can see direct links between certain Pentecostal centers, and especially magazines like *Herald of Faith* or *Harvest Times* and the upcoming Charismatic movement.

In 1967 this development was concretized in an “outpouring of the Spirit” among Catholics in Pittsburgh, Pennsylvania and Bogota, Colombia. Thus the Charismatic movement among Catholics became official. One of the often cited leaders was Dennis Bennett and many of the people affected initially were students (Cox 1996).

However, the Pentecostalization of the Catholic church should be seen more as a process than a punctual event. The development aligned with that of Pentecostalism in some respects and took another turn in others. The emphasis on the punctual experience of the Baptism of the Holy Spirit, for example, was played down in favor of the view that all believers are filled with the Holy Spirit at the “new birth” of the believer, and that subsequent experiences are mere refillings or replenishments of the Holy Spirit. The outspoken focus on “speaking in tongues” as the “initial evidence” of a baptism in the Holy Spirit, as advocated by, e.g., the North American Pentecostal denomination Assemblies of God, is often discarded for more pluriform manifestations like prophecy, miracles, healing, or physical manifestations of being filled with Spirit. In contrast to classical Pentecostals who put emphasis on evangelization and missionary

activities, Charismatics often regard their baptism in the Holy Spirit as a form of revitalization and renewal within their own church traditions.

The next step in the globalization of Pentecostalism has, strangely enough, been called “The Third Wave” by Peter Wagner. It has been localized to California in the early 1980s, but again this was a global phenomenon. This development, also called the “Neo-Pentecostal phase” took different forms, one of the most well known called the “Toronto blessing” started in 1993. This charismatic wave was characterized by new spiritual manifestations, like “laughing in the Spirit,” but also by structural changes. The early ideal of “suffering for Christ” was supplanted by a message that emphasized “health and wealth” or “prosperity.” The Universal Church of the Kingdom of God, with its center in Brazil, has as one of its mottos, often put up as a signboard outside the church building, the exact opposite of the first ideals: “*Basta de sofrer*” (“Enough of suffering”).

While early Pentecostalism favored a democratic, local congregation with strong popular participation, this was now replaced, or at least complemented, by an emphasis on “apostolic leadership” and “one shepherd.” This was supplemented by cell groups and, with its origin in Latin America, the “G12-method,” that emphasizes cell group responsibility, evangelization and hierarchical leadership.

In turn, this gave way to the “megachurch” trend, with neo-Pentecostal churches gathering several thousand people for a single service – or a series of services on a single day. The most well-known example is the Yoido Full Gospel Church of Seoul, South Korea, founded by Rev. David Yonggi Cho, that claims to have 10% of the capital’s inhabitants as active members. In many places, these trends have been combined with a new form of worship. While traditional Pentecostalism was characterized by prolonged personal prayer, often on one’s knees, the most recent trend emphasizes the opposite. People remain standing up with raised hands for a long time, and simple choruses are sung again and again. Sometimes this is combined with lights and sound systems that echo that of a rock

concert. Interestingly enough, this type of praise has an unexpected center in Australia, in the Hillsong church, directed toward young professionals (Coleman 2000).

Nevertheless, the megachurch is far from being the only form of Pentecostal church in today's world. We now see specialized forms of Pentecostalism. Apart from churches for business professionals, we now have churches for athletes, film stars, gay people and the like. In 2007, soccer player Ricardo Izecson de Santos Leite, or Kaká as he is better known, shocked the spectators of the Champions League final by stripping down to a T-shirt with the message "I belong to Jesus" emblazoned across his chest. Kaká belongs to the *Igreja Renascer em Cristo* ("The Rebirth in Christ" Church), which was founded in São Paulo in 1986 by Estevam and Sonia Hernandez. Far from being the largest denomination in Brazil, it nevertheless claims some 2,000,000 members and more than 1,500 local congregations.

Most Pentecostal churches, however, are small, local, ethnified, and culturally adapted churches. Styles of architecture, organizations and liturgy are almost as many as the number of churches. Pentecostal denominations are unstable entities and it is sometimes claimed that they are like cells; they multiply through fission or division. This adaptability, combined with a never ending optimism about the transformative power of Jesus, is the key factor for understanding the continuous growth of Pentecostalism around the world (Anderson 2004; Martin 2003).

Within the cross-disciplinary area of "Pentecostal studies," one may divide the many different theories about the attractiveness and growth of the different branches of Pentecostalism into three main paradigms. The first one could be labeled "North American Neo-colonialism." This paradigm can be claimed to include all the theories about Pentecostalism as a conservative form of Christianity that has been exported from the USA to pacify the rest of the world, often with a hint about infiltration from the CIA. This paradigm has been especially favored by Latin American, anti-North American scholars. Unfortunately, these

theories have proved very little and, if focusing on South America, one may note that much of the outside influence in Pentecostalism comes from Europe, not only from the United States, and that most of the more successful movements are indigenous of South America or at least perceived of as being endemic. Most North American, as well as most European, missionary agents have had little success on the continent.

The second cluster of theories may be called "The Deprivation Paradigm." These theories try to explain Pentecostalism as based on needs caused by fallible or meager social conditions. Worldwide urbanization, industrialization, and acculturation have deprived people of their traditional social security and left them with few alternatives, Pentecostalism being one of them; often seen as "the opium of the people" or the "haven of the masses." Here we also find theories on the issue of popular religion and Pentecostalism as "sect." It is obvious that Pentecostal movements have been attractive to the poor. The emphasis on oral tradition, mentioned above, is one such factor in the communication of the Pentecostal version of the gospel. Other such factors are emotional styles of worship, the heavy reliance on symbols, the absence of written creeds, modern music and the like. Considering the fact that Pentecostalism tends to grow in number and importance even when the economic situation improves considerably, as in countries as Brazil or Argentina, disclaims some of the explanatory power of this paradigm.

The third cluster of theories may be labeled as the "Empowerment Paradigm." This paradigm may be said to claim that Pentecostalism somehow empowers people to take things in their own hands, and to act. Pentecostalism may be conservative in certain respects, but it radicalizes people, frees them from social and verbal constraints; it prompts innovations and, as Elizabeth E. Brusco has put it: Pentecostalism "restores the breadwinner to the home" and it represents a "Reformation of machismo" in, e.g., Latin America, nowadays the continent of Pentecostalism. Here, we may also include the theories of the coincidence between the character of Pentecostalism and that of the postmodern

society. So far, this paradigm seems to be the one that holds more explanatory power than the others (Brusco 1995).

Cross-References

- [Ecclesiology](#)
- [Global Christianity](#)
- [Globalization, Sociology of](#)
- [Religion, History of](#)
- [Religion, Sociology of](#)
- [Religion, Theory of](#)
- [Religious Studies](#)
- [Systematic Theology](#)

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Pentecostalism, Charismatic Movements

- [Pentecostalism](#)

Perception

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Related Terms

[Sensation](#); [Sensory experience](#)

Description

The discipline of perception is concerned with explaining the operation of the senses and the experiences and behaviors resulting from stimulation of the senses. The senses are vision, hearing, the cutaneous senses (touch, pain, tickle, itch), chemical senses (taste, smell, flavor), proprioceptive senses (awareness of body positions and motion), and the vestibular sense (body orientation, balance) (Goldstein 2010a, b).

Psychophysical and Physiological Approaches

The discipline involves two parallel and interacting approaches, the *psychophysical approach* and the *physiological approach*. The psychophysical approach involves determining

the relationship between stimuli in the environment and perception. This approach has measured basic operating characteristics of perception by determining thresholds for qualities associated with each sense (e.g., detecting light, motion, sounds, taste, and smell stimuli) and how stimulus characteristics influence perception (e.g., how wavelengths of light are associated with color perception, frequency of sound with pitch, depth information in the environment with depth perception). The psychophysical approach is essential because it defines perceptual phenomena to be explained and also helps elucidate underlying mechanisms.

The physiological approach is concerned with determining the biological mechanisms responsible for perception. The main goal of the physiological approach is to determine the sensory code – how stimuli in the environment are represented by the firing of neurons. Recent research involving the physiological approach has determined (1) that there are areas in the brain that are specialized to process information about specific types of stimuli (e.g., an area for processing information about faces, an area for complex auditory stimuli), (2) that even stimuli that have specialized areas also activate many other areas of the brain – that is, their activity is “distributed,” (3) that the brain is “plastic,” – that is, its properties can be shaped by experience in perceiving specific stimuli. This shaping can result in neurons that respond best to these stimuli so that neurons eventually become tuned to stimulus characteristics that are most likely to occur in the environment, and (4) that there are neurons that respond to higher-order aspects of behavior. For example, neurons called *mirror neurons* fire when a monkey observes an action being carried out by the experimenter (e.g., picking up a peanut) and also fires when the monkey carries out the same action. There is also evidence that similar neurons exist in humans, with some researchers suggesting that mirror neurons are important for imitative behaviors, determining other people’s intentions, and guiding social functioning, and others taking a more cautious “wait and see” attitude regarding the functional significance of these neurons.

Theoretical Approaches

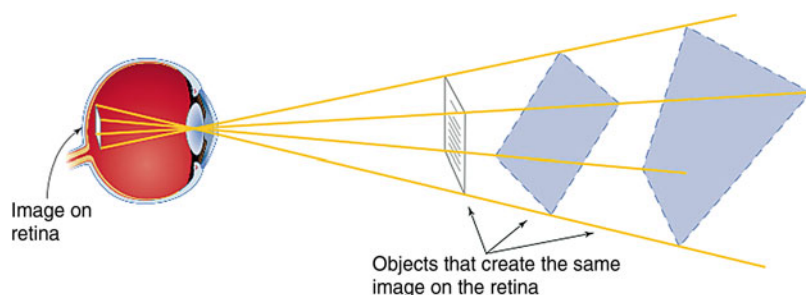
The Gestalt approach to perception, which is still influential today, was proposed by Max Wertheimer who, beginning in the 1920s, formulated “laws of perceptual organization” governing how elements of the environment are perceptually organized into larger units. The Gestalt principle that “The whole is different than the sum of its parts” emphasized the importance of context in determining perception (Koffka 1935).

The ecological approach to perception, introduced by J. J. Gibson beginning in the 1950s, emphasizes the importance of determining environmental stimuli that govern perception in the environment and considering perception as experienced by observers as they move through the environment (Gibson 1979). The focus on studying perception of the moving observer contrasts with traditional perception experiments of the time, which typically involved testing stationary observers in laboratory settings. The ecological approach is important because it emphasizes natural stimuli and conditions of observation.

The constructivist approach to perception takes as its starting point the fact that the information provided by the image on the retina is ambiguous because a particular image can be caused by an infinite number of objects (Fig. 1). Because of this ambiguity, additional processes are needed, and perception is conceived as an inferential process in which observers make use of their knowledge of *regularities of the environment* – aspects of the environment that occur with high probability. For example, it is likely that a blue area in the upper part of an outdoor scene is the sky and that a desk lamp extends behind a computer that covers part of it. This approach traces its roots to the nineteenth-century physicist Hermann von Helmholtz who proposed that perception is determined by a process called unconscious inference that occurs automatically and without conscious awareness of the perceiver. Irvin Rock later characterized this inferential approach as “perceptual problem solving” (Rock 1985). In the spirit of constructivism, an approach called the *computational approach* considers perceptual processes

Perception,

Fig. 1 Ambiguity of image on the retina. Any image can be created by an infinite number of objects. Three are shown here (from Goldstein, E. B. (2010). *Sensation and Perception*, 8th edition. Cengage Publishers)



as solutions to computational problems which involve inferences about the nature of the environment. This approach often states these inferences in formal statistical terms.

In addition to treating perception as an inferential process, modern perception research has begun to focus on links between perception and the physical capacities and behaviors of the perceiver. This approach, which has been called embodied perception, proposes that actions are the important outcome of perception. One reason for this assertion is the adaptive significance of taking action. Consider, for example, an observer who sees a dangerous animal nearby. While perceiving the animals is important, it is also crucial that the observer take the necessary actions to avoid being attacked by the animal (Milner and Goodale 2006).

Thinking about action as an important outcome of perception has led to a great deal of research on links between perception and action and the discovery of one processing stream in the brain responsible for perceiving and recognizing objects and another stream responsible for determining the object's location and then taking action toward it. This means that even a simple behavior such as picking up a coffee cup involves numerous brain processes – first, the object recognition system results in perception of the cup, then another system determines where the cup is, and finally, another system is involved in reaching for the cup, grasping it, and picking it up.

In summary, the study of perception has been extended beyond early research that focused on perceiving simple stimuli under reduced laboratory conditions to determining how people perceive in environmentally relevant situations and

how unconscious inferential processes are involved in perception, connections between perception and action, and the nature of the brain mechanisms that underlie both perceptions and the behaviors that derive from perception. As will be described later in this entry (see “[Reality](#)” and “[Knowledge](#)”), another important aspect of perception is how it can be influenced by the observer's knowledge, past experiences, and expectations.

Self-Identification

Science

The field of perception is a natural science. Perceptual research is governed by the methods of science and the facts and principles of the discipline derive from controlled empirical research based on the scientific method. The goal of perception research is to determine correlational and causal relationships between sensory stimuli and perceptual effects and to determine underlying physiological mechanisms.

Religion

The field of perception is not identified as a religion. Religious belief or doctrine plays no role in the elucidation of the principles of perception.

Characteristics

Perception is distinctive among other disciplines because it is concerned with a specific type of experience – experience derived from the senses – and the discovery of mechanisms responsible for

these experiences. It is this focus on sensory experience that differentiates perception from disciplines that may be concerned with other types of human and animal experience. There is, however, extensive cross talk between the discipline of perception and other related disciplines. For example, there are connections between perception and the subdiscipline of memory in that experiences rich in perceptual detail are often remembered more vividly and accurately than experiences that lack this detail. Emotion is another example of cross talk because perceptions can elicit both positive and negative emotions, and a person's emotional state can influence what they observe and how they observe it.

Relevance to Science and Religion

The discipline does not specifically concern itself with the scholarly area of science and religion, although there are some phenomena that may be of concern to religion, which could be studied within the field of perception. Examples of these phenomena are the nature of consciousness, connections between physical stimuli and experience, subjective feelings associated with religion, and perceptual aspects of religious practice.

Sources of Authority

The source of authority for the field of perception is empirical research reported in scientific journals and books and theoretical formulations. Research reported in journals is considered authoritative because of the use of the scientific method and because most research is peer reviewed. Authority is also achieved through the reputation of the authors who have published extensively in the field (see References for some representative works).

Ethical Principles

A major ethical principle, which is associated with the scientific method, is the principle of

objectivity of scientific investigation and the description of procedures in a way that enables results to be replicated by other investigators. Additionally, ethical principles established by university review boards and professional societies such as the American Psychological Association and the Society for Neuroscience govern how humans and animals are treated when they are subjects in experimental research.

Key Values

In addition to the ethical values described above, a value shared by many researchers is the importance of basic research for advancing knowledge. In some cases, the results of this basic research may lead to applications that result in improvement of the human condition. One example of basic research which led to an application is the auditory research that established connections between inner ear physiology and pitch perception. The result of this research later became the basis for the development of the cochlear implant prosthetic device which has made hearing available to hundreds of thousands of people. Prosthetic devices for vision, hearing, and touch are also being developed. Additionally, research on pain perception has applications for alleviation of chronic pain.

Conceptualization

Nature/World

Nature and the world are primarily conceptualized as the source of stimuli for perception. Of primary concern are any physical stimuli that can be sensed by people or animals.

Human Being

Human beings are conceptualized as biological organisms, which can be understood by reducing processes to basic mechanisms. The "human element" to these mechanisms is provided by considering how people's expectations and knowledge, which is usually connected with past experience, can influence perceptual

processes. A large amount of physiological research on perceptual mechanisms has been carried out on animals, with the results often being generalized to humans.

Life and Death

The origins of life are not treated, although the connection between developmental processes and perception (tracing perceptual capacities as they develop, beginning with birth and then continuing into old age) is an important area of research. Also, the various sense organs and sensory nervous system are considered to have evolved according to the principles of natural selection.

Reality

It would not be inaccurate to say that the study of perception is the study of people's conception of reality. From the point of view of the perceiver, perceptual reality is what is experienced. The person's subjective feeling accompanying this perception may be that what is perceived is an accurate reflection of what is actually present, but this may not totally be the case. One reason this is so is that only a fraction of what is "out there" is perceived. This occurs (1) because some things are too small to be perceived, (2) because some types of environmental energy cannot be sensed by our perceptual system. For example, humans cannot detect ultraviolet (very short wavelength) light energy (although other animals can), (3) we can pay attention to only a small fraction of the available stimuli, and (4) because of the limits of attention, we can miss changes that occur directly within our field of awareness. This effect, which is called change blindness, occurs, for example, when viewers miss continuity errors in movies – changes from one shot to the next in some aspect of a scene that is supposed to remain constant (such as what a person is wearing or the locations of objects on a table).

Illusions provide another example of a noncorrespondence between perception and physical reality. Although it may appear, in [Fig. 2](#), that the animal further down the railroad tracks is larger on the page than the one that is closer, both animals are, in fact, the same size on

the page (measure them!). Another way to check the degree of correspondence between perception and physical reality is to ask how an observer would perceive the sizes of the two animals if they were perceived within the actual three-dimensional scene. The answer to this question is that estimates of size do not always exactly correspond to physical reality. It is common for errors to occur in estimating qualities such as size, depth, movement, and the location of sounds, and these errors typically increase under degraded conditions such as low visibility or noise in the environment.

It is also important to note that everyone's perceptual reality may not be the same, and that because perception is a private experience, it is not possible to know whether experiences that two people label similarly (e.g., "the tomato is red") correspond to the same inner experience (see Goldstein, E. B. "Private nature of experience" in Goldstein 2010b).

Because perceptual reality is created by the brain, what we perceive reflects both what is "out there" and the operation of the brain. There are many examples of how physiological properties of the brain can affect perception, in some cases creating experiences that do not correspond to the physical stimulus (Goldstein 2010a). The most dramatic examples of how the brain can create "realities" that are not actually present physically occur when there is damage to the body or the brain. For example, it is common for people who have had a limb amputated to experience a *phantom limb* – the experience that the limb still exists. This illusory perception is caused by as yet not completely understood brain mechanisms (Ramachandran and Blakeslee 1998). Another distortion of reality caused by the brain manifests itself in some patients with damage to their right hemispheres, whose limbs on the left side of their body are paralyzed. Despite their inability to move their limbs, these patients deny they are paralyzed. This condition is called *anosognosia*, which means "unaware of illness" (Ramachandran and Blakeslee 1998).

But perhaps the most profound aspect of how the brain influences perceptual reality is that functioning of the brain not only influences how

Perception, Fig. 2 Ponzo or railroad track illusion. The two creatures are the same size on the page (composition courtesy of Mary Bravo; Railroad track photograph: William Vann/www.edupic.net) Contact information: Mary Bravo - mbravo@camden.rutgers.edu



we perceive the qualities of the physical world but that the brain creates the experience of some sensory qualities from energy that itself has no sensory quality. For example, the experience of color is created by how different wavelengths activate receptors in the visual system. Thus, when a fire engine reflects long-wavelength light into the eye, the nervous system creates an experience of “red” from electromagnetic energy that is colorless. Considering an analogous example from another sense, we can ask why sugar tastes sweet. Sugar is no more than an arrangement of molecules. Where is the “sweetness” in the sugar molecule (or the rancidity in molecules released from rotting meat)? These qualities are not in the molecules but are created by the action of these molecules on the nervous system. Perceptual reality is therefore determined by the energy to which the nervous system responds and by the experience it creates from this energy.

Knowledge

Knowledge plays an important role in perception because knowledge of the characteristics of the environment can affect perceptual experience. The effect of knowledge is often conceptualized in terms of top-down processing, which refers to the perceptual processes that take as their starting point the knowledge a perceiver brings to the perceptual situation. This contrasts with bottom-up processing, which refers to the perceptual processing that begins with information presented to the receptors. Most perception involves a combination of both types of processing. For example, consider a situation in which you are listening to someone talk in a noisy environment. You hear their words because pressure changes in the air that enters your ears and activates receptors inside the ear. This triggers a series of neural events that eventually reaches the brain. This is bottom-up processing.

Meanwhile, your knowledge of the language as well as the topic of the conversation enables you to perceive some words that may be partially obscured by noises in the environment. This is top-down processing. The idea of regularities in the environment is also relevant to top-down processing because knowledge about how the environment is constructed influences the ability to perceive objects and scenes.

Knowledge is also involved in perception because of the way experience in the environment can shape the characteristics of neural systems responsible for perception. As mentioned previously, the properties of the brain can be shaped by experience in perceiving stimuli so that neurons become “tuned” to respond best to common features of the environment. Looked at in this way, knowledge is programmed into the nervous system. One reason it has been difficult to program computers to perceive objects is that the computer programs lack the knowledge that is programmed into the human perceptual system.

Truth

Truth is involved when evaluating the accuracy of empirically collected data and how well perceptual theories explain the facts of perception. “Truth” is also involved when we ask whether a particular perception is “true.” The question can be evaluated only for qualities that can be objectively measured. For example, it is possible to compare the perceptual report “the 4-sided shape is square” to actual measurements of the four sides and angles of the shape. However, other perceptual experiences, such as perceiving colors, pitches, tastes, and smells, cannot be evaluated in this way because these perceptual qualities are created by the nervous system and are not, therefore, intrinsic to the physical stimulus (see “[Reality](#)”).

Perception

See previous description of the discipline.

Time

Time is treated as a variable in perceptual research by asking how other variables affect

the perception of the passage of time. It has been shown, for example, that a particular time interval appears to last longer as the frequency of events that occur within that interval increases. Time is also important when considering the time course of the perceptual process. Research has shown that the time course of perception is limited to some extent by the time course of neural responding, but that, in general, perception occurs extremely rapidly (within fractions of a second) and that a great deal of information about the environment can be taken in based on a very brief exposure.

Consciousness

Consciousness is central to perception because perceptual experience is a manifestation of consciousness. ► [Qualia](#) is the term used to refer to the essence of what it is like to have a particular experience. For example, a person’s experience of “red” would be his or her “red qualia.” A characteristic of qualia is that they are private experiences. Thus, if two people looking at a fire engine both say they experience “red,” there is no way to know whether their experience is the same.

An active area of perceptual research is the study of disorders of consciousness. This can include deficits in the ability to perceive specific perceptual qualities (e.g., color blindness) and also can refer to conditions in which people can demonstrate perceptual abilities even in the absence of perceptual experience. An example is *blindsight*, in which a person who is blind within an area of the visual field can report characteristics like orientation or the direction of movement of stimuli that are presented to the blind area, even though the person reports that they are unable to see the stimuli. This phenomenon is an example of what has been called “zombies in the brain” – the idea that much of our perceptual behavior is controlled by unconscious processes in the brain. This unconscious nature of processing is a characteristic of much of embodied perception described above (Ramachandran and Blakeslee 1998).

Rationality/Reason

The study of perception is considered rational because it is based on the scientific method. However, many perceptual phenomena appear to be irrational, such as anosognosia, in which people are unaware of apparently obvious physical deficits such as being paralyzed.

Mystery

Mystery, as such, is not a subject of study in perceptual research. However, the question of how physiological events such as neural impulses can become transformed into perceptual experience, which is called the ► [mind-body problem](#), is one of the most mysterious (and still unsolved) problems of nature.

Relevant Themes

Perception in Religion's Ritual and Practice

There are many connections between perception and religion both because of intersections between their concerns (both are concerned with issues such as reality, consciousness, and truth) and because perceptual phenomena are important components of religious ritual and individual religious practices.

Perceptual stimuli are hallmarks of many religious services. Services can involve colorful vestments, music, smells (such as those created by incense), tastes (as occurs in tasting wine and communion wafers), and visual environments of lights, colors, and religious icons. Such “multidimensional” sensory environments can facilitate spiritual feelings by creating a mood, transporting people out of their everyday routine, and thereby opening them to spiritual experience.

Considered from a mechanistic viewpoint, the pairing of sensory experience and religious services can create a conditioned response that exposure to perceptual stimuli elicits religious experience. For example, the smell of incense having been paired with the experience of the religious service may elicit religious feelings even outside of the religious setting.

Another example of pairing perceptual experience and religions practice is provided by the Islam practice of salat – performing a series of prayers five times during the day. Pairing occurs when the person adopts a particular body posture as each prayer is recited. For example, the opening prayer “Allah is great” is recited while standing, whereas other prayers are recited while in various positions (sitting, bowing, prostrate). This pairing of body postures and prayers can create a conditioned response that causes each body posture to elicit and therefore reinforce the spiritual feelings associated with the prayers. This conditioning may possibly be strengthened in situations in which the person prays in a group and so experiences his or her own body postures and also observes the postures of others. Recent research on mirror neurons (described above) indicates that watching someone else perform an action can cause the same neural responses that occur when the person is carrying out these actions.

Religious experience not only occurs within a perceptual environment, but can also create new perceptions. For example, meditators report experiencing visual images, sounds, words, feelings within the body, and tactile feelings. What causes perceptual experiences such as these, even in the absence of physical stimulation? This question can be answered in different ways. Consider, for example, a meditator who believes that sensory feelings experienced during meditation are caused by the presence of an angel (a belief that may be held by some, but not all, meditators). Some perception researchers, taking their cue from research which shows that perceptual effects and physiological responses can result from expectation and suggestion, might explain the meditator's experiences as being caused by their belief, which results in brain states that cause various sensory experiences (Austin 1998). The meditator, taking their cue from religious teachings, might explain their experiences as being caused by the actual presence of an angel. The difference between the explanations reflects differences in levels of explanation. The scientific explanation attributes causation to physical

events in the mind or brain, whereas the religious or spiritual explanation attributes causation to spiritual, not easily measurable, factors.

Another illustration of different levels of explanation is provided by the hook-swinging ceremony, a nearly extinct custom practiced in remote Indian villages, in which a “celebrant” hangs from steel hooks shoved under his skin and muscles and which are attached by ropes to the top of a small cart. As the celebrant is moved from village to village to bless the children and crops, there is no evidence that he is experiencing pain but instead appears to be in a “state of exultation.” Explaining this apparent lack of pain at a spiritual level might involve reference to the spiritual nature of the celebrant or to the operation of divine forces. Explanation at the physical level would focus on findings that pain can be decreased by modulation of the firing of neural impulses caused by a person’s mental state (Melzack and Wall 1988).

In addition to perceptual effects that are observed during spiritual practices such as meditation and ceremonies such as the hook-swinging ceremony, long-term effects of religion on perception could potentially occur. Just as growing up in a particular culture can affect perceptions (a well-documented example being the way differences in color naming in different cultures can result in differences in the way people perceive boundaries between different colors), it has been hypothesized that religious training might affect the interpretation and processing of perceptual stimuli. A study by Lorenza Colzato and coworkers (Calzato et al. 2008) has found that Dutch Calvinists tended to focus more on details of visual patterns than did a control group of atheists. They attributed this result to the Calvinists being taught from an early age to focus on local aspects of events. This result and its interpretation are intriguing, but empirical support for long-term effects of religion on perception is scant at this time.

Another example of long-term effects of training or practice is the following Zen Buddhist saying:

Before you study Zen, mountains are mountains and rivers are rivers. While you are studying Zen, mountains are no longer mountains and rivers are no longer rivers. But once you have achieved enlightenment, mountains are once again mountains and rivers again rivers.

This saying is usually explained to mean that once enlightenment is achieved through Zen practice, mountains and rivers are perceived not only as physical forms, as before, but with an added appreciation of the spiritual significance of the mountains and rivers and the connection or “oneness” of the mountains, the rivers, and the perceiver. Zen training, therefore, leads to new appreciations and ways of perceiving (Austin 1998).

The idea that there are modes of perception beyond the purely physical process of seeing or hearing is provided by St. Bonaventure’s description of *three ways of knowing*: (1) *the eye of the senses*, which involves pure sensation – sensing a light, darkness, color, or form without attaching meaning to it. (2) *The eye of reason*, which involves interpretation and organization that transforms pure sensation into meaningful perception. These first two ways of knowing correspond to “sensation” and “perception” as studied by contemporary perception researchers. And (3) *the eye of spirit or contemplation*, which involves perception at the level of the divine and realization that all things are one. This third way of knowing is analogous to the enhanced perception of mountains and rivers that results from Zen training.

The examples of the effect of Zen training and Saint Bonaventure’s *eye of the spirit* extend beyond what most perception researchers study. There is, however, an emerging field of “consciousness studies” that is concerned with investigating the role of the mind and brain in creating conscious experiences ranging from perceiving simple perceptual stimuli to feelings of transcendence (Austin 1998; Ramachandran and Blakeslee 1998).

In light of the above, it could be said that perception and religion have a symbiotic relationship. Perceptual experiences can enhance the experience of religion, and religious practice

can elicit new perceptions, add new dimensions to existing perceptions, and extend perception beyond the physical and into the spiritual.

Cross-References

- [Attention](#)
- [Biological Psychology](#)
- [Blindsight](#)
- [Cognitive Psychology](#)
- [Consciousness, the Problem of](#)
- [Ecological Psychology](#)

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Perceptual Systems, Gibsonian

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The means by which animals detect information specific to the environmental layout and its features. Perceptual systems extend beyond the

sensory receptors, neural projections, and brain processes to include the actions of the body that are essential for the detection of information (structure). For example, the visual perception system includes not only the retina, optical radiations, and the brain, but importantly, the possible movements of the head, neck, and entire body that participate in the detection of information. Such movements typically reveal invariant structure that is specific to particular objects and events. From the perceptual systems perspective, which was formulated by James Gibson, perception is best conceptualized as a perception-action process.

Perfect Being Theology

- [Theism, Classical](#)

Perfection

- [Pāramitā](#)

Performance

- [Theater](#)

Performance Art

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Artwork in which the primary medium is the artist himself or herself, or the artist's own body; distinct from the performing arts, such as theater, performance art grew out of Dada and Futurist events in the early twentieth century and

the Happenings of the 1960s. Performance artists often reject theatrical conventions and artifice, relying instead on the metaphoric and symbolic resonances of real materials and the artist's actions with them. Performance art is often intentionally provocative and/or political, inviting the audience to react intensely as the artist violates expectations usually associated with the performing arts.

Performance Event

► [Theater](#)

Performativity

► [Theater](#)

Perinatal

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Occurring around the time of birth.

Person

► [Personhood and Scientific Methodology](#)
► [Self](#)

Person Perception

► [Attribution/Attribution Theory](#)

Personal God

► [Monotheism](#)

Personalism

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Related Terms

[Personality](#); [Uniquely individual](#)

Personalism is a current of modern philosophy with different versions related by historical influence or by partly similar yet independently developed positions. It is distinguished from other forms of modern thought that make more limited and peripheral use of the concept of the person, and from earlier thought specifically about this concept, by making it central to its worldview in a more systematic fashion and by its insistence on further philosophical implications of personal experience.

While the term “personalism” had been used occasionally since the late eighteenth century, it became generally known as a designation of such philosophy only in the first half of the twentieth century. A main distinction could then be made between the American personalism of Borden Parker Bowne (1847–1910) and his successors mainly at Boston University, and the Continental European personalism of which Emmanuel Mounier (1905–1950) was long the best known representative.

The former is a quite distinct school with an unambiguous lineage in terms of the history of philosophy and with Bowne as the undisputed founder, while the latter is a more complex phenomenon in terms of its philosophical components and its historical development, and other thinkers, above all perhaps the early Max Scheler (1874–1928), could be considered quite as important and representative as Mounier. The earlier, American form of personalism is a version of nineteenth-century idealism, whereas all versions of the latter, European, are decisively shaped by twentieth-century phenomenology and existentialism. European personalism also developed

quite independently, without historical influence from American personalism.

European personalists sometimes regard their form of personalism as a completely distinct phenomenon that should always be considered apart from and never confused with American personalism. Yet, in substance, there is at least enough resemblance for others to have attempted to present a shared, more general worldview profile of personalism, and Mounier himself to some extent collaborated with the Americans.

For all personalism, the person is a uniquely individual, positively determined, conscious, rational, willing, partly free and morally responsible being, whose continuous realization or development of itself as such is achieved though its dynamic existence in social, reciprocal relation and community with other persons, through moral character-formation and action, and through the process of gradual appropriation and concrete manifestation of higher values. Properly understood, the reality and life of such persons reveal the nature and meaning of all existence, as conceived both in the theoretical terms of knowledge and metaphysics and in the practical terms – regarded as closely related to and in some respects preconditions of the theoretical – of ethics and aesthetics.

The person is thus asserted as an epistemologically, ontologically, morally, and axiologically primary category, i.e., in all traditional fields of philosophy, while its proper understanding is also held to add new dimensions of insight into the existential significance and potentialities of life. Because of the depth and complexity, the partial elusiveness and opacity of the reality designated as personal, its primacy does not offer any simple key to final, definitely formalizable solutions to all philosophical problems. But the truths regarding the nature of the person in most cases point in a particular direction, beyond other systems of thought. Especially American personalism, at least in its earliest formulation by Bowne, does conclude that all existence, and ultimate reality, must be conceived in personal terms. While it takes distinct positions on and sometimes reconceives traditional theoretical issues of philosophy, personalism is ultimately about the quality

of the life concretely lived by persons and in particular by persons-in-relation.

The person as specifically defined by personalism cannot be explained by, reduced to, or absorbed in impersonal or non-personal structures, realities, or unrealities, whether conceived in terms of matter, social and cultural conditioning, general scientific and mathematical laws and models, other conceptual abstractions and universal principles, general ideal forms, dialectical processes, social collectives, a pantheistically conceived totality, monistic spiritual unity, or nothingness. Personalism thus defends the spiritual and moral nature of humans against scientific reductionism, while also insisting on the personal nature of this spiritual and moral reality against impersonal conceptions of them.

The rejection of the primacy of impersonal universality and objectivity is not tantamount to relativism. Universality and objectivity are not suspended by but reconceived in accordance with the ultimacy of personality, apprehended either in the shared reality of a social plurality of human persons and/or as the supreme reality of the personal God. The nonrelativistic yet one-sidedly epistemological and formally moral subject of modern rationalism, including Kantianism, is modified, supplemented, or replaced by the concrete person, but the very nature of that person and his place in the personal whole rules out and invalidates relativistic subjectivism.

For this reason, personalism also rejects individualism. In terms of political philosophy, most forms of personalism have been characterized quite as much by the rejection of modern individualistic liberalism as by the rejection of collectivism and totalitarianism. Individualism too is a reduction of the person, either to the uniform rational abstraction of the Enlightenment, in which, in line with the term's etymology, individual does not signify any distinctive singularity, or to morally undisciplined singularity and the egoism that reduces other persons to means.

The person differs from the mere individual by its higher, moral and value-realizing nature that coordinates and synthesizes its singularity with the moral and spiritual order of which it is a part, and by its constitutively necessary

interrelatedness and community with other persons who are organic parts of that larger, personal yet at the same time objective order.

Such general positions could be said to characterize personalism in general, including most of its subdivisions. In the course of the second half of the twentieth century, some contact and exchange between the American and European schools have also been established, resulting in new syntheses and *rapprochements*.

At the same time, the differences not only with regard to philosophical and methodological points of departure but also of emphasis and specific, subordinate themes persist. Even when published in the same journals and appearing at the same conferences, personalists are still normally seen to represent a broad spectrum of different positions.

Historically, all personalism must, however, be understood against the background of and in close relation to the general cultural and intellectual development of Western modernity. Not least, it is in such deeper historical perspective that the shared themes as well as the meaning of the current issues and developments in personalism can be grasped.

Primarily in its idealist form but also to a considerable extent, albeit in some respects more indirectly, the phenomenological and existentialist, personalism was shaped by the nineteenth-century current of humanistic ideals of *Bildung* in their many national variations, and the unbroken confidence in the significance, power, and value of the modern subject as understood in nineteenth-century idealism – both harmonized with a more or less liberal version of Christian theism. In European personalism from the beginning, and in later generations of the American school, these values were merely modified and adapted to a new cultural, social, and political situation.

The philosophical concept of the person had developed through a long and complex historical process, beginning with the pre-Christian term *persona* being taken up in the protracted theological debates over the Trinity and the Incarnation. In the course of the Middle Ages, with a point of departure in Boethius' definition, *persona est*

rationalis naturae individua substantia (person is an individual substance of rational nature), it descended from the level of the divine to be applied on the human level, where its definition was continuously developed and refined. The process then continued as the concept was influenced by most of the main currents of modern thought, with an increased emphasis on subjectivity and self-consciousness.

The growing valorization of and confidence in secular humanity developed in the course of modernity account for much of the modern attention to and conceptual development of the category of personality. Even as personalism retained the theistic concept of God as the highest as well as deepest level of personality, and as the ultimate support of the value and dignity of human personhood, it was to some extent the conceptual development on the human level that was projected back onto the divine from where the concept had once descended. Thus, the theology or theistic metaphysics of personalism, in both its main early forms, was distinctively shaped by modern developments in theology, and, most obviously in the case of American personalism, in one strand of nineteenth-century idealism.

Making the concept of the person central in new systems of thought amounted to a kind of summary, encapsulation and reinforcement of the values and achievements of a broadly Christian humanism and idealism, reasserted against the perceived threats posed by impersonalism primarily in the forms of rationalism, naturalism, and collectivism. But by the time this project was becoming known under the new designation of personalism, it had already been carried on, in substance, for over a century. A historically decisive event for the development of what was subsequently to be called personalism seems to have been the so-called *Pantheismusstreit* in Germany in the 1780s, in which Friedrich Heinrich Jacobi (1743–1819) made the category of the person central to his criticism of the increasingly dominant pantheistic forms of thought that originated primarily in Spinoza.

Defending the core positions of the limited yet decisive freedom, the moral responsibility, and the value of the human person that is

constitutively defined by his relation to the personal God, Jacobi carried on and continuously updated his polemic as Spinozist pantheism was transformed from its Enlightenment rationalist incarnations of Mendelssohn and Lessing to the romanticized versions of the early Schelling and others. While in his understanding of the person, Jacobi was himself influenced by the Enlightenment and early Romanticism, i.e., by the whole modern humanistic development that accounts for the new importance and prominence of the human person, and while this influence combined with and modified his Christian convictions, he also clearly perceived the significance and problematic potential of the impersonalistic momentum of other aspects of the development of specifically modern thought. The new term *nihilism* was used by Jacobi to illustrate the effects of the impersonalistic dynamic within modernity that he predicted and warned against.

Jacobi's adversary, the leading German idealist Friedrich Wilhelm Joseph von Schelling (1775–1854), turned out to be receptive to Jacobi's analysis and arguments. In *Philosophische Untersuchungen über das Wesen der menschlichen Freiheit* (1809), his early idealism was strongly modified by a new, central use of the category of the person on both the human and divine levels. This contributed to the development of a whole alternative branch of German idealism, critical of the idealist mainstream from Fichte over the early Schelling to Hegel. It was called *der spekulative Theismus*, and represented by thinkers like Immanuel Hermann Fichte (son of Johann Gottlieb) (1797–1879), Christian Hermann Weisse (1801–1866), and Rudolph Hermann Lotze (1817–1881).

While the later Schelling was still strongly influenced by pantheist and to some extent esoteric conceptions in his idea of ultimate reality, distinguishing between God and a "Ground" in God in relation to which human history and God himself developed in a continuous moral and meta-physical drama, the speculative theists sought to overcome what they here perceived to be a residual element of impersonalism, and to elevate the new person-centered idealism above pantheism.

Jacobi himself had not been an idealist in the new, German sense, and was influenced rather

by elements of common-sense realism in his criticism of rationalism in its Enlightenment and idealist forms as well as of the romantic monistic intuition that was a feature of some German idealism. This aspect of Jacobi's criticism was taken up by the speculative theists in the form of the prioritizing of the irreducible concrete experience of the person as a necessary point of departure for philosophy, which came to define their strongly modified form of idealism.

There is an unbroken and sometimes strictly disciplic succession of thinkers here, not only from Jacobi over Schelling to the younger Fichte Weisse, and the latter's student Lotze, but further on to Lotze's students, among whom is found Bowne, and also Andrew Seth Pringle-Pattison (1856–1931), who developed in Britain an idealistic personalism similar to Bowne's. This alternative branch of idealism, which in Britain and America often came to be called *personal idealism* in contradistinction to *absolute idealism*, also had counterparts in many other European countries throughout the nineteenth century and often well into the twentieth century.

Before Max Scheler came under the influence of Husserl's phenomenology, he was a student of the German idealist philosopher Rudolph Eucken, who, while not strictly a speculative theist, was certainly familiar with this current of thought. Although it is unclear how much of it he picked up from Eucken, Scheler's most important work, *Der Formalismus in der Ethik und die materiale Wertethik* (1913–1916), is in many respects a transposition of basic themes in the broad current of nineteenth-century *avant-la-lettre* personalism to the terms of phenomenology. The criticism of Kant's ethical formalism and the emphasis of the positive, concrete development of personality under the normative guidance of intuited higher ideals like the good, the true and the beautiful (although the latter were not normally described in terms of values), ideals that were yet reconceived as realizable only in concrete personal form, had been developed in great detail by personalistic idealism throughout the nineteenth century.

The phenomenological method of the early Husserl, however, in some respects certainly

distinguished Scheler's personalism from the modified idealistic line carried on by Bowne, although in substance the latter was not always far from it. While idealism was largely retained by both the second generation of Boston personalists, Bowne's followers Edward Sheffield Brightman (1884–1953), Albert C. Knudson (1873–1953), and Ralph Tyler Flewelling (1871–1960), and the third generation represented by Peter A. Bertocci (1910–1989), the continuity with the idealist tradition in the strict philosophical sense was broken in continental European personalism in a way that made it seem it was never there at all.

Personalism had been used in France as a designation of his philosophical system already by Charles Renouvier (1815–1903) in the title of a work published in 1903. Renouvier was a representative of French Kantian neo-criticism, focusing on Kant's *Critique of practical reason*, and did exercise some influence on the development of personalism in France in the new century. Yet the general tenor of the personalism of Emmanuel Mounier is quite distinct from this version, and also in important respects from Scheler's in Germany. It is a product of the intellectual *milieu* of what has been called *les non-conformistes des années 30* in France, among whom Mounier was only one of several important personalists.

A cultural and social activist thinker rather than an academic philosopher, an editor of the journal *Esprit* and not a university professor, Mounier first conceived of personalism in the 1930s as part of a larger program of spiritual and moral renewal in a broad sense, perceived to have been made necessary by the decadence and materialism of bourgeois liberalism and democracy. While central concerns of the political philosophy of idealist personalism were in fact still recognizable, and the general Christian inspiration was central and basic, the mood of their expression in the new historical situation added quite as much as the new philosophical themes to the distinctiveness of this form of personalism. It was now primarily a practical philosophy oriented toward certain forms of social change.

The most important feature of the French personalism of this period was that themes from the emerging existentialist movement, in some respects a variation of phenomenology, were taken up. Considerable influence in this direction was exercised by the exiled Russian philosopher Nikolai Berdyaev (1874–1948). Some of the most characteristic of those themes were, however, anticipated already in the nineteenth century not just by Kierkegaard, but by Schelling and even to some extent Jacobi. They had developed in the line of these decisive early sources of personalism, and were now rediscovered and developed in new directions. Not least important in this context was the work of Gabriel Marcel (1889–1973), alone among the French existential personalists to be thoroughly familiar with the work of Schelling.

Within this framework, much that was to become central and distinctive of twentieth-century European personalism was developed by Mounier and other "nonconformists." In their work, the basic worldview profile of personalism is clearly restated and recognizable in most respects. Yet in the case of Mounier himself, the aversion to contemporary liberal society, in the Western European form and even more in the American, was so strong that he not only displayed, before the war, a partial sympathy for fascism, which many at the time construed as asserting community against mere liberal *Gesellschaft* in a way that was more compatible with personalism, but also a similar partial leaning, especially after the war, toward Soviet communism, whose anti-personalist nature was by then well known. This paradox in the thinker long considered the leading European personalist has been more adequately addressed by other scholars than by European personalists themselves.

Among the important personalists produced by the circles of the 1930s nonconformists were also Alexandre Marc (1904–2000) and Denis de Rougemont (1906–1985), who came to shape the growing European federalist movement in a distinctive manner that remains influential today, and whose specific political focus represents a variation of the activist features of French personalism. While these features could,

in the eyes of some critics, seem to become problematically absorbed and distorted by ideology even as one personalist, Jean Lacroix (1900–1986), would insist that personalism was nonideological, it also exercised a decisive influence on thinkers who came to some extent to represent a traditionalist, Christian counterweight to this development, namely the neo-Thomist philosophers.

Thomist personalists absorbed not just the existentialist influence from Mounier, but also the phenomenological influence from Scheler. Thus, a new synthesis was produced, in which the theistic and traditional moral dimensions of personalism were reinforced, and in which it was possible with the help of the new philosophical resources to add further meanings and values to or draw out latent ones from the rich and complex theological legacy of the development of the concept of the person ever since antiquity.

Thomistic personalism does not, like idealistic and early phenomenological personalism, take as its necessary point of departure the experience of the person and analyze the whole of reality in terms of it. Insights derived from this method are merely added as a new part to the already existing, traditional yet renewed system of Thomism. For this reason, it is not considered personalist in a strict sense, but only in a broader sense. Its claim to being a personalism is based on the singular value and role the system now ascribes to the person, but it is not the understanding of the person itself that determines the system as a whole. Yet the addition of elements of phenomenological personalism to Thomism accounts not only for new insights regarding the person, but also for the new emphasis on it.

This can be clearly seen in the work of Jacques Maritain (1882–1973) as well as that of Karol Wojtyła (1920–2005), who was a philosophy professor before becoming bishop of Krakow, and whose philosophical work later shaped the teaching of his encyclicals when he became Pope John Paul II. Wojtyła was the founder of the important Polish school of personalism, which is exclusively Catholic and whose leading representatives are members of the Catholic clergy.

Thomistic personalism too was, however, increasingly implicated in the ideological development of the twentieth century, as evidenced by Maritain's work after the Second World War with the United Nations' Universal Declaration of Human Rights, and with the Second Vatican Council, this tendency was further reinforced. While the theoretical opposition to naturalist and scientist reductionism was retained, the understanding of the import of personalism as an alternative to the more basic impersonalist dynamic in much of the intellectual and social developments of modernity was somewhat overshadowed by new concerns, such as the equal dignity and worth of all human persons. Personalism was increasingly used for the reinterpretation of the traditional Catholic teachings of the natural law as identical with modern human rights ideology.

This shift was not confined to European personalists, but also observable in new orientations of American personalism. Through the later Maritain, Thomistic personalism, increasingly conceived in terms of the new Catholic social ethic, had immediately exercised its influence in America, but the strict personalism of the Boston school too was now often being perceived primarily in terms of a similar ethics. American personalism is thus today shaped to a considerable extent by various social causes, the support of which is perceived to be the practical, ethical meaning and application of personalism. Much of this development Boston personalism has in common with the broader American current of liberal Christianity to which it belongs, although there are some significant differences between Bowne's ethics and that of the school's later generations.

A strong further impetus in this direction was given by the fact that Martin Luther King (1929–1968) wrote his doctoral dissertation under the direction of Boston personalists and explicitly identified himself as a personalist. Since then, American personalism has been even more preoccupied than European personalism with equal dignity and self-worth applications of its teachings to ever new *groups* of persons, in tandem with general ideological and

political change. Thus, the dignity of women, and of ethnic and sexual minorities has been a prioritized theme. One manifestation of this is the space devoted in a recent article on personalism by Bertocci's student Thomas O. Buford (1932–), the *doyen* of the Boston school, to “Afrikan” (African-American) and American Indian personalism. Representatives of such personalisms are considered on the one hand to have identified in Boston and other personalism elements congenial with the cultures of their respective groups, and on the other to have added to it distinctive qualities of those cultures.

Another characteristic application of this thematic is the emphasis on the equal dignity of the body as an integral part of the person conceived as the unitary whole of the human being, as against earlier idealist conceptions of the essence of personality in terms of spirit, self-consciousness, and will. American Methodist, Thomist, phenomenological and existentialist personalists have all increasingly insisted on such corporealist personalism, sometimes as being in line with Biblical teaching.

The idealist roots of American personalism are not wholly severed, however, and there is much discussion of the relation between the early Boston school and the other thinkers of its period, mostly at Harvard, some of whom were idealists, like Royce and Hocking. Others among these thinkers, however, created or belonged to more exclusively American currents of thought, like Peirce, James, Whitehead, and Hartshorne. Many of them called themselves personalists, but in the case of the pragmatists and process philosophers, there are significant differences between their personalisms and Bowne's idealistic and theistic version.

The importance of these differences was, however, reduced in the eyes of Boston personalists by the fact that, while Bowne's position was maintained by Knudson and others, the leading, second- and third-generation representatives of the school, Brightman and Bertocci, themselves abandoned Bowne's version of theism and approached that of process philosophy. Brightman reverted to a position similar to the later Schelling's which, although it represented

a decisive step in the development of personalism, had been regarded by the speculative theists as incompletely personalistic and which they had thus striven, as a further step in the same development, to supersede. If God is to be understood as personal, Brightman held, he must not only be conceived in finite and temporal terms, but there must also be a “nonrational Given” within God's own nature, which accounts for the evil which the world process, in which God is implicated, seeks to overcome. Significantly, in the European phenomenological context, the later Scheler too moved toward a similar new counterpart of the later Schelling's position.

One outcome of these developments as well as of the reduction of the divide between American and European personalism has been that personalism is seldom represented in its strict theistic idealist form either in Europe or America. With this exception, however, a rather broad spectrum of philosophers today regard themselves as personalists. The original similarities as well as the later convergence account for the fact that European and American personalists still largely share the very general, core positions outlined above, even as they are transposed to a new social and ideological context. Most of the European schools and branches have been further synthesized in the work of Armando Rigobello (1924–) – who builds partly on the thought of his teacher Luigi Stefanini (1891–1956) – and Juan Manuel Burgos (1961–), while American personalists continue both to reformulate Boston personalism and to integrate themes from European personalism.

Yet the complexity and vagueness of the concept of the person, with its many layers and facets of historically accumulated meanings, to some degree explain the further differentiation that has also taken place within the shared framework. The central category of personalism is one that many other philosophers too have to deal with. Thinkers who are not directly related, intellectually and historically, to personalism in its explicit forms and who do not call themselves personalists, have addressed personalist themes tangentially or within other frameworks. The prominence of themes recognizable as identical or at least congruent with those of personalism

proper accounts for the decisive influence of such thinkers in today's personalism.

Most importantly, the philosophy of dialogue developed by Martin Buber (1878–1965), and Emmanuel Levinas's (1906–1995) ethics of the Other, have been taken up and coordinated with the earlier themes of personalism. Levinas's ethics dovetails especially with and underpins the development of personalisms of minority groups and cultures in the West. But it is also the case that Buber's I-Thou-thematic does have a counterpart as early as Jacobi. Both of these developments in phenomenology, broadly conceived, have made it possible to bring out more clearly some implications of earlier personalist positions.

Another example of this is John Macmurray's (1891–1976) philosophy of persons-in-relation, which develops similar themes and has thus been regarded as personalist. Paul Ricoeur (1913–2005) was associated with both Mounier and Marcel in his early career, and retained some personalist themes in his later work. Michael Polanyi's (1891–1976) criticism of positivism and scientism, based on his understanding of personal and tacit knowledge, has also attracted attention among personalists.

The Christian input is continuously renewed, not just in the Thomist tradition, but also by Eastern Orthodox theologians, so-called social trinitarians, who seek to demonstrate the presence of "modern" personalist and dialogicist themes in some Church Fathers' views of the Trinity.

Personalism also responds to other concerns of contemporary philosophy. Erazim Kohák (1933–) has, for instance, addressed the relation between person and nature in general and with regard to the nature of animals, thus moving away from the too radical, Biblically inspired "human exceptionalism" primarily among Thomistic personalists.

Another important current trend is the interest shown by personalists in comparative work that finds parallels to personalism in Eastern thought. Some early personal idealists were aware of the relevance of such study, and Bertocci devoted an article to it. Today this work has at its disposal

vastly expanded scholarship and can build on well-established scholarly dialogue and mutual familiarity, although it still faces difficult questions of translation and interpretation.

Although the philosophical concept of the person and its being made central in philosophical systems are in themselves products of specifically Western historical and cultural developments, there are sometimes striking, more general world-view similarities, not least with some branches of Vedanta. Given the nature of the relevant Eastern schools of thought, it is possible that comparative personalism could facilitate a rediscovery of personalism's early idealist forms and prehistory. In this way, and through the assimilation of a wider range of insights from congenial traditions in other cultures, personalism could confirm and reinforce its position as perhaps the main philosophical alternative to physicalist and scientist reductionism.

Cross-References

- [Existentialism](#)
- [Idealism](#)
- [Phenomenology](#)
- [Self](#)
- [Theism, Classical](#)

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Personality

- [Personalism](#)
- [Personality Psychology](#)

Personality Psychology

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Related Terms

[Character](#); [Identity](#); [Personality](#); [Self](#);
[Temperament](#)

Description

Personality psychology is the scientific study of psychological individuality. Personality psychologists aim to understand the individual person as an integrated biological/psychological/cultural organism who, by virtue of human nature, shares many features with other persons and yet who is, at the same time, unique. Theory and research in personality psychology focus on individual differences in behavior, thought, feeling, and motivation across persons. Researchers measure the person's dispositional traits, temperaments, motives, goals, values, interests, identities, self-narratives, and other psychological features that tend to differentiate him or her from other persons. Assessments of personality are valuable to the extent they are able (1) to account for consistent trends in a person's behavior across situations and over time; (2) to predict important life outcomes like mental health and well-being, job success, the quality of interpersonal relationships, civic engagement, physical health, and mortality; and (3) to provide a full picture of a person's unique adaptation to the world.

The historical roots of personality psychology lie in nineteenth-century experiments and tests on individual differences in mental functioning, studies of character and biography, and the pioneering efforts of Sigmund Freud and other psychoanalytic theorists and clinicians who sought to understand the unconscious mind. The field of personality psychology emerged as a bona fide academic discipline in the 1930s, largely due to the influence of Gordon Allport's (1937) authoritative textbook, *Personality: A Psychological Interpretation*. Allport identified many of the perennial tensions and questions in the discipline of personality psychology, including the role of traits and situations in the prediction of behavior, the extent to which behavior is consistent or variable across different situations, the issue of personality continuity versus change over time, the links between normal personality functioning and psychopathology, and the relative merits of nomothetic research aimed at establishing general laws in personality versus idiographic case studies aimed at understanding

the individual person (Allport 1937). The discipline went through a very difficult period in the 1970s, when many researchers came to doubt the efficacy of personality traits as valid predictors of behavior. At the same time, the all-encompassing grand theories of personality that have traditionally been loosely grouped under the rubrics of psychoanalysis, humanistic psychology, and behaviorism began to lose favor among both researchers and clinicians. However, the next few decades witnessed a strong resurgence of activity in personality theory and research. Among the most important trends in the field today are (1) the revitalization of personality traits as predictors of important behavioral trends and life outcomes, (2) behavioral genetic studies speaking to the heritability of traits and gene by environment interactions, (3) neuroscientific studies of the psychophysiology of traits, (4) the influence of evolutionary psychology on understandings of psychological individuality, (5) cross-cultural studies of personality, (6) studies of motives and goals across the life course, and (7) the emergence of narrative approaches to personality that view human identity as an internalized and evolving life story.

Self-identification

The vast majority of personality psychologists identify themselves as behavioral scientists. The discipline of personality psychology is self-consciously scientific, publishing articles in rigorously peer-reviewed scientific journals, holding scientific conferences, securing scientific grants, and so on. However, the discipline has historically experienced tensions regarding its scientific status. Going back to Allport, personality psychology sets out to explore general laws or trends in psychological individuality and to understand the single case. It has always been difficult, however, to demonstrate how a nonrepresentative, idiosyncratic single case study can hold scientific value. Most personality psychologists, therefore, conduct conventional nomothetic research with large samples of subjects, which is evaluated according to

scientific standards, and yet they typically expect that their findings could, in principle, be applied to the individual case. At the same time, a small but vocal minority in personality psychology has perennially accused the mainstream of being overly concerned with scientific generality and of failing to focus enough attention on the uniqueness of individual human lives. This critical point of view usually comes from either clinical psychologists or from those personality psychologists who have a proclivity for cultural anthropology, qualitative sociology, literary studies, or the humanities.

Characteristics

Within psychological science, personality psychology stands out for its focus on psychological individuality. More than any other subfield in psychology, personality psychology aims to understand individual differences between people. It is also distinctive for its proclivity in developing integrative and broad-based conceptual perspectives that aim to understand the whole person. The field does, nonetheless, share many interests and perspectives with social psychology, developmental psychology, clinical psychology, and industrial-organizational psychology, among other fields. In many cases, boundaries between disciplines are blurred. Both social psychology and personality psychology focus attention on the social behavior of human beings, but personality psychology tends to emphasize individual differences in social behavior. Therefore, whereas social psychologists tend to study how different situations bring out correspondingly different behaviors in the same people, personality psychologists tend to study how different people show different behaviors in response to the same situation, those differences being due to different internal traits, motives, and so on. Both developmental and personality psychologists study continuity and change in behavior over time, but developmental psychologists study a wider range of phenomena – from perception to attention to cognition to emotion – and personality psychologists

focus mainly on social and emotional functioning as it appears, typically though not exclusively, in adults. Nonetheless, interest in child personality has increased in recent years. Most personality psychologists study psychological functioning within a more or less normal range, whereas clinical psychologists are more concerned with psychopathology. Having said that, clinicians have identified certain personality disorders – such as narcissistic personality disorder and antisocial personality disorder – and personality psychologists have shown increasing interest in these syndromes in recent years. Finally, personality psychologists focus on a wide range of individual differences, some (but not all) of which have proven useful in industrial-organizational psychology for predicting job performance, informing personnel selections, and the like.

Relevance to Science and Religion

Both Freud and Allport wrote important treatises on religion. In *The Future of an Illusion*, Freud suggested that religion was an irrational outgrowth of infantile and Oedipal dynamics (Freud 1927/1961). In *The Individual and his Religion*, Allport offered a more sanguine view, suggesting that intrinsic religious beliefs and practices can promote psychological maturity and motivate prosocial behavior (Allport 1950). Most personality researchers, however, have traditionally ignored the subject of religion. This is perhaps surprising given how important religious beliefs and practices are for millions of people the world over. The situation has begun to change somewhat in the past decade, as empirical psychologists of many different persuasions have come to recognize that religion is associated with many indices of mental and physical health (Emmons and Paloutzian 2003). Moreover, recent personality studies of virtues such as forgiveness and gratitude, for example, touch on religious themes (Emmons and McCullough 2004).

The historical reluctance of personality psychologists to explore religion in people's lives

may reflect, in part, the discipline's self-conscious and somewhat defensive status as a rigorous science. Just as psychology writ large broke away from philosophy and religious perspectives in the late nineteenth century to establish itself as a science, so did personality psychology struggle in the first half of the twentieth century to attain the imprimatur of science. The struggle was made even more difficult by the fact that some of the intellectual strands that went into the making of personality psychology as a science seemed to have certain kinds of religious flavorings. For example, some observers have characterized psychoanalysis as akin to a twentieth-century secular religion, complete with origin myths (Freud's years of "splendid isolation"), heroic figures (Freud, Jung, Adler, Erikson, Kohut), sacred beliefs (the unconscious, the Oedipus complex), and canonical practices (free association, dream interpretation, transference). In any case, a religious worldview has never resonated well with personality psychology's commitment to the scientific method and its effort to explain psychological individuality in terms of measurable constructs in the brain, the body, and society. That said, personality theories have traditionally addressed some of the same big questions in life that religions have addressed: Who are we? What is the meaning of life? What makes for a good life? Even as most personality researchers have traditionally shied away from these questions in their experiments and correlational studies, the questions still lurk in the background and probably inform research in subtle ways. Furthermore, these broad, existential questions often arise in college undergraduate classes on personality psychology.

Sources of Authority

The prime sources of authority in personality psychology are its scientific journals and monographs. Among the most authoritative journals are the *Journal of Personality and Social*

Psychology, the *Journal of Personality*, and the *Journal of Research in Personality*. Particularly influential are research reviews on personality appearing in such journals as *Psychological Bulletin*, *Psychological Review*, *Psychological Inquiry*, and *Review of Personality and Social Psychology*, as well as in chapters on personality in the *Annual Review of Psychology*. Because journal articles are subjected to scientific peer review, journals are considered more authoritative than books. Nonetheless, books often offer authoritative sources for personality theories and for broad applications and illustrations of research findings. In addition, the discipline holds in high regard a small number of classic books that have historically had a large impact on theory and research. In addition to Allport's seminal textbook, these would include some of Freud's writings (e.g., *The Interpretation of Dreams* (1900), *Introductory Lectures on Psychoanalysis* (1916)), Murray's (1938) *Explorations in Personality*, Erikson's (1950) *Childhood and Society*, Kelly's (1955) *The Psychology of Personal Constructs*, McClelland's (1961) *The Achieving Society*, Eysenck's (1967) *The Biological Bases of Personality*, Mischel's (1968) *Personality and Assessment* (a searing critique of the field), Bandura's (1971) *Social Learning Theory*, and Wiggins's (1973) *Personality and Prediction*. In recent years, a number of authoritative handbooks have been published. The most important are these: *Handbook of Personality: Theory and Research* (3rd Ed., edited by John et al. 2008), *Handbook of Research Methods in Personality* (edited by Robins et al. 2007), and *Handbook of Personality Development* (edited by Mroczek and Little 2007). College textbooks in personality come in two varieties. Modeled after Hall and Lindzey's classic (1957) text, books covering the grand theories of personality provide conceptual and philosophical overviews of the writings of Freud, Adler, Jung, Murray, and other theorists. These books tend to ignore scientific research, however, so their status as authoritative sources is seriously compromised. Still, they remain popular. The second type of college

textbook focuses on scientific research in the field while making efforts to connect to classic and contemporary theories of personality. A good example of the second type is McAdams's (2009) *The Person: An Introduction to the Science of Personality Psychology* (5th Ed.).

Ethical Principles

The ethical principles that guide work in personality psychology are those of science as it is intended to flourish in a free and democratic society. As such, personality psychologists aim to conduct well-designed research studies that aim to advance our understanding of psychological individuality. Studies should adhere to the best standards of practice for research on human subjects, as articulated by the American Psychological Association and the Association for Psychological Science, and by various institutional review boards at universities.

Key Values

The key values are generally those derived from science and medicine. From science, personality psychology derives the values of curiosity, open inquiry, and objectivity. Ideally, personality science is a progressive and self-correcting discipline wherein observations influence theory, which influences further observations, and so on. Over time, personality science should develop better, more coherent, more comprehensive, more rigorous and precise, and more generative understandings of psychological individuality. From medicine (and the clinical tradition in psychology), personality psychology derives values of alleviating suffering and improving human lives. Many personality psychologists hope that their research findings and their theories will ultimately have a positive impact on individual people and on society, through the dissemination of their ideas in the public and their application to clinical work and social policy.

Conceptualization

Nature/World

For personality psychology, nature/world would encompass all that is outside the person, often captured in the discipline's common expression of the *situation*. In simple terms, personality variables combine with the situation to produce behavior. In personality research, the situation usually refers to the proximal social and natural factors that impinge on the person at a given moment in time. The most contentious intellectual battles in the history of personality psychology have been fought regarding the relative efficacy of personality variable versus situations in the prediction of behavior. In the 1970s, the situationist view gathered many adherents, but today most personality psychologists espouse an interactionist perspective – behavior is a function of the interaction between the person and the situation.

Personality psychologists tend to see nature and the world as objectively “out there” – separate, in principle, from the person. However, personality psychologists are generally cognizant of the fact that reality is, to some extent, socially constructed. What often matters in the prediction of behavior is a person's perception of or interpretation of social reality. At the same time, the outside world provides a nested set of contexts that profoundly shape how people think, feel, and behave. These contexts range from the immediate situation to family settings, neighborhoods, schools, social class, and culture. A person's life is embedded in a complex social ecology. Whereas most personality psychologists do not study that ecology in detail, they are aware it exists, and they typically try to interpret their research findings with that kind of complex frame in mind.

Human Being

The person is a human being, endowed with consciousness and intention and expressing behavior, thought, and feeling as he or she moves across different situations and over time. In studying human beings in general, personality psychologists aim to shed light on

human nature and to determine what the most socially consequential individual differences between human beings are. In addition, they aim ideally to understand the individual human being – the case study of the particular person – who is like all other human beings and yet unique. Human beings begin life as social *actors*, but they eventually become motivated *agents* and self-*authors* as well. Even in infancy, basic temperament traits structure human action. By childhood, persons have developed goals and motives that they strive to achieve, expressing themselves as motivated, agentic forces in the world. In late adolescence and young adulthood, a third layer of personality begins to emerge, as individual human beings come to see their lives as to-be-authored narratives. The full expression of psychological individuality for the adult human being is an evolving patterning of social action traits, agentic motives, and self-authored narratives, complexly situated in time and culture.

Life and Death

As scientists, personality psychologists typically reject the concept of an immortal soul. Life and death are biological realities. People become who they are through a complex process of gene-by-environment transactions. Individual human beings are challenged to make sense of their lives while living. People may be more or less successful in making meaning out of their lives. A large factor in that meaning-making process relates to how people understand and anticipate their own deaths.

Reality

Personality psychologists have tended not to offer deep, philosophical musings on reality. Unproblematically, reality is simply “what is.” Yet, most contemporary personality researchers and theorists are aware of the fact that reality is psychosocially constructed in various ways – through perceptual biases (innate and learned), cognitive schemata, values and interests, motives and goals, expectancies, personal projects, life-narrative frames, and a wide range of internal psychological phenomena, as well as external

social categories, that influence what people see as reality and how they understand it.

Knowledge

Personality psychologists have generally not articulated complex epistemologies. Unproblematically, knowledge is “what people know.” Of course, knowledge comes in many forms, from semantic to episodic to procedural, from impersonal to social, from explicit to implicit. But these cognitive/epistemological distinctions are generally viewed to be the province of cognitive psychology rather than personality studies per se. Different personality theories hold somewhat different images of the kinds of knowers that people, in general, are. For example, Kelly’s (1955) theory of personality viewed the person as akin to a lay *scientist* who gathers knowledge in order to predict and control the world (Kelly 1955). McAdams’s (2006) life-narrative perspective on personality, by contrast, views the person as akin to a fledgling *novelist* who synthesizes autobiographical knowledge – both episodic and semantic – into a self-defining story (McAdams 2006). With respect to the field’s overall epistemology for itself, personality psychology values scientific knowledge above any other kind of knowledge.

Truth

Personality psychologists tend to believe that science reveals truths. Truth is adjudicated through the scientific process. Scientific truth trumps other kinds of “truth.” At the same time, personality psychologists realize that the people they study operate according to many different kinds of truths, many of which are not particularly scientific.

Perception

Personality psychologists do not have any profound insights to offer on the topic of perception, except to suggest, as do many other behavioral scientists, that people perceive the world through a wide range of idiosyncratic filters, including various sorts of biases, expectations, stereotypes, and the like. There is probably no such thing as unbiased and completely objective perception.

Nonetheless, personality psychologists aim to decrease bias in their own observations and to develop consensually valid and reliable methods for observing/perceiving the behavior of persons.

Time

Time is a very important issue in personality psychology. For starters, personality itself – that is, the pattern of psychological individuality that distinguishes one person from the next – is assumed to have some nontrivial duration in time. If personality does not continue to exist in the same form from one moment to the next, then “it” is not “personality.” Thus, personality psychologists distinguish between momentary *states* in human life and more enduring *traits* of personality. The question of just how enduring traits – and other features of psychological individuality – are is a question that lies at the heart of personality science. A wealth of empirical data collected over the past three decades shows conclusively that dispositional traits (such as extraversion, neuroticism, agreeableness, and conscientiousness) can be remarkably stable over the life course – especially from young adulthood onwards – and yet also change in developmentally meaningful ways. The issue of time is important for personality constructs in other ways, too. For example, motives and goals in personality are time-dependent constructs in that they capture what a person is striving to accomplish in the future. People’s self-narratives reflect how individuals make sense of their own lives in time. Self-narratives integrate the reconstructed past and imagined future to tell a more or less coherent and causally convincing story about who I was, who I am now, and who I will be in the future.

Consciousness

Most approaches to personality psychology view human beings as inherently endowed with consciousness and intention. Yet the role of consciousness is more prominent in some approaches as opposed to others. Whereas Freud and the psychoanalysts tended to value unconscious forces over conscious experience, the humanistic personality theorists like Rogers and Maslow

argued that a person's conscious phenomenology lies at the center of psychological individuality. On the current scene, approaches that focus on cognition and motivation tend to value consciousness more than do trait-based and purely behavioral approaches to personality. But even the latter depend on people's powers of conscious reflection. For example, studies of personality traits typically rely on self-report questionnaires. People respond to a series of questions about themselves that ask them to reflect upon their lives and/or to rate their characteristic thoughts, feelings, and behaviors. The researchers assume that their participants are endowed with the powers of consciousness necessary for providing scientifically useful self-reports. The huge empirical literature attesting to the construct validity of self-report trait scales suggests that the researchers are correct in that assumption. At the same time, most personality researchers recognize that some determinants of human behavior are implicit, lying outside of conscious awareness. Obtaining reliable and valid assessments of outside-of-consciousness factors has always presented a tough challenge for the field.

Rationality/Reason

Personality psychologists differ with respect to the extent they view human beings as rational organisms. Freud focused almost exclusively on human irrationality, whereas Allport viewed persons as potentially planful, well-organized, and reasonable. On the contemporary scene, there is no consensus on this issue. For the most part, personality psychologists seem to work under a "both/and" assumption: People are capable of rational analysis but do not always engage in such; indeed, rational thought is probably not the most adaptive response to some, if not many, social situations, both today and, most likely, over the course of human evolution.

Mystery

Personality itself – that pattern of psychological individuality that distinguishes one person from others – is a great mystery, and that mystery probably motivates personality psychologists to

study what they study. The scientific aim, of course, is to cut through the mystery, so that we can eventually replace all the unknowns with knowns. But we are a long way from accomplishing this feat, so it is safe to say that personality will remain an intriguing mystery – in the minds of both scientists and laypersons – for the foreseeable future.

Relevant Themes

More than many other subdisciplines of psychology, personality psychology has perennially struggled to reconcile the grand theories that defined the discipline in the middle years of the twentieth century with the hard realities and constraints of empirical research. The conflict is reflected in the different ways that the course is taught in universities and colleges. One approach is to focus exclusively on the grand theories of yesteryear – from Freud onwards. This kind of course has the advantage of lending itself to the big questions about human life that many undergraduate students are so interested in asking. The disadvantage is that the old grand theories have a very tenuous relationship to the current science. The other approach is to focus on the current science, surveying important studies on personality structure, function, and dynamics, with some minimal coverage of the grand theories. The latter approach has the advantage of reflecting the contemporary scientific scene, but it sometimes leaves students (and instructors) longing for more of the big picture.

Cross-References

- ▶ [Altruism](#)
- ▶ [Developmental Psychology](#)
- ▶ [Evolutionary Psychology](#)
- ▶ [Narrative Psychology](#)
- ▶ [Positive Psychology](#)
- ▶ [Psychoanalysis/Depth Psychology](#)
- ▶ [Self](#)
- ▶ [Social Psychology](#)

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Personhood and Scientific Methodology

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Related Terms

[Method](#); [Person](#); [Personhood](#); [Science](#)

Description

Personhood concerns the problems about what makes a human being a person. The notion involves a cluster of interconnected philosophical questions and everyday concerns, descriptive as well as normative, that are pertinent to research on the relation between science and religion. How do we ascertain that an organism is in fact a person and not simply a lump of living tissue? What are the criteria that convince us that something is a person? Once it is ascertained that an organism is a person, should that affect how we treat that organism? Why is being a person different from being a snail or even a stone? Is the fetus a person from the time of the conception, and if not, when does it become a person? What makes one person different from another? Can we actually say that a human being remains the same person through time? And does a person continue to exist after the physical organism is dead? This entry will not investigate any of these questions in detail but will focus on some of the more general philosophical questions about the descriptive and normative dimensions of personhood in relation to scientific methodology. The discussion of personhood has a long and complex history in both Western philosophy and Christian theology. In fact, the philosophical conception of a person is closely connected to early Christian debate about the Trinitarian God (three separate persons that are all the same God)

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and the survival of intact personhood after physical death. Furthermore, Eastern philosophies have discussed the concept of a person to the same extent and possess a perhaps an equally rich literature on the subject. This entry, however, will limit itself to discussions developed in twentieth-century Western philosophy (Kant is used, nevertheless, because his concept of a person still plays an important role). Furthermore, the focus will be on issues that are relevant to the contemporary discussion about the legitimate scope and possible limits of scientific methodology when it comes to questions about human nature. By way of conclusion, it will be argued that the relation between personhood and scientific methodology is relevant to contemporary research on science and religion. But turning to the question of personhood, we need a definition, or at least a general idea, of what is meant by scientific methodology. This is not an obvious or simple matter.

Scientific Methodology

The nature of scientific methodology has been a long-standing philosophical problem since the beginning of the twentieth century. The rapid, and sometimes dramatic, development of empirical sciences such as psychology, anthropology, ethnology, and paleontology together with the birth of new disciplines such as molecular biology, quantum mechanics, evolutionary biology, cognitive neuroscience, and cognitive science in the first 60 years of the century elicited many questions about the formal unity of the different scientific methods, forms of research, and explanatory arguments. These questions are still intensely debated today. One reason why the nature of scientific methodology is particularly critical for philosophy and theology today is that, since the mid-1990s, disciplines such as evolutionary psychology and cognitive neuroscience have argued for a new and, allegedly, more scientifically sound explanation of human nature (Pinker 2002). Whereas less scientific times used logical analyses and reflective introspection to understand human mind and action, this new approach makes use of empirically verified

observation and brain imaging to explore the enigmatic human nature. According to advocates of such an approach, a combination of graduate evolutionary development and complex neural networks can explain human consciousness and behavior. This view is variously characterized as ► *physicalism*, ► *reductionism*, or *eliminative materialism* and involves several problematic philosophical questions. The two most critical, or at least most debated, questions today are whether or not it is legitimate to speak about one ultimately valid scientific methodology and whether or not such a scientific methodology is sufficient for explaining human nature. This section deals with some of the problems involved in the first question. The section aims at offering, if not a picture of a unified scientific methodology, at least a general idea of what is commonly considered to qualify as scientific methods as opposed to nonscientific methods. This done, the rest of the entry will present some problems concerning the explanation of human personhood that arise when approached by means of such a scientific methodology.

The critics of scientific methodology typically address the imperialistic tendency in the use of scientific methods more than the validity of the methods themselves. Few philosophers, or theologians for that matter, would question the value of scientific methods in every academic discipline, from organic chemistry to biblical exegesis, or the benefits of such methods for the production of legitimate research results. The question under debate is rather the nature, scope, and limits of scientific methodology. One way to approach the question is to examine two forms of scientific methodology: (1) a minimalist version and (2) a restricted version.

A Minimalist Version: Objectivity and Rationality

A minimalist version of scientific methodology can be characterized as a set of specific methods that separates academic research from other kinds of explanations of what constitutes the world we live in: how we understand the world (and possibly other worlds), the creatures that populate the world, and how and why we humans think, feel,

and behave as we do. Contrary to everyday reasoning about the world and the human mind (often characterized as ► *folk physics* and ► *folk psychology*), academic research sets some standards and rules that must be accepted and followed in order for arguments and explanations to qualify as scientific. In this sense, a very broad definition of scientific methods is that they are objective and generate objective knowledge by means of rational (internally consistent) arguments. In other words, scientific arguments and explanations are characterized by absence of subjective biases and values. A scientific study, no matter if the subject is the sermons of Jesus or the auditory cortex, must approach the material at hand, develop the arguments, and produce its results, independent of the researcher's individuality. Personal convictions, religious beliefs, and metaphysical assumptions are considered irrelevant and even impairing to a scientific study. Thus, first-person accounts and explanations can be an integral part of a scientific methodology if, and only if, they can be checked and verified from a rational, third-person point of view. Obviously, science is performed by individual human beings, but their different character traits can have no bearing on the research. The various methods employed by different academic disciplines must all subscribe to the minimal criteria of objectivity and rationality, notwithstanding their heterogeneous material and individual research procedures. From around the middle of the twentieth century, the notions of objectivity and rationality have at times been criticized as unattainable ideals with no basis in the actual process of science. One of the most important contributions to this kind of criticism was made by the American physicist Thomas Kuhn (1922–1996) in 1962 (Kuhn 1962). Kuhn argued that the historical process and growth of scientific knowledge is not a continuous and objective uncovering of truth by means of rational arguments. The most decisive scientific insights are attained, not by the development of a continuous scientific evolution, but by means of scientific revolutions produced by individual scientists. Scientists are never completely isolated from their subjective biases and social environment,

and Kuhn argued that it is actually these subjective features and social factors that contribute most to the growth of scientific knowledge. But although Kuhn pointed out the idealistic nature of objectivity and rationality, he still maintained the benefit of these ideals for the progress of science. Besides the criteria of objectivity and rationality, ► *falsifiability* has also been regarded as a minimal criterion for scientific methodology in order to demarcate science from nonscience. This criterion was first proposed by the Austrian-born philosopher Karl Popper (1902–1994) in 1934 and gained enormous influence with the English publication in 1959 (Popper 1959). Put in simple terms, Popper argues that a scientific hypothesis, proposition, or theory is only scientific if it is falsifiable. Many theories can be made compatible with empirical observations without being scientific theories, but only those hypotheses and theories for which empirical counterexamples are possible are to be considered scientific. If the methods employed by a theory do not allow for the results to sustain the test of falsification, they cannot be considered scientific methods. However, whereas the criteria of objectivity and rationality are part of the methodology employed by every academic discipline, the criterion of falsifiability is not so readily accepted. There are several conceptual difficulties with the application of the criterion, but perhaps the most persistent one is the difficulty of falsifying hypotheses: there are so many factors involved in scientific experiments that it becomes close to impossible to falsify a theory on the basis of one inconsistent empirical observation. A scientist can defend his theory against observed empirical facts by appealing to another fact, namely, that one or more of the factors involved in the experiment may have changed during the experiment (Dupré 2001). Thus, a minimalist version of scientific methodology must limit itself to the criteria of objectivity and rationality since only these are accepted as general standards in all academic disciplines. This broad view, however, is only valid for those who consider all academic disciplines to be doing scientific research. There are a growing number of

philosophers and empirical scientists who argue for a more restricted version of scientific methodology.

A Restricted Version: Facts and the Risk of Scientism

Not everybody is happy with the minimalist version of scientific methodology. Through the 1990s, long and vehement intellectual battles, the so-called *science wars*, were fought in academic circles as well as in the larger public (Ashman and Baringer 2001). On one side were those who believed firmly in the objectivity of science, and on the other, those (often coming from the humanities and the social sciences) who rejected this objectivity and considered it a dangerous ideology. The science wars, however, subsided at the close of the century, and since the early years of the twenty-first century, empirical scientific disciplines such as neuroscience and evolutionary psychology have dominated both the academic and public debates. The unified critique of the objectivity of science has dissipated into sporadic skepticism, and appreciation of a general naturalistic framework for understanding human nature is growing steadily, even inside the humanities and the social sciences. Anthropology, literary theory, psychology, economics, and other disciplines look to the biological roots and evolutionary explanations of the world and human nature for scientific validation of their theories. In this rapid development, an old philosophical issue has resurfaced, namely, naturalism versus supernaturalism. Supernatural or immaterial elements cannot be allowed to figure in scientific explanations. Thus, immaterial phenomena or entities (soul, God, values, concepts, ideas, thoughts, feelings, etc.) must be either reduced to natural (materialistic/physical) constituents or eliminated altogether. In order to find a valid explanation of human mind and behavior, we need to establish a naturalistic framework by means of solid scientific methods. But objectivity and rationality are not sufficient criteria for such an enterprise, since many disciplines that deal theoretically with immaterial phenomena and entities, such as theology, philosophy, cultural anthropology, and

psychoanalysis, claim scientific status on exactly such terms. Hence, scientific methodology needs a more positive demarcation against supernatural explanations if the naturalistic framework is to be secured. There are various ways to do so, but a general trait among the different theories is to model scientific methodology on the methodology of the empirical sciences, in particular physics and biology. On this account, a methodology can only be scientific if its arguments, explanations, and results find support in observational data. Contrary to other forms of explanations, a scientific explanation discloses the natural facts of the world, and only empirically verified phenomena and entities are considered factual (Gillett and Loewer 2001). Disciplines that do not meet the demand for empirical verification cannot qualify as scientific, or at least they must be considered less scientific than the sciences that fulfill the empirical criterion.

Obviously, this restrictive view has been met with suspicion and criticism, in particular among philosophers. Some critics have, somewhat disdainfully, named this firm trust in the empirical sciences *scientism*: an attempt to distinguish normatively between a restrictive class of first-order real sciences (physics, chemistry, and biology) from a murky and broad class of second-order “sciences” (disciplines that do not conform to the methods of the first-order sciences). Scientism creates a hierarchical model of academic disciplines with normative implications. The empirical sciences are considered the superior scientific disciplines with ultimate authority over the interpretation of nature and human life. If other less empirical disciplines are to have any credibility, they need to accommodate their methods to those of the empirical sciences and construct their theories, arguments, and explanations on the data provided by the empirical sciences. Scientism does, indeed, face various explanatory problems including the eliminative, or at least reductive, attitude regarding mental states and subjective experience. How can we explain anything as impalpable and hazy as thoughts and subjective experience within the limits of a naturalistic framework? Are such phenomena to be considered supernatural and thus remnants of less

enlightened times? The problems concerning naturalism and supernaturalism become sharpened when faced with such difficulties. The blunt rejection of anything supernatural entails explanatory problems concerning the phenomenal content of human consciousness and the blurry nature of human values. A completely naturalized explanatory framework must either reject the existence of such phenomena or reduce them to something that can be accounted for by means of a restricted scientific methodology. One way to illuminate the problematic status of both subjective experience and human values within a naturalistic framework is to look at the complex nature of human personhood.

Personhood

Few advocates for a restrictive scientific methodology are willing to dismiss the notion of personhood. Nonetheless, the notion involves phenomena that are considered suspicious and recalcitrant on the basis of a purely empirical explanation of human nature. Human beings are creatures of nature and constituted by the same physical and chemical constituents as all other living organisms. And yet, human beings are quite peculiar beasts (Preuss 2004). They behave very differently from even their most intimate relatives on the phylogenetic scale. Their behavior is characterized by highly developed language capacities and elaborated social interaction. Furthermore, human rationality and feelings differ drastically from those of other primates in the sense that human needs are controlled by more than the present biological and environmental factors that explain most behavioral patterns of similar primate species (monkeys and apes). The behavioral difference between humans and other animals is often explained by the fact that a human being is a person as well as a biological organism. A person is constituted by thoughts, ideas, rationality, free will, delicate feelings, values besides biological needs, and a persistent identity. The concept of a person has been widely discussed in twentieth-century philosophy and continues to engage philosophers in the

twenty-first century (Laitinen and Ikaheimo 2007). The debate is saturated with difficult issues, such as how persons differ from other living organisms, how a person persists from one time to another, what is it to be a person, what constitutes personhood, whether a person can become a nonperson, what are the normative implications of being a person, and so on. There are many various descriptive criteria to be addressed in accounting for personhood. We may turn to language, rationality, feelings, free will, physical characteristics, personal identity, value-guided behavior, and many others. Moreover, it is even difficult to determine which of these (whether one, several, or all) actually account for being a person as opposed to being a nonperson. If we choose language, what are we to do with inarticulate babies or language-impaired adults? If free will, where do we place a paralyzed individual? And if we trust physical characteristics, which feature determines whether a body or a face is human or not? How, where, or by which means we are to set the boundaries for personhood seems impossible to determine on purely descriptive terms. Problems concerning the criteria for ascribing personhood or not are rife with normative implications to such an extent that most philosophers have tried to steer clear of them by limiting themselves to descriptive questions about the nature and persistence of personal identity. The normative issues are, however, important in relation to the question about scientific methodology. Thus, in the following, both the descriptive and normative dimensions of personhood will be briefly presented. The first section exposes two descriptive approaches to personal identity, whereas the following section addresses some problems involved in the normative dimension of personhood.

The Descriptive Dimension of Personhood: Personal Identity

One of the most complex questions about human personhood arises from the fact that, contrary to that of other living organisms, human identity is not unambiguously stable from birth to death. We may doubt the identity of another human being

and, at times, even our own. This doubt stems from the fact that we normally consider human beings as persons and not just as aggregates of material tissue. But is this assumption actually legitimate from a strict scientific (physical) perspective? Leaving this difficult question aside for the moment, we can start by focusing on the question of personal identity over time. What are the criteria for a person to remain identical from one time to another? How can I be sure that I am identical to the person that I was yesterday, or when I was a fetus, and will I remain identical to what I am now if I somehow end up in a vegetative state? Since the dawn of the twentieth century, the philosophical debate about the persistence of personal identity has centered around two dominant approaches: the psychological and the biological (Olson 2007). As the names suggest, each approach picks out one of the two traditional features of being human, namely, body and mind. The psychological approach claims that identity must be verified with reference to a person's consciousness, whereas the biological approach believes the physical constitution of the person to be the definitive criterion for identity. The two approaches can be characterized very roughly as follows. The psychological approach maintains that there must be some form of continuity or connectedness between the psychological states (memory, experience, ideas, dreams, desires, feelings, and so on) of a person from one time to the other in order to establish the identity of that person. Memory is crucial to this argumentation. Somehow, there must remain in the present state some kind of a remembrance or trace of memory of the past, if the person now is to be considered identical with the person in the past. These memories may not be explicitly conscious but may simply possess a causal dependence expressed in thoughts and bodily movement (I may not remember how I learnt to ride a bicycle, but I know how to now). This approach, however, runs into serious difficulties with respect to questions about the fetus, mental illnesses, or persons reduced to a persistent vegetative state. Are these human beings no longer (or yet) identical with the persons that they used to be (are to become)? It is

difficult to accept such a criterion for personal identity since it seems physically (by means of DNA) and emotionally (from the perspective of parents and loved ones) obvious that a person should remain identical no matter what happens to that person. Thus, some philosophers have rejected the psychological criterion and proposed a biological approach instead, arguing for simple physical continuity as the criterion for personal identity. For more than a century now, the biological sciences have informed us that human beings are physical organisms just like every other living creature in nature. There are no categorical difference between man and other animals, only a difference in degree. Thus, the biological approach claims that only physical continuity can be an acceptable scientific criterion of personal identity. Besides the obvious problems mentioned above, the psychological approach relies on the anthropocentric prejudice that human identity is somehow different from that of other animals: only humans are endowed with an accessible psychological life, and thus only humans can possess a personal identity. It is hereby implied that only a conscious being can be a person, and so the descriptive analysis reveals a normative prerequisite. On the contrary, the biological approach claims to remain scientifically neutral with regard to what constitutes personhood or not. It focuses only on what we can empirically access and verify, namely, our physical continuity. In this sense, it avoids the problems that troubled the psychological approach. No matter what psychological or physical transformation an organism sustains, it remains identical to itself. In this way, the fetus is identical to the adult person, a person suffering from dissociative identity disorder remains identical with every change of personality, and the person reduced to a persistent vegetative state is identical to the person he or she used to be. Although this approach avoids some of the problems involved in the former, it still leaves the question open about what makes human identity so drastically different from that of other animals. Therefore, perhaps the most important gain from the biological approach is the assumption that a descriptive explanation of personal

identity cannot answer the question about what constitutes a human person. The question of personhood appears to involve some kind of normative, or at least metaphysical, account.

The Normative Dimension of Personhood: Values and Responsibility

It seems that an empirical methodology cannot provide criteria for determining what separates a person from a nonperson. On a purely physical basis, there is no substantial difference between the identity of humans and that of other animals. However, on this account, the concept of a person seems to lose its meaning. The fact is that we distinguish, in thought and action, between humans and other animals by means of personhood, and in order to account for this difference, we need to understand what we mean by being a person. There are at least two fundamental questions concerning the notion of personhood: what is a person (as opposed to a nonperson) and is there any difference between human beings and persons? The German philosopher Immanuel Kant (1724–1804) has given a very concise answer to both these questions. He famously wrote that we shall always treat humanity in ourselves and in every other person as an end in itself and never as merely a means to an end. In other words, we are told that every human being is considered a person and that a person is characterized as a being with a purpose in itself that can never just be a means to another purpose. Thus, the influential Kantian account identifies human beings with persons and, furthermore, provides a definition of personhood as autonomy. But Kant saw his account of personhood as a normative postulate and not as an empirical necessity. And we do not need Kant to tell us this. History and everyday life teaches us that human beings are not always treated as persons if personhood is characterized by autonomy. Furthermore, autonomy is a difficult concept. What constitutes the autonomy that makes all human beings persons? It cannot simply be our intelligence, communication, or free will, since humans may lack those characteristics in a vegetative state or under similar conditions. In fact, human autonomy cannot be explained by

a description of any part or the sum of the physical and mental constituents of a human being. On the contrary, human autonomy appears to be intrinsically connected to human action and behavior. Contrary to other animals, humans are able to choose *how* to act instead of simply reacting to certain stimuli. Thus, on the Kantian approach, personhood is characterized by how we act and, more particularly, how we treat other human beings. Every human being is a person, but the individual person has the responsibility to express this personhood in action and behavior. A person can choose to act contrary to his or her own personhood by treating himself or other persons as nonpersons. Human personhood is linked to values that regulate the behavior of human beings. Other animals are not persons because they cannot behave as persons. Their conduct is not influenced by values such as those inherent in human personhood. How persons treat nonpersons (animals, nature, or objects) is another, and very serious, matter. Nevertheless, this is not immediately relevant to the definition of personhood. The Kantian solution to the problem of personhood is not final or uncontested. Many critics have noted that his explanation of personhood relies on the unwarranted metaphysical assumption that human beings possess an autonomy or freedom that separates them from the rest of nature. Furthermore, the rationalistic emphasis in the Kantian picture of human personhood has been contested. Nevertheless, although one may disagree with Kant's metaphysical assumptions, arguments, and explanations, his emphasis on the normative character of personhood together with his rejection of a descriptive approach remains an important contribution to contemporary philosophical discussions of what it takes to be a person. It is difficult to see how a definition of the concept of a person can avoid any normative stance. We can meticulously describe every feature and characteristic of personhood, but in order to determine what is not a person, we necessarily argue in accordance with some normative and ethical standards (Korsgaard 2009). In this sense, explanations of personhood surpass the borders of empirical assessment and verification.

Personhood in Relation to Science and Religion

Both the descriptive and the normative dimensions of human personhood have noteworthy implications for the debate about the nature, scope, and limit of scientific methodology. On the one hand, the descriptive approach may yield considerable insight into the problems concerning personal identity but leaves the question about the nature of personhood entirely open. On the other hand, the normative approach to personhood relies on phenomena such as values and personal responsibility, which transcend the legitimate boundaries of empirical confirmation. It is important, however, to notice that these implications do not disqualify scientific methodology in the approach to human personhood. They merely call for a more refined differentiation of the general picture of scientific methods and of science in general. Explanations of human personhood benefit from a scientific approach in the sense that it makes us deal with personhood in objective and rational terms in order to avoid subjective, cultural, or religious influences. It is part of a scientific process to overcome influences that may stem from such prejudices. In this sense, the study of personhood is not different from a study of a bacterium or the chemical composition of a fluid. However, the complex nature of personhood defies the restrictive view of scientific methodology proposed by scientism. We cannot explain human personhood by means of empirical assessment and verification only. The concept of a person involves a normative dimension that surpasses the naturalistic framework proposed by this restrictive version of scientific methodology. In this way, the concept reveals not only the need for scientific approach but also the variegated nature of scientific research. Scientific methods cannot hinge on the physical foundation of the empirical sciences if they are to explain the complex nature of human reality. Besides personhood, there are many aspects of human life and behavior that need a scientific explanation without being reducible to the restrictive methods of scientism. The continuous growth of scientific insight depends on an appreciation of

heterogeneous scientific methods that are able to explain the world and human nature by means of the minimalist version of scientific methodology, i.e., objectivity and rationality.

The discussion about personhood and scientific methodology is relevant to contemporary debate about science and religion since this debate is often marred, on both sides, by a restrictive, or at least insufficiently articulated, understanding of science and scientific methodology. The question about personhood challenges a simplistic picture of science by bringing out the need for a diversiform approach to scientific methodology. From the perspective of a religious approach, it is important not to confuse science with scientism. Scientific methodology is not equivalent with reductionist methods or the exclusion of anything that cannot be accounted for empirically, as in the restrictive version presented above. Not all empirical scientists dismiss the need for a broader understanding of scientific methodology. And there is much to learn from the methodology and research of the empirical sciences with respect to religious phenomena and notions like personhood and value. On the other hand, scientific results and discoveries are not to be accepted uncritically and at face value. As the problems concerning personhood illustrate, the nature of a methodological approach must be examined before any judgment, approving or critical, is passed on the final result. From the perspective of a scientific approach (empirical sciences as well as various scientific studies of religion), it is important to be aware which kind of scientific methodology is adopted for a specific study. As we have seen, there are various models of scientific methodology with different degrees of verification. In one approach, for example, research on a certain bacterium, a restrictive methodology is preferable in order to produce pregnant and reproducible results. In others, concerning more impalpable matters such as personhood or religious experience, the scientific methods, in order to be adequate, must be chosen according to a less restrictive methodology. Otherwise, the study runs the risk of ending up with distorted answers that have nothing to do with the initial questions.

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Personification

- [Anthropomorphism](#)

Pfingstbewegung

- [Pentecostalism](#)

Phenomenology

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Related Terms

[Experiential philosophy](#); [Philosophy of experience](#)

Description

Phenomenology was founded by the German philosopher Edmund Husserl (1859–1938).

In his early work, most notably in his *Logical Investigations* (1900–1901), Husserl urged philosophers to attend to experience itself, rather than engage in rationalism, Kantian or Hegelian methodologies, or to begin with abstract philosophical theories. Today, a philosopher may be said to engage in phenomenology to the extent that he or she proceeds to base their positions on how something appears in experience. So, someone might base their view of intentional, free agency on the grounds of what it feels like to undertake action deliberately. Phenomenology today is often thought of as involving the first-person point of view, rather than engaging in a third-person perspective, as one might in science or, in the philosophy of mind, with behaviorism. Well-known phenomenologists besides Husserl include Martin Heidegger, Nicolai Hartmann, Max Scheler, and Edith Stein.

The most recent development involving phenomenology concerns accounts of mental life and the possible limitations on scientific accounts of the mental. In the 1970s, Thomas Nagel and T.L.S. Sprigge simultaneously and independently argued that a third-person description of another person or animal would have to leave out something crucial: what it is like to be that person or animal. This “what it is like” refers (on their view) to what it is like experientially or in terms of conscious awareness. Arguably, you may have a nearly exhaustive account of a bat’s behavior and anatomy, yet still not know what it is like for the bat to be aware of itself and surroundings. This line of reasoning has been used to object to forms of materialism that advance a strict identity between the mental and the physical (Husserl 1964).

Self-Identification

Science

Husserl did think of phenomenology as a kind of science; it was a method that generated a body of knowledge, and he aspired to establish phenomenology as an international undertaking. Subsequent phenomenologists did not have the same confidence as Husserl, and while

many phenomenologists such as Dietrich von Hildebrand saw themselves as establishing objective insights into values, they saw themselves principally as philosophers, rather than scientists.

Religion

Phenomenology does not self-identify as a religion. The religious perspectives of prominent phenomenologists have varied widely, from devout, traditional Roman Catholicism (von Hildebrand, Edith Stein) to atheism (Heidegger). The phenomenological study of religion has been significant in the twentieth and first decade of the twenty-first century. A student of Edmund Husserl, Stein brought her phenomenological methodology to bear on the interiority of religious belief. Some of this is brought out in Alasdair MacIntyre's 2006 book *Edith Stein: A Philosophical Prologue* (Stein 1989). Another domain in which phenomenology has had a role in twentieth-century religious thought is through the work of Karol Wojtyla (later Pope John Paul II). Some of Scheler's work may be seen in shaping Wojtyla's work *Love and Responsibility*.

Characteristics

Phenomenology was founded as a subdiscipline in philosophy, but it might better simply be thought of as a methodology and/or a movement. Phenomenology is not unlike empiricism, with its attention to experience, but it is broader than empiricism. Historically, empiricism has tended to be quite reluctant to recognize objective values and necessary truths about virtue and the structure of reality, while phenomenologists have sometimes claimed just that. Scheler and von Hildebrand stand out as having produced a substantial account of objective values.

Relevance to Science and Religion

Many of those in the phenomenological tradition have been interested in science and religion. As noted earlier, phenomenologists have tended to be resistant to scientifically inspired forms of

reductionism (accounting for consciousness in terms of nonconscious forces and structures) and, as a rule, they have tended to be open to the kinds of phenomena that are in play in religious belief and practice. So while the atheist Sartre's work on shame and anxiety has been seen as helpful for philosophy of religion, a significant number of theologians (such as Karl Rahner) have been influenced by Heidegger.

Sources of Authority

The success of a phenomenological investigation depends upon whether the description and explanation of the experiences investigated (whether this be an experience of pain or guilt or a sense of the presence of a transcendent, sacred reality) match the experiences of others. What, if anything relevant, has been left out? An objection to Heidegger's famous work in phenomenology, *Being and Time*, is that it gave very little role, if any, to the ethical. Heidegger's work contains much about living authentically, but there is little attention given to human rights, justice, or the foundation of ethics.

Ethical Principles

There are no distinctive ethical principles that are unique to phenomenology as a practice or discipline, though phenomenologists themselves such as Scheler and von Hildebrand have identified a host of what they consider basic, irreducible moral principles (Scheler 1973; von Hildebrand 1952).

Key Values

Phenomenology offer an account of human and other animal life that is an alternative to those that ignore or downplays the role of conscious experience. By putting experience on center stage, phenomenology preserves what seems distinctive about human and some nonhuman animal life.

Conceptualization

Nature/World

Heidegger and Sartre both made use of the concept of the “world.” They both sought to capture what it is like for human beings to be temporal, contingent, and mortal agents who find themselves (as it were) thrown into the world. Both thinkers were quite explicit in their embracing of a nonpurposive understanding of the cosmos. There is no provident purpose behind the emergence of human life.

Human Beings

Most self-identified phenomenologists see human beings as conscious, deliberate, intentional, and purposive beings, regardless of whether they see the cosmos itself in theistic or atheistic terms (Merleau-Ponty 1981).

Life and Death

While some phenomenologists have believed in some afterlife (von Hildebrand and Gabriel Marcel), many of the better known phenomenologists such as Heidegger and Sartre did not, and for them, the finality of human life is a great defining dimension of what it is to be human.

Reality

Some phenomenologists are realists and claim to be mapping out objective states of affairs. Some suspend judgment as to the objective world and see themselves as simply offering a description and account of experience.

Knowledge

See above

Truth

See above. But also note that phenomenologists have tended not to think of truth along Platonic, propositional lines. Heidegger introduced a somewhat epistemic notion of truth in terms of a clearing (in Greek “*alethia*”).

Perception

Perhaps the most substantial contribution by a phenomenologist to the nature of perception is

Maurice Merleau-Ponty. He stresses the embodied nature of perception, producing a more anchored understanding of perception than one finds in, say, Hume.

Time

For many phenomenologists, time and subjectivity are foundational dimensions of human life.

Consciousness

Phenomenologists have tended to resist reductive accounts of consciousness. Some have been highly critical of appeals to the unconscious, and some have wrestled with the concepts of a false consciousness or self-deception. In a case of self-deception, it seems that the subject has to both lie to herself and yet still know the truth.

Rationality/Reason

Rationality and reason are best seen as operating on experience as opposed to abstraction.

Mystery

Some phenomenologists hold that consciousness is not accountable in nonconscious terms. Consciousness is not thereby a great mystery in the sense that it cannot be known, but it may still be a mystery in the sense that it is basic and not understandable in alternative categories. In 1940s, Gabriel Marcel published a book with two parts, *The Mystery of Being*. Part one is called *Reflection and Mystery*, and the second is entitled *Faith and Reality*.

Relevant Themes

Free will: Some of those in the phenomenological movement (who are sometimes also considered existentialists) such as Jean Paul Sartre were keen defenders of free agency.

Emotion: Some phenomenologists have carried out sustained investigations into religiously relevant emotions, such as guilt, love, and anxiety.

Religious experience: Some phenomenologists have done a close study of religious experience.

Cross-References

- [Cognitive Psychology](#)
- [Consciousness, the Problem of](#)
- [Epistemology](#)
- [Experience](#)
- [Metaphysics](#)
- [Personalism](#)

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Phenomenology of Religion

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One of the major approaches in religious studies originates in the broader phenomenological movement in philosophy (E. Husserl). Phenomenology of religion is represented by P. D. Chantepie de la Saussaye, C. P. Tiele, R. Pettazzoni, R. Otto, G. van der Leeuw, M. Eliade, or N. Smart. Phenomenology of religion is today broadly criticized for its non-empirical and anti-historical nature, its empathy-based approach to religion, sui generis conceptualizing of religion, and vague usage of the term “sacred.”

Philology

- [Language and Literature, French](#)
- [Language and Literature, Spanish](#)

Philosophical Anthropology

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Related Terms

[PA](#); [Philosophical discourse on humans](#)

Description

From classical times some treaties are consecrated to Philosophical Anthropology (=PA), or “philosophical discourse on humans,” as, for example, Plato’s *Alcibiade*, and Aristotle’s *On the Soul*. At the dawn of twentieth century, Wilhelm Dilthey distinguished between nature sciences and human sciences (*Einleitung in die Geisteswissenschaften*, 1883). Among the authors who followed this inspiration in the first half of that century it is worthy to recall Max Scheler (*Wesen und Formen der Sympathie*, 1923) and Martin Heidegger (from *Sein und Zeit*, 1927, to *Über der Humanismus*, 1946) in Germany, Jean-Paul Sartre (*L’être et le néant*, 1943) and Maurice Merleau-Ponty (*Phénoménologie de la perception*, 1945) in France, Miguel De Unamuno (*Del sentimiento trágico de la vida*, 1912–1913) and José Ortega y Gasset (*El tema de nuestro tiempo*, 1923) in Spain; the English speaking world seemingly ignored this tendency.

The second half of twentieth century has known deep changes of paradigm in philosophy, under the fourfold influence of the human sciences, phenomenology, analytic philosophy, and, more recently, the neurosciences. The first three trends presuppose the idea that human

beings are deeply entrenched with the world and the others. The human sciences as economy (Stephen Gudeman, *The Anthropology of Economy. Community, Market, and Culture*, 2001), sociology (Pierre Bourdieu, *Raisons pratiques. Sur la théorie de l'action*, 1994), ethnology (Claude Lévi-Strauss, *Mythologiques*, 1964–1968), and psychology and psychoanalysis (Erik Erikson, *Identity and the Life Cycle*, 1959) imposed their views helping to better describe human beings in their complexity. Phenomenology concentrates its efforts on the structure of consciousness engaged in the world and with others (Jean-Luc Marion, *Le phénomène érotique*, 2003). The analytic philosophy and linguistics, paying attention to common language (Peter F. Strawson, *Individuals*, 1959), clarifies the concepts of society, individual, and person. Neurosciences, with the support of medicine and biology (Antonio Damasio, *Descartes' Error*, 1998), link PA to the natural sciences. Recent developments in bioethics outline several relevant problems of PA.

Self-identification

Science

For the classical Greek world, philosophy becomes the “first science” determining the most universal principles. This pretension remains central to Descartes (*Discours de la méthode*, 1637) and Husserl (*Philosophie als strenge Wissenschaft*, 1911). Today, such a program is no longer accepted, as every science has its own method and recognized domain. PA however represents the attempt of dealing with the essence – unique and complex – of humans, even if that complexity does not allow to pretend to deliver an universal complete and definitive account.

The distinction between “explaining” and “understanding” (Paul Ricoeur, *Du texte à l'action*, 1986) consecrates the division between both realms: the methodology of human sciences is not that of natural sciences; nevertheless all sciences, included the natural sciences, are

inscribed on a human quest for meaning, and so they depend ultimately on the reflection of the human on himself.

Religion

All religions are concerned about human beings; and consequently PA is concerned about religion. Since every religion deals with “transcendence,” it becomes relatively easy that humans fall prey of self-delusion. PA elaborates criteria inviting religion to respect human beings and their ability to access others. It produces at the same time a critique of modern sciences, which, in their self-reference, conceive their “objects” in function of their own interests. PA presupposes that a distance or a “différance” (Jacques Derrida, *L'écriture et la différence*, 1967) – comprised the religious one – can be sensed in this case.

PA receives from religion a nuance: it is the science of human beings, taking them in their integrity and totality, able to access “otherness.” PA is not happy with describing exclusively intentional essences or forms (Gerardus Van der Leeuw, *Phänomenologie der Religion*, 1933; Mircea Eliade, *Le sacré et le profane*, 1965); it becomes a hermeneutic (Jean Greisch, *L'âge herméneutique de la raison*, 1985), attentive to the distance or difference structuring internally human beings and their expression in language. PA cannot ignore the *via negativa*, giving credit to its expression, since the procedures of *via negationis* or analogy (Pseudo Dionys), are imposed to reason to allow thinking “radically different.”

Characteristics

PA distinguishes itself from natural and human sciences (economy, psychology, history...) in the same way as does general philosophy. Philosophy shares however the critical spirit of sciences. Every science defines its domain and method, and watches about its own limits; so does philosophy as well. The domain of PA is the human being considered in its totality, and that

means more than just history (human science), or biology (nature science). PA ambition is to take into account all aspects of human being, taking as a criterion its existential unity.

Relevance to Science and Religion

Philosophy has been thought traditionally, since the classical Greeks, as a mediation between sciences and religion. It states that scientific epistemology responds to a requirement of meaning, and not only to a closure of knowledge in definitive proofs. "Meaning" is marked by the wish to know ever more, the desire to know reality which cannot be exhausted by any particular science. Religion is indeed determined by this radical alterity of reality. PA contributes to sciences with a concern of totality, allowing them to avoid closing human being in the particularity of their points of view and helping to enlarge their judgements.

Sources of Authority

The sources of PA come from its statute of mediation. The authority of scientific sources is that which every science confers to its own sources. It is the same for religious sources where, however, authority becomes rather more extrinsic. Particular sciences acquire authority only after they engage on a research that, mediating, overcomes the limits. Likewise PA assumes information received from its own sources of religious life, criticizing them after its own criteria of rationality, and transforming itself under the influence of its conclusions.

Ethical Principles

The first principle of PA comes from its attention to all human being that, at the same time, is individual, person, in society, responsible to herself and to others, a living being in which freedom is in the growing.

Key Values

PA is guided by the conviction of unity of human being, which is not only an object of research but rather the subject creating PA. PA is consequently taught with the aim of helping listeners to unify inwardly current traditions present in their societies.

Conceptualization

Nature/World

It would be possible to define these terms as follows: "Nature" is the universal pole dialectic of human being, unique and irreducible in itself; the necessity in which that being happens to be himself (e.g., the nature of that person is to be human). These concepts design therefore an immanent alterity to singular human beings. Those, as long as they find themselves subjected to these alterations of them in that nature, constitute their "world" (the world of artists, that of politicians. . .).

Human Being

Human being is defined classically as a "rational animal." Reason is our faculty able to represent together many things, of synthesizing them; it is adequate to the universal. However, in the universal, the differences do not disappear. Reason, uniting everything, could reduce the many in a univocal genre. The reasonability is the quality of reason that binds everything without confusing anything, able to receive possibilities of relationships without imposing them arbitrarily. Reasonability completes and balances in this point rationality. First condition for such a function is freedom and responsibility which everybody takes form his/her own activity. In the reasonability, human being becomes personalized with other persons, rendering it – in Aristotle's words – "political animal."

Life and Death

Life and death of persons are at the heart of PA, since ever regarding death (Plato), and more recently regarding life (Hannah Arendt,

The Human Condition, 1958). These issues are understood by PA in terms of finitude of persons (Martin Heidegger, *Sein und Zeit*, 1927), which is thought mainly in function of life, so long there is no death without a prior life – death is therefore thought in relationship to a certain problematic permanence of personal life (as appears in funerals). Life happens in multiplying itself and letting the living in a vital flux not reduced to any particular living. PA assumes the considerations of human sciences about life and death of persons and human sets (races, cultures, religions, etc.); it is not satisfied with the positions of current natural sciences determining with criteria of sheer material need the origins of individual human life; it does not pretend nevertheless be able to substitute biological research – the biological origins of life will not find an adequate explanation in PA, which cannot answer to all the questions about human beings, but just to clarify their human meaning.

Reality

Reality is that what resists. The idea of reality implies therefore those of difference and relationship. The finitude of a person and, at the same time, her consciousness of being in relationship engenders the idea of reality that is both of every singular individual and of all together.

Knowledge

For PA knowledge is not objective, as long as it implies the engagement of a knower; it is reflexive. Linguistic studies, especially those on the performative dimension (John Austin, *How to do things with words*, ²1955) are essential in this case. The anthropic principle points in the same direction. Scientific knowledge that depends from its own history and the interests of scientists is not objective in an absolute way; it requires steady the engagement of a prudent subjectivity.

Truth

The definition of truth as *adaequatio rei et intellectus* can be assumed so long as the *res* (reality) under consideration here, for PA regards

the human being and the individual and social process. Truth in PA is for that reason teleological and not factual. It proposes an ethic for a practice at the measure of human nature.

Perception

Sensation is submitted to bio-physic determinism. The perception however seizes the perceived putting it into a form. Perception cannot be excised therefore but at the condition that what is sensed is predisposed. It is assumed a relationship “chiasmatic” (Merleau-Ponty) between what is sensed and the perceiver, and the original unity of their mutual relations. That “chiasm” (cf. Husserl, *Idées II*, § 37: when my two hands touch each other, one is touching and the second one is touched, and inversely at the same time) has a meaning at the level of intersubjective empathy.

Time

Cosmic time has a dimension abstractly necessary where the time preceding my life and that following my death. Its chronology fixes the facts under symbolic figures. It means the history culturally memorized and the historians determining its rhythms in function of their options (paying attention to wars, to State heads, popular revolutions, etc.). Human time results rather from the free engagements of everybody and has meaning only through what is lived, entrenching in multiple forms. It becomes expressed resorting to the means of narrative.

Consciousness

Consciousness is bound to the engagement of a person in the human time. It is borne from the presence of a self to a self and expresses the awareness of being at the origin of its activities. To “loss consciousness” means to become absent and irresponsible of its own deeds. Consciousness is freedom that access to the knowledge of its power of action in the world.

Rationality/Reason

Reason is a cognitive faculty that argues after affirmations logically furnished, with series of propositions articulated following logical

criteria. The intellect is rather intuitive and seizes the first principles, metalogical. Reason is enlightened by the principles seized by the intellect and cannot overflow them. The intellect, and not the reason, knows the freedom and its engagement in the exteriority or alterity. This distinction, often nullified by the reduction of intellect to scientific reason, is nevertheless a classic one. The ancient Greek distinction between *dianoia* and *nous*, the Latin distinction between *ratio* and *intellectus*, and the Kantian between *Verstand* and *Vernunft*. The domain of *nous*, of *intellect* or *Vernunft* is the transcendental, and above all, the one of freedom.

Mystery

Mystery is known by intellect, it is not irrational, but more than rational. Gabriel Marcel distinguishes between a “problem” that is submitted to the reason to find a solution; and a “mystery,” which involves rather who is perceiving it, in a way that cannot be objectified to be described and solved (e.g., the question of being involves the human being who poses it, because this one belongs to being [Heidegger]). In this sense the human being, its freedom, and its thought are “mysteries.”

Relevant Themes

Individual

The word “individual” means “what cannot be divided.” Freedom is individual because entire and indivisible, responsible of itself in everyone of its actions.

Person

The definition offered by John Damascene (*Dialectica*) is normative: “person is that who, expressing through his operations and properties, gives a manifestation that distinguishes him from others of the same species.” The expression, which creates links between freedoms, unites at the same time that distinguishes; it is essential to a person, in whom the concept means indeed the rational essence of the human being.

Society

The word society comes from the Latin *socius*, the associate, the companion. Society conjoins free individuals without confusing them in a formal community.

Community

The word “community” means “with one,” i.e., a set of human beings. The expression “human genre” referring to the human community, can remain just generic, a logical genre whose first species would be “female” and “male.” The distinction between genre and species is between the most generic and the individual. The generic “community” is abstract: individuals do not appear as such individuals, but rather as “particular” aspects (a part) of a whole. “Society,” composed by individuals considered “members” or “companions,” is however concrete. This view consciously reverses the terminology of the traditionally one from the philosopher of history Arnold Toynbee, since seems more etymologically appropriated.

Gender

The current issue of “gender,” that is not a “genre” in its abstract ongoing meaning, belongs to the reflection on society rather than about the community. It insists on the presence of all in the distinct beings; “female” and “male” are not part of a whole, but the realized whole; therefore, the sexual differentiation does not determine the belonging to a gender.

Beneath the classical works quoted in the article, see:

Cross-References

- [Anthropomorphism](#)
- [Body](#)
- [Emotion](#)
- [Existentialism](#)
- [Freedom](#)
- [Passion and Emotion, Theories of](#)
- [Theological Anthropology](#)
- [Theory of Mind](#)

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Philosophical Discourse on Humans

► [Philosophical Anthropology](#)

Philosophical Ethics

► [Ethics](#)

Philosophical Naturalism

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The view that nature is all that there is, excluding all supernatural entities, including God and gods, ghosts, spirits, souls, and so on. The epistemology and ontology of philosophical naturalism is usually closely tied to that of the physical

sciences: the avenues of knowing that are available are typified by those found in the sciences and the kind of beings that we should believe to exist are those found in the sciences. Although philosophical naturalists admit that the content of science changes over time and new discoveries are yet to be made, they are confident that the ontology and theories of contemporary science are relevantly close to what any final theory would conclude.

Philosophical Theology

► [Natural Theology](#)

Philosophy and Way of Life

► [Judaism: An Overview](#)

Philosophy in Buddhism

► [Abhidhamma, Southern](#)

Philosophy in Islam

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Related Terms

[Arabic philosophy](#); *Falsafa/hikma*; [Philosophy in Islamic intellectual history](#)

Description

The expression “Islamic philosophy” refers to premodern philosophical rationalist traditions in

classical Islamic civilization that have been influenced by Ancient Greek legacies in philosophy in general and by Pythagorean, Platonist, and Aristotelian doctrines in particular. The beginnings of Islamic philosophy can be traced back to the foundational epoch in the first decades of the ninth century (Gutas 1998). The conceptual prolongations of its classical textual sources and teachings are still influential in traditionalist schools of thought in Iran, in addition to being revived in adapted popularized forms by various intellectual movements within the Arab world, and in countries such as Turkey, Malaysia, and Indonesia. The scholarship in modern mainstream academia that focuses on studying Islamic philosophy is mainly undertaken in the context of curricula on medieval philosophy and scholasticism in departments of philosophy or in terms of studying the commentaries on Greek philosophers within classics departments. In more widely practiced classifications of knowledge within contemporary mainstream universities, Islamic philosophy is primarily studied in Middle Eastern, Arabic, or Oriental studies departments and in connection with the broader field of Islamic studies in particular. However, the modern academic curricula on Islamic philosophy have tended hitherto to adopt an approach that is rooted in archival textual documentations rather than examining this corpus in purer philosophical terms. The most recent developments in Islamic philosophy can be broadly connected with modern Islamic thought and its focus on issues associated with politics, social reform, ethics, and to questions related to the role of Islam as a lived faith and culture in modern societies. However, the classical key preoccupation of Islamic philosophers with metaphysics, cosmology, ontology, epistemology, logic, in view of understanding the ultimate principles of reality and of the human condition, all are no longer central to modern Islamic thought. The subdisciplines within Islamic philosophy are determined in terms of their doctrinal leanings and orientations, and these are usually classified as being Aristotelian, Peripatetic, Platonist, Neoplatonist, Neopythagorean, Illuminationist, and at times even connected with what is conventionally

referred to as apologetics in Islamic theology (the *Kalam* legacy), or with mysticism and its underpinning of Sufism (Sharif 1961).

Self-identification

Science

Islamic philosophy can be identified as a classical form of scientific thinking that was anchored in the material culture of classical Islamic civilization, and that rested on logical methods of proof and on rudimentary forms of empirical testing, while aiming at devising rationalized explications of its principal problems, paradoxes, and theories. Islamic philosophers were generally engaged in protoscientific research within the premodern exact sciences and medicine. Most philosophers in classical Islamic civilization (from the beginnings of the ninth century till the middle of the seventeenth century) were also polymaths who composed various compendia and treatises in the exact sciences and on a variety of topics in mathematics, astronomy, logic, and medicine. Many among them were also celebrated physicians. The more recent developments in Islamic thought started to depart from the anchoring of philosophical thinking in the exact sciences and medicine, while showing greater interest in mysticism, scriptural exegesis, and in debating the questions of ethics and politics in comparisons with the revealed text and the prophetic tradition. Islamic thought in its modern expressions is no longer rooted in science, as this was originally the case with premodern Islamic philosophy.

Religion

Islamic philosophy can be identified as a traditional form of religious thinking that was grounded in the material culture of classical Islamic civilization and that rested also on scientific forms of reasoning in terms of logical proof, rudimentary empirical testing, and rational explication. However, Islamic philosophers did not self-identify themselves as being religious scholars or theologians, since they distinguished themselves from the dialectical theologians of

Kalam and from their methods of argumentation that were axiomatically rooted in religious scripture. Nevertheless, Islamic philosophers were generally engaged in central questions that preoccupied the theologians and religious jurists and grammarians, albeit, they treated them in the context of demonstrations in metaphysics and cosmology, instead of theology per se. These were articulated in terms of reflections on the ultimate principles of reality and of the human condition, in connection with nature, and in meditations on divine creation. They treated questions pertaining to debates over the nature of the divine essence and attributes and the relation of the doctrine of the eternity of the universe with the belief in creationism. They also strived to reconcile the adapted theories of the Greek philosophical sources with the monotheistic religious tradition and particularly with the articles of faith in Islam. Not all philosophers in classical Islamic civilization were Muslims, some were Syriac and Sabaeen (non-Muslim natives of Syria and Mesopotamia), Christian, and Jewish. However, they all developed their modes of reasoning and thinking in response to an intercultural multiethnic and multireligious *milieu* that was principally marked by the directives of the Islamic faith and its praxis. The identification of Islamic philosophy as a religion can be soundly established in broad cultural terms, in the sense of referring to this discipline and its subdisciplinary branches as a rational intellectual tradition in philosophizing that was anchored within an Islamic *milieu*. Islamic philosophy maintained a balance between the cultural conventions of its monotheistic religious context from one side and its Ancient Greek philosophical sources on the other side. This resulted in counterbalancing the mystical and theological orientations within its modes of thinking with an accentuation of the merits of science and the logical methods of proof and reasoning. Furthermore, and as noted earlier, the more recent developments in Islamic thought started to depart from the anchoring of philosophical thinking in the sciences, while showing greater interest in mysticism, scriptural exegesis, and the controversies over questions of

ethics and politics. Islamic thought in its modern expressions is no longer rooted in science, as this was originally the case with premodern Islamic philosophy.

Characteristics

Islamic philosophy can be distinguished from Islamic theology and the classical traditions of science in Islam. Specialized classical scientists and mathematicians, namely, those who only focused on research in arithmetic, algebra, geometry, astronomy, mechanics, and optics, tended at times to cast some doubt about the epistemic value or the soundness and validity of the propositions of the philosophers (Rashed 2011). Mathematicians in the Apollonian and Archimedean tradition, who were also inspired by the Euclidean and Ptolemaic legacies, tended to have skeptical positions with regard to the philosophical doctrines of the Pythagorean, Platonist, and Aristotelian philosophers, in addition to being dismissive of most of the views of the theologians of dialectical *Kalam*. The classical scientists and mathematicians in Islamic civilization were not necessarily philosophers but rather specialized polymaths with expertise in various branches of the exact sciences. The philosophers anchored their thought in the sciences but were not necessarily scientists. Likewise, philosophers treated shared questions with the theologians but were not necessarily themselves religious scholars or jurists. Moreover, religious thinking and theology may have borrowed or mimetically mirrored the methods of the philosophers in logical reasoning and argumentation, but their forms of thinking were dialectical and tended to have apologetic undercurrents.

Relevance to Science and Religion

Islamic philosophy occupied a remarkable historical and epistemic position in intellectual history in Islam in terms of being situated in-between science and religion, and in seeking also to devise ways by which their commensurability can

be demonstrated in view of accentuating the harmonization of their relationships, connections, and distinctions. Islamic philosophers aimed at reconciling Ancient Greek science and logic with religious thinking and praxis in Islam. They endeavored to prove that the sources of antique wisdom confirmed the revealed religious truth and that science assisted in uncovering the ultimate principles of reality and of the human condition in a manner that is complementary and commensurable with religious revelation and the exegesis and hermeneutics of scripture. Islamic philosophers brought also a mystical tendency or orientation in explicating the bearings of the sciences and their contribution to the affirmation of the articles of faith through rational reasoning and logical forms of inference and also by way of empirical and mathematically grounded methods of demonstration. Islamic philosophy offered an ideal framework for bringing science and religion to bear unto one another without reducing them into each other. Philosophy in Islamic intellectual history mediated the relationships and tensions between science and religion while raising ontological interrogations and epistemological questions concerning their theoretical underpinnings and conceptual structures. Philosophizing in connection with religion and science in Islamic civilization assumed a metaphysical stance regarding the positive character of the axiomatic parameters of science and religion in the sense of self-identifying itself as the unrestricted mode of thinking, which is reflective and critical in essence.

Sources of Authority

The sources of authority in Islamic philosophy are judged according to the quality of their philosophical knowledge and the exercising of sound and valid reasoning. This is undertaken through rational deliberation, logical argumentation, critical assessment, and empirical demonstration. The focus of such workings of the intellect is directed toward the elucidation of questions concerning truth, goodness, justice, and beauty, while also focusing on the

central problems of ontology and epistemology (respectively in addressing the question of being *qua* existence and in reflecting on the manner we acquire knowledge about worldly and natural phenomena). Authority is also established in exegetical and interpretive skills in terms of commentaries on the principal philosophers, in the Greek and Arabic sources alike. Excellence in explicating the thoughts of antique masters like Plato, Pythagoras, Aristotle, Plotinus, Proclus, and Philoponus was also central to establishing an authoritative voice and eminent scholarly reputation. The same applies to mastering the teachings of these celebrated philosophers and of the principal thinkers in Islamic intellectual history.

The following paragraphs offer synoptic accounts about some of the main authorities in Islamic philosophy, which are presented chronologically hereinafter, from the beginning of the ninth century till the middle of the seventeenth century (Refer in this section to: Corbin 1993; Fakhry 1983; Gutas 1998; Sharif 1961).

We start with the figure of Abu Yusuf Ya'qub ibn Ishaq al-Kindi (ca. 800–870 CE) who is customarily referred to as the “Philosopher of the Arabs.” He was one of the pioneering Islamic philosophers, with Aristotelian and Neoplatonist leanings, who also directed research and translation teams in Baghdad under ‘Abbasid patronage (Rashed 2011).

Abu Bakr al-Razi (ca. 841–926 CE) was al-Kindi’s contemporary, who in his own right was also a remarkable Persian physician, philosopher, alchemist, musician, and mathematician, known in Europe by the Latinized rendition of his name as “Rhazes.”

Abu Nasr al-Farabi (ca. 870–950 CE) was another major luminary, probably of Turkish descent, who became known among his contemporaries and successors as the “second master” to come after Aristotle. He was an influential Platonist metaphysician and political philosopher, as well as a polymath. He composed many works including an encyclopedic treatise entitled *The Enumeration of the Sciences (Ihsa’ al-‘ulum)* and a tract that is akin to Plato’s *Republic* and titled *The Virtuous City (al-Madina al-fadila)* (Mahdi 1992).

The Ikhwan al-Safa', or the Brethren of Purity (flourished in the second half of the tenth century in Mesopotamia and Syria), were the anonymous members of a coterie of learned urbanites. Their fame emerged in response to their widely disseminated and influential encyclopedic compendium the *Epistles (Rasa'il)*, which dealt in 52 tracts with all the main sciences of their age in arithmetic, geometry, music, astronomy, geography, logic, natural philosophy, mineralogy, botany, zoology, in addition to psychology, theology, metaphysics, and magic. They cultivated an ecumenical syncretic approach to religion, which appealed equally to the religious teachings of Islam, Christianity, and Judaism, in association also with the antique wisdoms of the Greeks, and of ancient Egyptian, Babylonian, and Persian esoteric sages (El-Bizri 2008).

One of the foremost intellectual minds in the Islamic history of ideas was Abu 'Ali al-Husayn ibn Sina (ca. 980–1037 CE), commonly known as Ibn Sina, and in Latin renderings as Avicenna. He was a remarkable and highly influential Persian physician, philosopher, polymath, and poet. His thought impacted subsequent philosophers in Islamic civilization till the twenty-first century, and his influence in Europe continued up till the early-modern period in philosophy and medicine. He was inspired by the Aristotelian and Neoplatonist traditions, and introduced novel prolongations to their concepts, and to the evolution of philosophizing in the classical Greek-Arabic-Hebrew-Latin heritage. His most notable works are the encyclopedic compendia in philosophy, the *Kitab al-Shifa' (Book of Healing)* and the *Kitab al-Najat (Book of Deliverance)*, besides his monumental compendium of medicine *Kitab al-Qanun fi al-tibb (The Canon of Medicine)* (Goodman 1992; Nasr 1993; Wisnovsky 2003).

Ibn Sina's contemporary and a scholar of great eminence who engaged in disputations with him via remarkable epistles was Abu al-Rayhan al-Biruni (ca. 973–1048), known also in Latin as Alberonius. He was a highly accomplished Persian natural philosopher, mathematician, astronomer, geographer, and anthropologist,

who also cultivated a special expertise in Indian/Indic affairs (Nasr 1993).

Another giant in this constellation of minds, and a contemporary of Ibn Sina and al-Biruni, was the Arab polymath al-Hasan ibn al-Haytham (ca. 965–1041 CE), known in Latin renderings of his name as Alhazen. He was a remarkable Mesopotamian Iraqi optician, astronomer, and mathematician, who impacted the unfolding of the science of optics up till the time of Johannes Kepler in the seventeenth century, and whose mathematical treatment of natural philosophy in the context of experimental controlled testing laid down the earliest foundations of the proto-history of early-modern scientific methods in research (Rashed 2011).

In the philosophically oriented pantheon of theological thinkers, the most prominent is the Imam Abu Hamid al-Ghazali (ca. 1055–1111 CE) who was a highly influential Persian philosopher, theologian, mystic, and jurist. He is known for his formidable critique of the Aristotelian and Platonist philosophers like al-Farabi and Ibn Sina, as he argued his case in his monumental treatise *Tahafut al-falasifa (The Incoherence of the Philosophers)*.

The Andalusian polymath and natural philosopher, Ibn Bajjah, known in Latinized renderings as Avempace (ca. 1095–1138 CE), had an influence on later philosophers in the Aristotelian legacy, such as Ibn Rushd (Averroës) in the Islamic tradition and Albertus Magnus in European scholasticism. He was famous also as a botanist, and he composed *The Book of Plants (Kitab al-Nabat)*.

Abu al-Walid ibn Rushd (ca. 1126–1198 CE), more commonly known as Ibn Rushd, and in Latin scholasticism as Averroës, was a leading Andalusian jurist and Aristotelian philosopher who impacted the thought of figures like Thomas Aquinas and Moses Maimonides. He was a defender of philosophy against its theological critics, and he composed a specific treatise in response to al-Ghazali's attack on the philosophers, which carried the title *The Incoherence of the Incoherence (Tahafut al-tahafut)*.

The mystical legacy in Islamic philosophy finds perhaps its first most powerful voice in the

teachings of Shihab al-Din Suhrawardi (ca. 1155–1191 CE) who was a mystical Persian philosopher of the Platonist tradition and the founder of the Illuminationist school (*al-ishraq*) in sapiential thought.

In the theological traditions that emulated the methods of the philosophers, we can perhaps identify the figure of Fakhr al-Din al-Razi (ca. 1149–1209 CE) who was a Persian Sunni theologian and a critical commentator on Aristotelian natural philosophy and the philosophical tradition of Ibn Sina.

The mystical legacy in Islam finds its most influential expression in the Sufi tradition of Muhyi al-Din ibn ‘Arabi (ca. 1165–1240 CE), more commonly known as Ibn ‘Arabi, who was an Andalusian mystic and metaphysician and who settled in Syria and became a leading figure of Sufism. His penchant in mysticism and the impact of his spiritual teachings eventually earned him the name *al-Shaykh al-akbar* in Arabic (chief sheikh) and *Doctor Maximus* in Europe. His influence continues to be felt till our century in mystical orders and in Sufi practices within Muslim societies as well as in Europe, Australia, and the American continent.

Nasir al-Din al-Tusi (ca. 1201–1274 CE) was a highly accomplished Persian natural philosopher, astronomer, and mathematician, who was also known for his major astronomical databases and charts, including his revision of the geocentric Ptolemaic model in anticipation of the Copernican heliocentric system. His philosophical works were anchored in the tradition of Ibn Sina and in the Aristotelian doctrines.

Ibn Khaldun (ca. 1332–1406 CE), the Arab Tunisian pioneering historiographer, sociologist, became famed for his *Prolegomenon* (*al-Muqaddima*) in history of civilization. His record of the history of the Arabs and Berbers was rediscovered in European eighteenth-century scholarship and became highly celebrated by nineteenth-century Orientalists as a protohistory of sociology, economics, and historiography. He displayed also the acumen of the natural philosopher in his analysis of history, society, and economics.

One of the last influential thinkers in classical Islamic philosophy was Mulla Sadra (ca. 1572–1640 CE), also known as Sadr al-Din al-Shirazi. He was an influential Persian natural philosopher whose thoughts continue to impact the ontological and theological doctrines of contemporary traditionalist thinkers in Iran, including some of the authoritative clerics in the mainstream Shiite tradition.

Ethical Principles

In the cosmological sense, there is a general emphasis on anthropocentrism and on an analogical analysis of the human being in connection with nature, the cosmos, and the ultimate principles of reality. This is mainly articulated in terms of the microcosm and macrocosm classical analogy. Ethics was marked by a protohistory of humanism in Islam. The ethical main maxim accorded with the Socratic injunction: “Know thyself!” which was furthermore given a religious overtone in terms of being in itself conceptualized as a mode of “knowing nature” and ultimately of potentially “knowing God.” The main guiding principle in leading a virtuous life and in the pursuit of happiness was set according to rational criteria by way developing one’s own intellectual faculties, powers of discernment, and sound judgment. It is through the agency of reason and the intellect that ethical principles are upheld and practiced. Such philosophical wisdom was seen as being commensurable with the sagacity that is embedded in the directives of religious scripture and the pathways that were laid down in rationalized interpretations of the Qur’an and of the teachings of the Prophet Muhammad.

Key Values

The key values in Islamic philosophy rest on the centrality of reason and the intellect in the acquisition of knowledge and in leading through rational deliberation and intellectual discernment what amounts to an ethical life, which is in

harmony with the articles of faith and in resonance with the principles governing nature.

Conceptualization

Nature/World

Nature and the world are in general conceived from the standpoint of being governed by their internal laws that are explicable via causal principles. The conception of nature is in general influenced by the Aristotelian doctrines. The main principle that underpins nature is that of motion (*kinesis* in Ancient Greek, *haraka* in Arabic). This denotes change in terms of growth and diminution in size, it also describes the movement from potentiality to actuality in existence, it moreover refers to displacement as a transition or transfer from a given place into another, and it furthermore underlies generation (such as birth) or corruption (like decay, bodily demise, and death). This conception of natural phenomena, as being animated by motion, also presupposes that nature is a plenum; hence that it does not admit the existence of an actual vacuum, but rather that phenomena of nature are interconnected through uninterrupted chains of causes and effects. This philosophical outlook on nature contrasted with the views of the dialectical theologians in Islam, who in general upheld an atomist doctrine that affirmed the existence of the void in nature, and that all natural bodies were constituted from the smallest indivisible entities that cannot be partitioned, namely, the atoms. These atomic indivisible entities adhered together and were segregated apart due to factors that were not intrinsic to their own properties. Being together or apart was accidental to the formations of constellations of atoms rather than being substantial or necessary. In ontological terms, the philosophers argued that the world and nature were conceivable as being coeternal with God, and that they were not created *ex nihilo*, but came to be through a process of hierarchical descending emanation that is modulated by way of a causal nexus. This view refracted the Aristotelian worldview with the Neoplatonist cosmology in explicating divine

creation through an affirmation of the existence of internal laws that governed nature.

Human Being

The human being is generally conceived as a *rational animal* in a manner that is akin to the Aristotelian doctrine, while also situating humanity between the animal and angelic nature in a broader religious sense. The human being is considered as a biological living creature that obeys the same principles governing life in general. This conceptualization of humanity is mediated via the microcosm and macrocosm analogy. The human mind, body, and soul are taken to be analogical in essence to natural phenomena that make up the universe and spheres of life and that, likewise, the world is a macro-human that is fashioned in a manner that structurally resembles the constitution of humanity. This carries with it antique echoes from the Neoplatonist, Neopythagorean, and Vitruvian legacies. The principal characteristic of humanity is that of being endowed with intellect and reason. This is also reinforced by a dualist metaphysical distinction between mind and body that resulted in an affirmation of the immortality of the human soul. As a biological entity, the human being is furthermore considered as a living creature equipped with a brain, which is the seat of the faculties of intellect, imagination, memory, discernment, speech, thought, and inventiveness and that enables the development of conceptual categories pertaining to reflections on being, truth, goodness, justice, and beauty.

Life and Death

Life is determined by an animating spirit or soul that passes through living physical bodies of plants, animals, and human beings. In religious terms, and from an ontological standpoint, living is ultimately one of the divine attributes. The ground of all life is rooted in existence and in granting life to the animating agency. Life follows the patterns of physical phenomena in being governed by motion. This takes form in terms of change that is animated by generation as birth, nutrition that results in growth, and corruption as demise and death. Having a soul is

essentially a human property, but it can be shared with animals, at least this being affirmed in some of the philosophical viewpoints. Life is itself accompanied by bodily perishing, while the soul is generally conceived as being immortal. Death is customarily associated with bodily dying and not with a demise of the soul. However, some philosophers questioned the doctrine of the immortality of the soul and necessitated embodiment in the afterlife. This rested on a belief in bodily resurrection that brought the soul into life on the Day of Judgment. Ultimately, the differences in philosophical opinion arose around the assertion of the mind/body dualism versus accounts that stressed the inherent unitary quality of embodiment. Life and death belong to the sphere of biological study and medicine in the broad sense, while also encompassing botany and zoology, but in their ultimate principles, they involve reflections on nature in physics, and meditations on existence in metaphysics, with prolongations in conceptual terms that touch upon theology in connection with thinking about the divine essence and attributes.

Reality

Reality is considered at the physical level in connection with natural phenomena in the world around us as embodied humans, which we can observe with our senses. In its ultimate principles, reality is ontologically determined beyond what presents itself to us in the realm of appearances. It is the broader domain of being that is not restricted to the natural world but goes beyond it into the realm of archetypal forms and intelligible universals and ultimately into what is sustained by God.

Knowledge

Knowledge about natural phenomena and the experiential realms of perception are acquired via the intellect with the aid of imagination, memory, and the faculty of discernment, comparative measure, and judgment. This is undertaken through didactic and pedagogic forms of training and education that sharpen rational deliberation by way also of logic, science, and mathematical demonstration. This form of rationalized

knowledge that is verifiable is however distinct from the sapiential modes of grasping reality as underpinned by mystical attestations, epiphanies, and the psychical *cum* spiritual exercises of the sages among the Gnostic philosophers who adhered to esoteric teachings.

Truth

Truth is grasped as the ultimate reality underpinning existence and its principles. Truth is conceived from the standpoint of rationalized philosophical knowledge as the universal order of the totality of facts about natural phenomena and the modes of using language and the articulation of thought about them. The supreme truth and its absoluteness are furthermore conceptualized as belonging to the divine essence that is revealed in discursive reasoning through the study of nature and the cosmos, while being manifested in mystical forms of meditation and contemplation as an epiphany of divinities. Truth is ultimately taken to be absolute and universal, and that human understanding and spirituality were able to grasp its attributes, even if partially.

Perception

Perception is conceptualized as the manifold conscious sensation of the variegated external influences and effects from the outer physical ambient environment that affect the senses of vision, hearing, touch, taste, and smell. Perception is usually conceived as being underpinned by neurological brain activity that modulates the psychological responses and interpretation of outer stimuli by way of the intellective workings of the faculties of the soul, its discernment capacities, its imagination, and memory. Perception is also vital in acquiring rationalized knowledge and in granting access to factual truths about nature.

Time

There are multiple theories of time, and the most dominant are those that were inspired by Aristotle's *Physics* and natural philosophy. The conception of time is mainly that of a passing "now-moment," which determines what went before and what is coming after in the processes

of ongoing change in nature and in the fields of perceptual experience within the ambient surrounding environments and in our own bodies. The chronological character of time is measurable by the intellect, and some devices were also invented to calculate the periods of its lapses in mechanical and objectified methods of reckoning. This aspect of time is worldly in the sense of being rooted in the ephemeral and temporal attributes of natural phenomena and of living beings that are brought into existence by way of generation, and that also suffer demise and death by way of corruption. However, time is also eternal when thought of in connection with divinity and the entirety of the sphere of being and reality. Time is ontologically determined. It is temporal in relation to beings *qua* existents and eternal in connection with existence *qua* being. Eternity is an attribute of the divine essence and of the pre-eternal and post-eternal character of the world as being coeternal with God as creator. This is conventionally explicated through a conception of creation by way of emanation that is inspired by Neoplatonist doctrines.

Space

There are multiple theories of space, and the most dominant were derived from Aristotle's *Physics* and the Aristotelian conception and definition of *topos* (place) as a "surrounding surface of containment." Space was ultimately reducible to the order of the Aristotelian *topos* or place. The conception of spatiality as an extension that is volumetric and three-dimensional, which became akin to what in later epochs has been known as a "Euclidean space," is attributable to the geometrization of place by the polymath, mathematician, astronomer, and optician Ibn al-Haytham (Alhazen). His geometrical conception of place was commensurable with a conceptualization of the metric extension of space as a postulated/imagined mathematical void. The vast majority of philosophers would have retained a conception of nature as a plenum that does not admit the existence of an actualized vacuum. However, the prevalent theory continued to be rooted in the Aristotelian account of place, with some tendencies among

the mystically oriented philosophers, such as Shihab al-Din Suhrawardi, to advocate some accounts that are suggestive of spatiality in connection with the Platonist conception in the *Timaeus* of the receptacle "*Khora*" (*Chora*), which in relatively modern times is usually translated from the Ancient Greek into the English language as "space."

Consciousness

Consciousness is a relatively modern concept, and the closest notion that is akin to it in the Islamic philosophical traditions pertains to knowing one's own self and acquiring knowledge about other minds and beings. It is a mode of awareness that arises as an alert response to stimuli in the world and in imagined realms or recollected memories by way of reminiscence. Consciousness is closely linked to the notions of knowledge and perception.

Rationality/Reason

Rationality is the most fundamental notion for the pursuit of truth and the acquisition of knowledge about God, self, and nature. Reasoning is the proper mode of grounding perception and consciousness and in leading a virtuous life on the path of goodness. Reason and rationality are conventionally understood as manifestations of the workings of the intellect (*al-'aql*) that is aided also by memory, imagination, and the senses.

Mystery

Mystery is usually evoked in sapiential reflections and mystical meditations in relation to what remains veiled and concealed of the principles of reality and the ultimate truth that is sustained by divinity. It is conventionally a phenomenon that is central to Sufi and Gnostic traditions within Islamic philosophical circles and is rather connected with the Neoplatonist and Neopythagorean schools instead of being central to Peripatetic tendencies in natural philosophy. Mystery points ultimately to that which is as yet unknown or that may always remain unknowable. There is perhaps a deeply seated hope that what is mysterious may potentially become explicable

after the evolution of knowledge, be it rationalistic or based on spiritual exercises.

Relevant Themes

God

The question concerning the divine essence and attributes preoccupied many philosophers in Islam in the context of their response to the dialectical theologians of the *Kalam* traditions. The most representative thesis of the philosophers is perhaps embodied in Avicenna's (Ibn Sina) take on this question. His approach to the divine essence is mediated via his ontology, whereby in the context of reflecting on divinity, he grasped the divine essence as pure existence (being) that is necessary due to its-self and is not caused by anything else other than itself. This is the most fundamental attribute of divinity. However, denying other attributes is problematic from a theological standpoint. For instance, to overcome this difficulty, Avicenna affirms the divine omniscience but in terms of knowing immutable universals and not as being a knowledge of changeable particulars. Ultimately, God's thoughts are the principles of reality and laws of nature.

Emanation and Creation

The classical philosophers in Islam advocated a conception of creation by way of emanation. This notion was anchored in the worldview that the nature of God as creator necessitated that something is effused from his being and is granted existence, namely, that by the nature of divinity, it emanates something out of itself and imparts existence unto it. The derivative secondary existents flow from the more primary ones in a descending hierarchy of causal links. Emanation is distinct from the doctrine of creation *ex nihilo*, since it removes the positing of a will in the first cause, rather beings emanate according to the nature of the One as the primal and immutable first principle, instead of emerging from nothingness by way of divine volition. This process was inspired by the Ancient Greek Neoplatonist doctrines of Plotinus

and Proclus. Existence is granted from the One like an irradiation of light. The world that is given being is also conceptualized in this framework of hierarchical causal links as being coeternal with God. The philosophers generally rejected the view that the world was created *ex nihilo* as proclaimed by the theologians. This resulted metaphysically in combining contingency with necessity by way of affirming that the world was *contingent due to its-self* and was at the same time *necessary due to something else that was other than itself*.

Cross-References

- ▶ [Astronomy in Islam](#)
- ▶ [Humanism in Islam](#)
- ▶ [Logic in Islam](#)
- ▶ [Mathematics in Islam General](#)
- ▶ [Medicine in Islam](#)
- ▶ [Mysticism in Islam](#)
- ▶ [Optics in Islam](#)
- ▶ [Physics, Science in Islam](#)
- ▶ [Theology in Islam](#)

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Philosophy in Islamic Intellectual History

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Philosophy in Judaism

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Related Terms

[Jewish philosophy](#); [Jewish theology](#); [Jewish thought](#)

Description

The relationship between Judaism and philosophy has historically been complex, dynamic, and, at various times, oppositional. Whereas Christianity, in its nascent formation, came almost immediately to think of itself in terms proffered by Hellenism, Judaism, understanding itself in its own terms as covenantal witness to the utterly transcendent and personal God of Abraham, Isaac, and Jacob, has often found philosophy to be an alien mode of thinking in which that personal and covenant-making God is necessarily replaced by an abstract and impersonal first principle – which, to the Jewish mind, more resembles a thing than it resembles any person. Leo Strauss, in his well-known essay (Strauss 1983), asserted the fundamentally incompatible orientations of Athens and Jerusalem and affirmed the essential inability of philosophy to speak of God as God is known by Judaism or to provide epistemological justification for revelation. For Judaism to attempt to articulate itself philosophically, one might conclude, is for it to distort itself to the point of abandoning its nature; reason, unaided by Biblical revelation, can know the God of the philosophers, the first principle, but

cannot speak at all of the God who is person and subject – the living, commanding, and redeeming God of the Jewish people.

For some, the non-Jewish origin and Greek-born method of philosophical reasoning has been sufficient reason to proclaim Jewish philosophy a hybridization that has no proper place in Judaism. Yet, it is also true that philosophy has been a fact confronting Jewish intellectual life since Judaism's contact with Hellenism (c. 323 BCE). Moreover, since the destruction of the Second Temple (70 CE), Judaism has had a diasporic existence which necessarily brought it into contact with ideas, customs, and world-views originating in foreign cultures. It has been forced to contend with these cultural influences, appropriating, reacting to, and re-forming itself in response to many of the influences, the ideas, and the systems of knowledge it has encountered, rejecting those which were in opposition to its perceived basic affirmations while accepting into itself those influences that did not, becoming an evolving, dynamic, and living tradition. Philosophy's long-standing contact with and affect upon Judaism make it difficult to declare it a purely "foreign" or heteronymous entity within Jewish history. Philosophy is a part of Jewish intellectual history, and Judaism's identity includes the results of its having grappled with its influence.

Philosophy, insofar as it includes the rational development of worldviews or the rational establishment of metaphysical principles, must remain antithetical to Judaism insofar as Judaism is understood to represent a set of metaphysical truths acquired by means of revelation. But even this distinction need not prove definitive: In reinterpreting the core onto-theological (Onto-theology) claims of Jewish scripture and tradition, Jewish philosophy has striven to reveal revelation's compatibility (or even its identity) with reason. The works of the Neoplatonist Philo (20 BCE–50 CE) are characterized by just such a rational "unpacking," and may be said to constitute the earliest true example of the thoroughgoing application of Greek philosophical concepts to Judaism. Philo's allegorical method of scriptural interpretation foreshadows much

that was later to become accepted procedure in medieval Jewish philosophy.

The medieval period saw the rise of philosophical thought in Judaism, and this brand of scholarship took root alongside rabbinic studies. The “Greek” mode of inquiry infiltrated the enclave of Jewish intellectual life by way of contact with the works of Muslim theological philosophers (► [Mutakallimun](#)). The dialogues of Plato and the works of Aristotle, translated into Arabic, became the point of departure for the rationalistic consideration of Judaism, as they had for the Muslim and would for the Christian scholastics. The idea that human reason, while limited, is a gift of God and that the Torah teaches nothing that is contrary to reason became the supporting principles of Jewish medieval philosophizing: The consonance of Judaism and reason became an article of faith for those who saw in philosophy the most proper human opportunity to obey God’s Commandment to know Him and to love Him with all one’s strength.

Usually regarded as the first truly philosophical Jewish thinker, Saadya Gaon (882/892–942) maintained that the concepts and categories of Greek philosophy represent the workings of universal human reason and that it is impossible for Judaism to be antithetical to reason. Saadya thus held reason to be the final arbiter of truth in cases in which scripture and reason appear in contradiction. Although not all subsequent Jewish philosophizing would go so far as to defer to reason over scripture, Saadya’s confidence in the rationality of Judaism served to pave the way for the systematic rationalism of Maimonides, as well as for the Jewish rationalism that would largely define post-Enlightenment modernity ([Husik 1948](#)).

With its prime exemplar in the person of Moses Maimonides, the interest of the medieval Jewish philosophers was that of providing a rational account of Judaism and its worldview within the framework of the systematic cosmology and natural science of Aristotle. The works of Aristotle presented a systematized account in which an eternal, unmoved mover and final cause provided the ultimate explanation of the existence of the universe and its contents and

engendered a unified and orderly cosmos. Medieval Jewish philosophers were able to see in this cosmological vision a consonance with the notion of the transcendent Creator God of Jewish scripture and tradition, and through that identification, to unite scientific knowledge of the world with religion and give metaphysical shape to the concepts of the Torah ([Manekin 2007](#)). A new horizon of theological discourse was opened: God’s attributes, His relation to the world, goodness and knowledge, power, and relation to humanity were given to the mind of the thinker as subjects of inquiry. Knowledge of the nature and workings of the universe became understandable as aspects of a cosmic order directly instituted by God and which had God at its summit. New questions could be posed, and questions that had long since been formulated by the rabbis could receive detailed and reasoned elaboration in a system in which the God of Israel was reckoned according to Greek cosmology and the rigors of logic. Israel’s God was now explicitly understood as omniscient, omnipotent, and omnibenevolent, as infinite, and as having created the world *ex nihilo*; the philosophical problems attending the posit of human free will, predestination, the possibility of God’s having knowledge of particulars, made explicit what had arguably been implicit in the theological concepts employed by the rabbis and the notions of God and world narrated in the Torah ([Samuelson 1976](#)).

Philosophers such as Gersonides, Crescas, and Nahmanides likewise grappled with the legacy of Greek philosophy, in both its Aristotelian and its Neoplatonistic (Neo-Platonism) forms (In his *Duties of the Heart*, for example, Bachya understands man’s ultimate duty to be love of God which, while unattainable by means of the intellect, nonetheless requires the use of reason insofar as knowledge from authority alone is insufficient aid to such deep love: All natural effort must be made to know God by means of the intellect.). Attempting to understand traditional Jewish convictions as amenable to both the dictates of rational thought and the metaphysics and cosmology of the Greeks, these thinkers followed Maimonides in addressing questions of creation/the eternity of the world, God’s

knowledge of the finite world, human free will in light of divine omnipotence and omniscience, and the meaning and possibility of prophecy and revelation, among other topics. Although some medieval Jewish thinkers, such as Yehuda Halevi, eschewed Greek rationalism as a means of framing the Biblical worldview, the majority of medieval Jewish philosophers accepted a version of Aristotle's cosmology and natural science and, affirming the essential unity of all truth, championed the identity of philosophy's first principle and the God of Judaism (Frank and Leaman 2003).

The acceptance by the Jewish philosophers of the Aristotelian cosmology served to give new shape to traditional ideas about God and the world. The Torah's anthropomorphism was rationalized, its picture of God as in possession not only of human physical attributes but also of changeability and emotion were subjected to the rigors of reasoned analysis upon Greek philosophical lines: For Maimonides and others, these Biblical expressions made manifest the understanding of God accessible to finite human beings by attention to the effects of divine attributes and acts – it is by analogy and metaphor that God's nature is known; by way of the observation of the effects of God's acts, and analogy with our own, human beings can attain a working knowledge of God which, while neither exact nor literally true, can serve to facilitate one's upholding the covenant and worship of God (Seeskin 2005).

The rudiments of the Aristotelian account of the world became standard concepts in Jewish theology, both academic and popular, persisting long after the natural science of Aristotle had been abandoned in favor of the science of Copernicus, Newton, and the worldview of early modern science. The relative dearth of Jewish philosophy after the middle ages until the nineteenth century resulted in a freezing of the theological conceptions of an earlier time and a consequent growing chasm between the world as conceived by science and that depicted by religion. Early modern science posed little obvious difficulty for the Jew, for its understanding of the universe, while no longer requiring the posit of God as an explanatory principle, nonetheless

did not in principle prevent that posit. The resulting shift from the medieval conception of the universe and the early modern understanding of the universe as mechanism could largely be ignored by Jewish thinkers, and the conception of God remains largely undisturbed despite the vast changes in scientific paradigm (Samuelson 1989).

Contemporary physics, however, proffers a worldview that has not the same theoretical space for the posit of the God of Israel, in that it represents the universe as a closed system requiring no external "act" by which the universe or its contents are brought from Aristotelian "potentiality" into the "actuality" of existence. Despite the relative ignorance of the contemporary nonscientist of the specifics of quantum physics, the quantum view of the universe presents grave difficulties for the theologian, who must reckon the usefulness of traditional Jewish notions of God and the world in a universe perhaps best described by quantum physics – an understanding of reality that at least *prima facie* cannot accommodate the most characteristic contents of the Jewish religion. The discrepancy between two apparently contradictory worldviews is reflected in the life of the contemporary believing Jew: As science comes to constitute ever more of the common understanding of the world, so do the concepts of traditional religion become less believable, and the sense that science's truths refute the claims of religion grows ever more unavoidable. The life of the contemporary Jew is characterized by a cognitive dissonance: While the universe is conceived roughly in terms of today's science by the modern Jew, Judaism retains a grievously outdated, Aristotelian, worldview.

The nineteenth century brought a marriage of philosophic rationalism and scientific empiricism that, in the Jewish world, culminated in the work of Hermann Cohen. Cohen's post-Kantian approach saw in Judaism the seeds of a universally valid and rational religion that expressed itself most of all in practical wisdom (ethics). Losing all content of revelation not accessible to reason as well as all Jewish particularity in favor of universality and philosophy,

Cohen's understanding of Judaism as ethical monotheism marked the complete rationalization of Judaism and religion.

Jewish philosophy through the twentieth century has, in the main, been aligned with continental philosophy and removed from explicit concern with natural science. The existentialism of Martin Buber, the critical ethical philosophy of Emmanuel Levinas, and the New Thinking of Franz Rosenzweig sought access to meaning through the analysis of relationship, rather than by means of consideration of the metaphysical nature of the universe, while thinkers such as A. J. Heschel, Steven Schwarzschild, and Joseph Soloveitchik searched for a way to account for the reality of a God who remains inaccessible to the determinations of rationalism and yet present to Jewish observance (Borowitz 1983).

Vast differences of both subject matter and approach characterize Jewish thought and philosophy today, and never since the medieval period has Jewish intellectual life involved as much academic philosophical activity. Some characteristic concerns of contemporary Jewish philosophy include the following: the possible epistemological justification of belief in God (howsoever construed) in the face of the modern scientific worldview which does not require the Deity as an explanatory principle (cause) and provides an account of reality which precludes traditional theistic posit; the possible justification of revelation (howsoever construed) as a source of knowledge; possible accounts of Jewish particularity which provide for the uniqueness of the Jewish people in a way that both avoids racial chauvinism and is consonant with the universal principles of philosophical reason; the questioning of the premodern assumptions concerning the relation of religion generally and Judaism in particular to natural science; the theme of modernity and its failure; the nature and authority of Halakhah in light of modern science and philosophy; Zionism and the significance of the land of Israel and the Jewish people; Jewish feminism and the reconstruction of Jewish tradition with attention to the voice of women; and Holocaust philosophy and theology, which explores the serious difficulties involved in

maintaining traditional Jewish ideas about God, Jewish chosenness, and even humanity in the face of the suffering of many and the near decimation of the Jewish people. Many of these themes and concerns are echoed in "mainstream" or secular philosophy; however, in its reference to traditional Jewish sources and ideas, as well as to specifically Jewish concerns about values and peoplehood, Jewish philosophy exists as a body of works and a pursuit in its own right, reflecting both the fact of Jewish distinctness and Jewish life a manifestation of a more universal humanity.

Self-identification

Science

Jewish philosophy does not self-identify as a "science" in the common, contemporary understanding of the term. It does not have directly to do with the empirically based observation of natural phenomena, does not generate quantifiable results, and does not proceed by way of empirical or theoretical experiment or calculation, such that its results can be validated either through repetition or community consensus. Jewish philosophy, as philosophy, is describable as science in the broadest and most originary sense of the term – that of knowledge and the quest for knowledge.

The division of knowledge and inquiry into "science" and "philosophy" was a relatively late development in the history of Western culture. In the ancient and medieval worlds, and even as late as the nineteenth century, "science," as knowledge, was a broad term that encompassed what we today understand as the natural and human sciences and philosophy. "Philosophy" was likewise a term with a broad scope. As "the love of wisdom," a philosophical pursuit was any investigation in pursuit of knowledge: The acquisition of knowledge about the world and about values was recognized as the means by which wisdom – knowledge of the good life for human beings – might be attained. Empirical science was called "natural philosophy," and it treated of the material, as opposed to the theological and spiritual, elements of reality. It was not uncommon for a philosopher also to be competent in one or

more of the natural sciences, nor for a natural scientist to be a philosopher. Although contemporary usage distinguishes between the investigation of nature and speculation concerning transcendent, foundational, ultimate, or ethical matters, the division between philosophy and what is now termed “science” is less clear-cut than might be imagined: Advances in scientific knowledge influence philosophy by raising questions of philosophical importance and by providing much of the subject matter of philosophical thinking; science, for its part, involves philosophical reasoning in the formation and development of its theoretical commitments and paradigms and often finds itself to dovetail with philosophy insofar as its progress demands the formation of an account of nature of both the object known and the investigating knowing subject.

Religion

Jewish philosophy does not self-identify as a religion but is a form of intellectual life within the Jewish religion. Jewish philosophy is the pursuit of speculative knowledge undertaken from the perspective of the Jewish religion, in reference to Jewish concerns, or in relation to canonical Jewish texts. There are many ways in which the relation of this subdiscipline of philosophy to Judaism can be manifested, and its connection with the specific religious content of Jewish tradition can take many forms, from acceptance of the literal truth of Biblical and theological statements to the reinterpretation of the religion as a whole.

Characteristics

Jewish philosophy is philosophy and it is Jewish, and both of these elements serve to distinguish Jewish philosophy from other related traditions and give it its own dynamic and set of problematics.

What precisely makes any philosophy “Jewish”? Simply to denominate any and all philosophy authored by a Jewish person “Jewish philosophy” is to proffer a definition perhaps too broad to be either useful or informative – and there

are Jewish philosophers whose Judaism has little or nothing to do with the subject matter of their philosophical work. Conversely, were we to limit the appellation to only such philosophy as seeks to provide a philosophical account or justification *of Judaism*, we would narrow the definition overmuch, as well as rule out much philosophizing of significant Jewish import. In addition, it should be noted that there is a distinction to be made between philosophizing that takes as its starting point the tenets of revelation and that which seeks to provide philosophical justification of revelation and its contents (the former would best be called “Jewish religious philosophy,” and perhaps “theology,” and the latter, “philosophy of Judaism”). Jewish philosophy, then, can be seen to take the form of reasoning either from or about the principles of Jewish Biblical faith, to be concerned to provide a philosophical account of the Jewish religion itself, or to provide an overall philosophical account of reality (or of any particular aspect of reality) in a way consonant with or relevant to the tenets of Jewish Scripture or intellectual tradition. The contemporary liberal Jewish philosopher, Norbert M. Samuelson, suggests a broad definition of Jewish philosophy as having the goal of forming “judgments about almost everything relevant to the survival and flourishing of the Jewish people that is likely to be true . . .” (Samuelson 2009). Whether or not we accept Samuelson’s pragmatic focus marrying the practice of Jewish philosophizing and the promotion of Jewish flourishing, a working definition of Jewish philosophy as pertaining to “thought and judgments about the nature of almost everything (an understanding of reality) that is relevant to the fundamental concepts and traditions of the Jewish people that are likely to be true” just might provide sufficient anchor for the survey of so vast and varied an enterprise as Jewish philosophy.

Relevance to Science and Religion

Contemporary Jewish philosophy must address the existence of science, either by contending in a direct manner with the scientific worldview or

by providing a philosophical justification for declaring engagement with the subject irrelevant to its purpose of developing a reasoned account of reality, humanity, Deity, and their interrelation that is important from a Jewish religious point of view.

While the understanding of the universe provided by the Torah remains sufficiently vague as to entail no one specific metaphysical view, there are certain intractable assertions that, it is clear, may not cohere with contemporary scientific notions. More pressingly, the vast majority of premodern Jewish philosophical works hail from the medieval period, and as such, present a view of the universe and its contents, as well as an understanding of God and God's relation to the universe, which is entirely incompatible with the modern scientific understanding of the nature of the universe.

The general understanding of the universe presented by early modern science after the medieval period, while not requiring the posit of the transcendent God of Judaism, was able to support it. As a consequence, Jewish theology did not find itself to be particularly threatened by the advance of natural science. In addition, Judaism's historically multivalenced approach to Biblical interpretation entailed that the tradition did not insist upon a literal interpretation of the details of the Book of Genesis, such that the felt conflict between the ideas of pre-contemporary natural science and Jewish religiosity remained negligible, in contrast to the tension experienced within Christian theological circles.

The intellectual climate of the Western contemporary world has spawned a crisis of faith of a kind never before known. The contemporary believer in any of the three religions of Abraham finds him or herself tasked with attempting to inhabit two cognitively incompatible worlds – the world as understood by religion and the world of modern science. The theological difficulties attending the maintenance of traditional Jewish ideas in the light of modern science are not a problem affecting only theologians and philosophers but are likewise of great moment to the average believing Jew. The apparent incompatibility of the traditional concepts of

Judaism and the scientific understanding of the world requires the attention of Jewish thinkers, if Judaism is to remain a meaningful and “live” option for Jews into the twenty-first century.

Sources of Authority

There is no single textual or institutional source of authority that is recognized across the discipline of Jewish philosophy. While all Jewish philosophy in some way involves a relation to Jewish tradition, Jewish texts, or Jewish culture/peoplehood, there is no single manner in which Jewish philosophy as a whole may be said to be related to any aspect or aspects of Judaism.

Although a Jewish philosopher can regard revelation as authoritative and maintain a philosophical position that is built upon the recognition of its authority, much Jewish philosophy is concerned with establishing a rational justification of revelation as a source of truth, often reinterpreting both the nature and content of revelation in ways that differ from tradition. Jewish philosophy is the rational investigation of matters of concern to Judaism, including the rational investigation of all traditional sources of authority.

Ethical Principles

Being Jewish, Jewish philosophy may be said to adhere to the values inherent in Judaism and to share Judaism's characteristic preoccupation with ethics. However, the philosophical investigation of Judaism, the philosophical interpretation of Jewish doctrine, and the task of philosophizing about matters of Jewish concern, need not, as a discipline, understand itself to be bound to Halakhah (the path or the way) as traditionally construed or to any particular articulation of Jewish ethics and values.

Key Values

There is no one set of values that may be said to span the discipline of Jewish philosophy, save

those of the pursuit of truth through reason and a concern with matters of Jewish import.

Conceptualization

Nature/World

Judaism traditionally understands the natural world to have been created by God and insists on the ontological separation of God and His creation, rejecting all forms of pantheism.

In contemporary Jewish thought, the principle of God's complete transcendence of the world has occasionally been less strictly maintained. With the Enlightenment's confidence in human reason as a means of reliable knowledge, empirical science came to supplant medieval metaphysics as the generally accepted worldview. Science yielded a self-sufficient worldview: Unlike any premodern understanding of nature, it did not require the posit of God as a causal explanation of natural phenomena. Mordecai Kaplan's naturalism is a result of this ► [scientism](#): Kaplan's anti-supernaturalist stance dispenses with all extra-empirical posits and, reducing "God language" to finite and natural terms, proffers a Judaism purged of its transcendent God, redefining God as that force within (human and extra-human) nature that makes for salvation. Similarly, Judaism's engagement with science today faces the challenge of making sense of religious ideas in a context that perhaps rules out both God and transcendence.

Human Being

Judaism understands the human being to be the creature of God who is created in the image of God. The human being, commanded by God in the Book of Genesis to be fruitful and multiply, to care for and have dominion over the earth and its nonhuman creatures, was created from the dust of the earth into which God blew the breath of life (spirit). For Judaism, the task of the human being generally is understood as obedience of the Noachide laws, while the life of the Jewish human being involves obeying the Commandments that distinguish the particular relationship between the Jewish people and God.

Within Jewish philosophy, the Biblical narrative describing human life is subject to various interpretations.

Life and Death

Biblical tradition holds that God is the author of life and that human mortality is the result of God's punishment of Adam for his disobedience in the Garden of Eden (the first sin). Within Jewish philosophy, the narrative explanation of the origin of death is often understood metaphorically, and a universal and rational (philosophical) account is given which is consonant with the philosophical position espoused.

Reality

In Judaism, reality is all that which is created by God; God gives to all creation its being.

Knowledge

Jewish tradition understands knowledge to be a gift from God and the human use of reason to be incumbent upon one who wishes properly to serve and glorify the Creator. The study of Torah, as revealed knowledge, is a duty (*mitzvah*); knowledge of the natural world of God's creation is understood to be a means of knowing God through His (creative) acts.

Truth

One of the many names of God given in the Tanakh is "God of Truth" (*El Emet*) (Ps. 31:5). While the Hebrew *emet* does denote truth as that which is real, and the correspondence of a proposition with reality, it likewise connotes firmness, reliability, and, derivatively, responsibility and action. Thus, God, as truth, is the firm presence that can be relied upon, trusted; our acknowledgement of God involves responsibility and ethical action.

Perception

This concept is not of particular interest in the field of Jewish philosophy.

Time

The concept of time in Jewish philosophical tradition has integrally to do with the world's

finitude (as contrasted with the infinity of God) and human history as humanity's struggle for redemption.

Consciousness

This concept holds no special importance within Judaism or Jewish philosophy.

Rationality/Reason

In Judaism, reason is considered a gift of God, and Jews have a duty to make proper use of reason in knowing God through the study of Torah as well as through the investigation of God's handiwork, His creation. With the exception of Maimonides' 13 Principles of Faith, Judaism historically has not emphasized dogmatic belief as requisite to salvation or to membership in the Jewish community. There is thus less of an opposition of reason to faith in Judaism than in other religions (such as Christianity). Medieval Jewish philosophy understood revelation as consonant with reason, although mainly held the content of revelation to be inaccessible to unaided reason.

Mystery

In contrast with ancient pagan mystery cults as well as with its daughter religion, Christianity, Judaism rejects mystery in the sense of any avowal of the Infinite God's embodiment in the finite (as in the Christian Incarnation, its transubstantiated Eucharistic host, or the ritual objects of the mystery cults). Jewish theology does not identify theological contradiction with sacred mystery, although it affirms the human intellect's inability to transcend its finite limitations and arrive at conceptual knowledge of the Infinite God.

Relevant Themes

Jewish philosophy must devise ways of coming to terms with modern science, insofar as science proceeds from a worldview that, at least *prima facie*, is at odds with how the world is understood within Biblically based religion. If science provides our best current knowledge of how the universe really is, then Judaism, if it is to have

a claim to truth, must either be reinterpreted or reworked so as not to be in conflict with this knowledge.

Quantum physics proffers an account of the universe that purports to be inclusive of reality in toto. Unlike the mechanistic worldview of premodern science, the quantum account of the universe is understood to explain not only physical reality but also reality as such. While the mechanistic worldview removed God from His place as Prime Mover within the Aristotelian cosmology espoused by medieval science, theoretical room could still be found for the Deity in premodern mechanism, and God's existence, while not required for explanatory purposes, was not ruled out. Such is not the case in the modern view of quantum physics. In creating a closed-system account of all that exists, quantum physics rules out any posit of a God transcending the universe, and any affirmation of God's causative role in generating the universe is rendered incoherent.

If the worldview of science is understood to describe reality in its every aspect:

- The coherence of affirming the existence of the Biblical God perhaps becomes impossible.
- The nature of the human being as understood by Jewish tradition becomes problematic.
- The notion sanctity of the human person espoused by Judaism cannot be supported.
- The traditional concept of the soul cannot be maintained.
- The universe as understood by quantum physics, excluding purpose and objective value, perhaps excludes ethics.
- The Jewish understanding of human history as metaphysically significant is rendered incoherent.
- The Jewish concepts of redemption and the world-to-come are imperiled.
- The relation of Judaism to truth becomes a question: In what sense can the Jewish worldview be replaced by science and still be called "Judaism"? Are there truth claims so integral to Judaism that their replacement would be sufficient to render its worldview no longer "Jewish" in more than a nominal sense? Could science "disprove" Judaism by

refuting one or more of its central truth claims?

- Does intellectual assent to the worldview of modern science entail an *ontological* commitment to that worldview (is science ontology)?
- Medieval philosophy assumed that theology is a continuation of science's account of the physical universe. Must Jewish theology be grounded on the account of the physical universe proffered by quantum physics, or is the best philosophical account of reality one that would provide an account the worldview of science?

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Philosophy of Aesthetic Experiences

- [Aesthetics \(Philosophy\)](#)

Philosophy of Art

- [Aesthetics \(Philosophy\)](#)

Philosophy of Being

- [Ontology](#)

Philosophy of Existence

- [Existentialism](#)

Philosophy of Experience

- [Phenomenology](#)

Philosophy of Language

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Description

Introduction

Language is a fundamental human capability. It may be generally defined as the human activity aimed at formulating and communicating information, at expressing feelings, needs, and psychological states, and at influencing other's behavior. It is characterized by the syntactic, semantic, and pragmatic dimensions. Syntax concerns the set of rules and principles according to which the linguistic elements are *combined* to give rise to well-formed complex expressions. Semantics has to do with the *meaning* of linguistic expressions; it is often associated with denotation but may also be understood as referring to

the relations that a term bears with other terms. Pragmatics concerns the *use* of language and of the linguistic expressions as uttered by determinate speakers, aimed at specific goals, dependent on the intentions of the interlocutors, and in general occurring in different contexts.

The expression “philosophy of language” appeared in the 1960s. According to Dummett’s *Frege: Philosophy of Language* (1973), this discipline (as a definite branch of philosophy) has been somehow initiated by G. Frege in the late nineteenth century (Frege’s 1892 *Sense and Reference* is usually regarded as its “act of birth”). This, of course, does not mean that philosophy begun to deal with language so late in its history; however, the systematic addressing of questions connected with language as a crucial task of philosophy starts in that period. Moreover, according to R. Rorty (*The Linguistic Turn*, 1967), it is with Wittgenstein’s *Tractatus logico-philosophicus* (1922) that philosophy posed the issue of language at the very core of its investigations. With the linguistic turn, the philosophical problems are regarded as often generated by the vagueness and ambiguities of language or as related with misunderstanding the real meaning of linguistic expressions. Consequently, linguistic philosophy aims either at eliminating such problems or at solving them by clarifying the proper meanings and functions of the linguistic elements.

Philosophy of language, as it configures in the course of the twentieth century, has a broader scope than “linguistic philosophy” in the strict sense (see, e.g., Block (1981), Lepore and Smith (2006), and Lycan (1999)). It does not claim that all the problems of philosophy and of knowledge in general are problems of language. Of course, it does maintain that a better understanding of language may concur to address those problems; in general, however, it aims at understanding language as such, as a human activity with its various facets and connected with other cognitive and anthropological dimensions.

Philosophy of language should not be conflated with linguistics. The easiest way for distinguishing the two is by noting that linguistics is mainly concerned with the syntactic (and the

phonological) dimension of language, whereas problems of semantics and of pragmatics are central to contemporary philosophy of language.

Nowadays, philosophy of language is linked in various ways with several disciplines. Logic is surely one of those. In the domain of philosophy, it is also connected with philosophy of science and philosophy of mind. It bears relations with linguistics (of course) and with semiotics (i.e., the general theory of signs). It entertains more or less direct relations with a number of scientific disciplines, e.g., psychology, cognitive neuroscience, evolutionary biology, scientific (or “physical”) anthropology. As it will appear in the following, philosophy of language is relevant for philosophical (and even theological) anthropology.

We will focus on the key steps in philosophy of language from Frege on. The scope of this entry is further restricted to philosophy of language in the analytic tradition. The important reflections on language offered by philosophers like E. Husserl, M. Heidegger (especially his late works), and P. Ricoeur will not be dealt with here. More linguistic approaches (F. de Saussure’s to mention one) will not be taken into account too – except for N. Chomsky’s works. The last section will hint at current lines of scientific research that provide insights also for a philosophical understanding of language. This will also clarify some of the reasons why philosophy of language is relevant for “science and religion.”

Philosophy of Language in the Late Nineteenth and the Twentieth Century

From Logic to the “Linguistic Turn”

G. Frege (1848–1925) realized that his “logician” program (the program of grounding mathematics in logic) required an absolute logical rigor; this, in turn, would have required a deep understanding of the structure of sentences. His explicit intent was of freeing “thinking from the fetters of language by pointing out the logical imperfections of language.” His 1879 *Begriffsschrift* (“concept-notation”) is aimed at building a “perfect language” to be substituted to the natural ones. Frege’s distinction between sense (*Sinn*) and reference (*Bedeutung*) provides the background for much of the research in

philosophy of language. Starting from singular terms (i.e., terms that indicate an individual object), consider the two expressions “the morning star” and “the evening star,” which are two singular terms having the same reference, i.e., Venus. If in the two expressions there is nothing more than their reference, then “the morning star is the morning star” should be equivalent to “the morning star is the evening star.” However, the first proposition is a mere tautology, while the second one conveys a relevant past astronomical discovery. What distinguish the two expressions, therefore, are their *senses*: The sense of a singular term is *the way in which* it refers to its referent (the “mode of presentation of the referent”). The distinction between sense and reference also applies to concepts or general terms (i.e., predicates). For Frege, a concept is an unsaturated expression (a function) that cannot have a definite truth-value (i.e., that cannot be true or false) unless saturated by its application to an object: The expression “... is Italian” becomes true or false depending on the person of whom it is predicated. The reference of a concept (or function) is the set of all the truth-values that it will assume when saturated by all its possible arguments (where the arguments of a concept – or of a function – are the objects to which it can be applied). Finally, the reference of complete sentence is its truth-value (the Truth or the Falseness). The sense of a sentence consists in its truth-conditions, i.e., the conditions that have to obtain for the sentence to be true.

The sense of a sentence, moreover, is often understood by Frege as the “thought” associated with the sentence. Therefore, such a thought comes to coincide with the conditions under which the sentence *would* be true. To ascertain if that sentence *is* true (to judge about its truth), however, one needs to pass from the sense to the reference (or, equivalently, from the thought to the truth-value). The reference of a sentence depends on the references of its constituents (this is a rough formulation of the so-called compositionality principle). In other words, the reference of the argument and the reference of the concept (i.e., the set of the truth-values that the concept assumes depending on the argument)

determine the truth-value of a sentence (i.e., the sentence’s reference).

Though being close to “a thought,” the Fregean sense cannot be conflated with the subjective representation associated with an expression. The representation is private, usually depending on the personal experience of the speakers (their memories, emotions, etc.). Neither the reference *nor* the *sense* is private: The sense of an expression – the thought associated with it – can be shared by several individuals. This is certainly an aspect of Frege’s anti-psychologism attitude. The connection between sense and thought together with the distinction between thought and representation may hint at interesting connections between language and cognitive attitudes (a connection that will progressively acquire relevance in philosophy of language).

To judge about the truth of a sentence requires considering the reference of the terms composing it. In particular, it is crucial that the singular terms do indeed refer to a determinate object. Now, Frege’s main interest was about formal languages (precisely about that formal language indispensable for pursuing his logicist program). In such languages, according to Frege, it is always possible to ensure that any singular term has a determinate reference (so that any sentence can always be judged to be true or false); this can be ensured by establishing appropriate conventional definitions and by avoiding the introduction of any single term without fixing its reference unambiguously. Different is the situation for natural languages, and on this point B. Russell (1872–1970) diverged from Frege’s positions. On Russell’s view, singular terms may be distinguished in proper names – like Aristotle, Dante, Venus, etc. – and expressions such as “the master of Alexander the Great,” “the author of the *Divina Commedia*” or “the morning star” that apparently are proper names (and indeed they may grammatically have such a role) but in fact, logically, are “definite descriptions” (i.e., expressions that point to an object by means of ascribing to it such-and-such properties). In Russell’s own example (*On Denoting*, 1905), the sentence “the King of France is bald”

is composed by the definite description “the King of France” – which does not refer to a concrete existing individual (at his time like at present) – and by the concept or predicate “... is bald.” For Frege, such an expression has a sense (i.e., expresses a thought) but has no reference, as it is neither true nor false. In Russell’s view, on the contrary, the grammatical form of the sentence hides its truly logical one, which is, “Exist an x that is the King of France and is bald.” So reformulated, this sentence has a definite truth-value: It is false since such an x does not exist. In this way Russell shows how, in his view, the Fregean notion of sense is useless, and that reference is the only semantically relevant feature of an expression. In sentences containing a definite description that does not refer to any single existing object, there is actually no element that refers to *any* object: The explicit, logical form of that expression (as analyzed in *On Denoting*) reveals that all the constituents of such sentences do refer, but to *properties* or to combinations of properties, and not to objects. This holds true also for sentences containing definite descriptions that do refer to a single concrete object of which, however, the speakers do not have any direct acquaintance or knowledge. Even in this case, the constituents of such a sentence refer to properties with which the speakers are directly (empirically) acquainted, and not to a particular object (either not existing or not directly known). A name refers to a concrete individual object (i.e., it is a logically proper name) only if the user of that name is directly acquainted with the named object.

In his *Tractatus logico-philosophicus*, L. Wittgenstein (1889–1951) accepts Russell’s idea that names have a reference (either the object or the property that they name) but not a sense: The meaning of a name is its reference. Wittgenstein regards the propositions (i.e., any declarative expression) as the pictures of facts. A so-conceived proposition does have a sense, which coincides (following Frege) with its truth-conditions; this means that a proposition, if true, tells how things stand in reality (*Tractatus*, 4.022 and 4.024). Propositions have no reference, however, as they are not names, but pictures

(and do not refer to abstract realities like the Fregean Truth and Falsehood). Propositions have no reference since they are conceived as the sensible expression of a thought (*Tractatus*, 3.1), which, in turn, is understood as the “logical image” of a fact (*Tractatus*, 3). The semantic value of a proposition is given by its capability of displaying, of *exhibiting* the logical form of a fact or a state of affairs (*Tractatus*, 4.1), i.e., of showing the logical relations holding among the objects *or* properties denoted by the names compounding it. Such logical form is what grounds the structural unity of propositions, and in this way Wittgenstein adheres to Frege’s compositionality principle by maintaining that a name has a meaning only within the configuration exhibited by the proposition (*Tractatus*, 3.3 and 3.4). A proposition is true if the picture it conveys corresponds to a real state of affairs (i.e., if the logical relations among its elements correspond to the logical relations among the real objects and properties referred to by those elements) and is false if such a correspondence fails (*Tractatus*, 2.222–3, 4.06 and 4.25). The sense of a false proposition is the (possible but unreal) fact that would obtain were the proposition true.

Wittgenstein maintains that the propositions of the ordinary language are logically well ordered as they are (*Tractatus*, 5.5563), but also that language masks the genuine thought and its properly logical form. Hence, “All philosophy is ‘critique of language’” (*Tractatus*, 4.0031) having the task of removing the mask of ordinary language from the real logical form of thought. This statement is usually regarded as the debut of the “linguistic turn.”

Meaning, Knowledge, and Ordinary Language

The doubts raised by Frege, Russell, and the *Tractatus* of Wittgenstein on many aspects of ordinary language ended up at the Logical Empiricists (or Logical Positivists). This group of scholars aimed at establishing a “Scientific World-Conception.” In doing this, they assumed Wittgenstein’s views according to which (1) the propositions of logic and mathematics are all tautologies (the “logical side” of the movement) and (2) the meaning of a (factual) proposition

coincides with the state of affairs occurring if the proposition is true (the “empirical side”). This latter point brings to the so-called verification principle. In the formulation of M. Schlick (1882–1936), the principle states that the meaning of a sentence is equivalent to the procedure for its verification (*Meaning and Verification*, 1936). Thus, the verification principle constitutes a criterion for partitioning linguistic expressions in meaningful and meaningless ones. Consequently, Logical Empiricists acknowledged only two classes of sentences as endowed with meaning: analytic propositions of mathematics and logic, and empirical propositions respecting the verification principle (essentially those of physics).

Logical empiricist R. Carnap (1891–1970) studied under Frege at Jena. His early works (*The Logical Structure of the World*, 1928 and *The Logical Syntax of Language*, 1934) can be regarded as an attempt at pursuing the program of building an artificial language suitable for translating scientific knowledge in absolute rigor. Carnap’s philosophy underwent a maturation that progressively brought him to weaken both the unconditioned adhesion to the radical formulation of the verification principle – already evident in *Testability and Meaning*, 1936 – and the emphasis on reference at the expenses of sense – operated in *Meaning and Necessity*, 1947. To the Fregean dichotomy of sense and reference, he preferred the extension/intension one (first proposed by Leibniz). In *Meaning and Synonymy in Natural Languages* (1955), he spelled out a formal definition of the intension of a predicate (a point that Frege did not deal with explicitly) together with an operative criterion for ascertaining intensions in natural languages. The intension of a predicate Q for the speaker X (of a certain natural language L) is the general condition that and object y has to fulfill if X is ready to predicate Q of y (in L). In pleading the “intensional” thesis, Carnap argues that for ascertaining the intension that a subject attributes to a word, one should take into account not only existing cases (i.e., not only objects $y_1 \dots y_n$ that actually exist) but also cases that are merely *possible*. This marks the abandonment of the verification

principle as a strict criterion for meaning. This is relevant as far as a strictly referential (or “extensional”) account (like Russell’s) may be less able to deal with (scientific) theoretical entities (and their historical modifications) than an account attentive to intensions as well.

W. v. O. Quine (1908–2000) was a disciple of Carnap in the United States. Much of Carnap’s later developments (those bringing to *Meaning and Necessity* and following works) are also due to the interactions with him. Quine’s *Two Dogmas of Empiricism* (1951) attacks those that he arguably considers the two main assumptions of Empiricism: the neat distinction between analytic and synthetic truths (or sentences) and the possibility of reducing the meaning of any statement to “some logical construct upon terms which refer to immediate experience.” What is mainly relevant here is that, in doing this, Quine develops a sharp critique to the very notion of meaning (i.e., to Frege’s senses and Carnap’s intensions). He states that any clear notion of meaning should be able to account for the *synonymy* of two expressions and for the *analyticity* of a proposition. Quine shows how any attempt at clarifying the notions of synonymy and analyticity are vitiated by unavoidable circularity, thus concluding that the very notion of meaning as conceived at that time is untenable.

In *Meaning and Translation* (1959), Quine pushes forth his critique to the notion of meaning in relation to the possibility of a “radical translation,” i.e., a translation of a completely unknown language into one’s own language only on the basis of the behavior displayed by the speakers of the unknown language and of the “immediate experiences” shared by the speakers and the translator. One of the main focuses is again on the notion of synonymy between expressions of those two (completely separated) languages. He concludes that, (1) without the background of an already interpreted language, the identification of the meanings of the unknown-language expressions is impossible and that, (2) once such previously interpreted language is admitted, the ascertainment of how much the translation is good becomes senseless (because a so-obtained translation actually turns out to be a re-moulding

of the unknown language in the translator's one). The radical translation trials our meanings and "discovers that they are nothing."

Quine is often taken as a supporter of a behavioristic attitude toward language. This is due to the fact the his radical translation admits as possible data only the empirical evidence immediately available to the speaker and the translator as well as the speaker's *behavior*, but not the speaker's mental states or conceptual categorizations. Indeed, Quine stresses that the *conceptual schemes* with which the speaker of the unknown language partitions the world are (1) not necessarily similar or compatible with the translator's ones and (2) not accessible at all to the translator. Quine is therefore convinced that the unavoidable background of any special language (artificial, jargonistic, scientific, etc.) is the natural language (which sets the basic conceptual schemes of the speakers). Thus, having such a crucial role, natural language has to be "regimented" to become a more and more useful tool for knowledge.

From Frege on, philosophy of language has almost exclusively focused on *declarative* statements. The approach to language of the Logical Empiricism implied reductionist aftermaths; among others, it excludes, in essence, all the discourses (such as metaphysics, ethics, theology, etc.) but the strictly scientific ones. Against such a strict and limited view of language reacted the *Philosophical Investigations* of the late Wittgenstein (published in 1953 but written mainly between 1941 and 1947). As mentioned, names' reference has a grounding role in the *Tractatus*. In the *Philosophical Investigations*, denotation no longer serves such an office (§§ 39–40), and the functions of language are no longer reduced to the descriptive one. Language is used for a variety of tasks and needs, and in a virtually infinite number of different contexts (§§ 10–14 and 23). The meaning of a linguistic expression, far from being reducible to its sense or its reference, is given by its uses (§ 43). Wittgenstein conceives these different uses as different "linguistic games" (§ 7). The notion of linguistic game conveys (at least) two important ideas in the *Investigations*: that of family resemblance and that of "rule-following." By noting

that there is not an "essence" common to all what is usually called a game, Wittgenstein claims that there is not even a single trait common to all the phenomena that we call "language" (§§ 65–67), but there are many family-resemblance relations linking aspects of some linguistic phenomena with aspects of other ones. The idea of language game brings with it the idea that any game is defined by some set of rules to be followed. However, the rules regulating the uses of language are not conceived as monolithic, exerting their control up to the finest details and fixed once for all, but leave margins for discretion and interpretation (§§ 85 and 185–187) and can be made up and modified "as we go along" (§ 83) in playing linguistic games. As pointed out by M. Beaney (in Hale and Wright (1997)), "Wittgenstein's doctrine that meaning is use and his conception of rule-following . . . are inextricably linked" in the *practice* of language as a fundamental human activity. The rules of the linguistic games should not be searched outside the actual practice of those games. Such a practice has an unavoidably public and social dimension, as attested by Wittgenstein's renowned argument against the private language (especially in §§ 256–263; also § 202).

Wittgenstein's later works prompted a broad "discovery" of the multifaceted uses of daily linguistic practice, thus encouraging what is known as the "ordinary language philosophy." A first input in this direction came from *A Plea for Excuses* (1956/1957) by J. L. Austin (1911–1960), which regards language as the repository of all the connections and distinctions considered relevant in the course of many generations, thus attesting a priority of natural language on any attempt at building a "better language." Another key contribution (*How to Do Things with Words*, 1962 posthumous) is the acknowledgment of expressions that are not descriptive but "performative" in the sense that their utterances are not meant to merely describe something but aims at *doing* something (e.g., promising, ordering, etc.): These are linguistic *acts*. A second ordinary language philosopher is H. P. Grice (1913–1988); one of his merits is of having emphasized the notion of "intention" and

its relevance for philosophy of language (*Meaning*, 1957; *Utterer's Meaning and Intentions*, 1969). He attempted at explaining the notion of meaning in terms of the speaker's intentions: The meaning of an utterance is what the speaker intends to produce or effect with that utterance.

From Language to Cognition and Mind

Austin's linguistic acts and Grice's emphasis on intentions converge in the work of J. R. Searle (born 1932). In *Speech Acts* (Searle 1969), he points out that "speaking a language is engaging in a (highly complex) rule-governed behaviour." Soon after, he specifies that such behavior is *intentional* and follows the internal, mental states of the speakers (thus blocking any behavioristic wake). Indeed, what distinguishes something as linguistic, Searle claims, is its being produced with some kinds of intentions. Speech acts (i.e., making statements, asking questions, promising something, etc.) are "the basic or minimal units of linguistic communication." Each speech act has three compounding acts: an utterance act (the actual emission of sounds or marking of signs), a propositional act, and an *illocutury* act. The propositional act conveys the propositional content that essentially consists in reference and predication. Searle understands these terms diverging from "classical" views. For him, referential expression "serves to pick out or identify an 'object' or state of affairs apart from other objects or states of affairs." Predication is any expression somehow attached or attributed to the object or the state of affair identified by the reference. In this sense, both the assertion "John is coming" and the question "Is John coming?" convey the same propositional act. The illocutury act is what specifies the *mode* of the utterance act associated with the propositional act. It is possible to employ the same propositional act for performing different illocutury acts (such as asserting, asking, commanding, promising, etc.).

The theory of speech acts is a theory of meaning. An utterance means something to the extent to which the speaker intends to perform an illocutury act through that utterance; communication takes place when the hearer understands

the illocutury act that the speaker intends to perform with its utterance. "On the speaker's side, saying something and meaning it are closely connected with intending to produce certain effects on the hearer. On the hearer's side, understanding the speaker's utterance is closely connected with recognising his intentions" (*Speech Acts*, p. 48). Any illocutury act has its "conditions of satisfaction," which may be seen as a broadening of the notion of truth-conditions for assertions: An illocutury act of assertion is satisfied if it turns out to be true, as well as a promise is satisfied if it is kept or an order if it is obeyed. The illocutury acts should not be conflated with the *perlocutury* act, i.e., the fourth dimension of a speech acts aimed at eliciting a *hearer's* action, at inducing him to do something or to produce some effect *in his/her turn*. On this point, Searle sharpens Austin's positions by distinguishing the illocutury effect (which is the hearer's *understanding* of what the speaker intends and means) by the perlocutury effect (the *eliciting* of a hearer's action as a consequence of the illocutury effect). Illocutury acts are not always aimed at obtaining a perlocutury effect beyond the illocutury one.

Speech Acts represents an important development in contemporary philosophy of language. Its value, however, would be only partially appreciated if not related with Searle's theory of intentionality. In *Intentionality* (1983), Searle begins with clarifying the notion of "intentional state" by means of the intentions characterizing speech acts, but it soon becomes clear that intentionality is a presupposition for language and, more particularly, that speech acts are made possible by (psychological) intentional states. Searle assumes that intentional states (such as believing, hoping, blaming, disliking, etc.) are prior to speech acts (this assumption is held from both the evolutionary and the developmental standpoint, as well as at the level of the conditions of possibility). The crucial "disanalogy" between the two is that to perform a speech act one needs to *produce some physical entity* (a sound or a mark, etc.) which is not intrinsically intentional, whereas an intentional state is intrinsically intentional: "John couldn't mean that *p* [a speech act] unless

he was ... doing something *by means of which* he meant that *p*, whereas John can simply believe that *p* [an intentional state] without doing anything" (*Intentionality*, p. 29). The crucial question thus becomes how passing from intentional states to speech acts or, in other words, how the intentionality intrinsic to mental states may be passed to not-intrinsically intentional, external physical objects such as sounds or marks. Searle's answer is that "I impose intentionality on my utterances by intentionally conferring on them certain conditions of satisfaction that are the conditions of satisfaction of my psychological state" (*Intentionality*, p. 28).

N. Chomsky (born 1928) has given impressive contributions to linguistics; many of them do not leave philosophy of language indifferent. Reacting to both structuralist linguistics and the behavioristic approaches to language, he took an "internalist" view of the linguistic capability, thus maintaining that language is to be studied from the standpoint of the internal states of the individual. Famously, Chomsky also maintained that the "faculty of language" is innate (and genetically specified). The first reason for this conviction is that in acquiring a language, the stimuli that a child receives are by far insufficient for determining his rapid and punctual learning: "the child knows vastly more than experience has provided" (Chomsky (2000), p. 6). This may be grasped thanks to the Chomsky's distinction between the deep structure and the surface structure. The surface structure is the explicit hierarchical structure of the phrase's components as uttered by a speaker. The deep structure is the formal structure underlying the surface and is related to semantics and to the meaning of the phrase and its components. The deep structure produces the surface structure by means of grammatical transformations (which are mental and abstract operations) on the semantic components of the phrase. Phrases with very similar surface structures may convey quite different meanings that depend on different deep structures. The surface structure not always indicates the deep relations among the constituents of a phrase and "is misleading and uninformative" with respect to the properties of the "deep structure" required for

linguistic competence (Chomsky (2006), p. 33). This brought Chomsky to introduce the idea of an innate "Universal Grammar" constituting the core structure of the grammars of any particular human language: a complex system of rules underlying any grammatical construct. The Universal Grammar was meant as an innate "language acquisition device" indispensable to bring from the limited experiential input (provided by surface structures) to the acquisition of a language (as well as the mastery of deep structures and related grammatical transformations).

Chomsky's program underwent significant revision in the 1980s and 1990s. The idea of an innate set of grammatical rules was abandoned in favor of the idea of an innate *disposition* to acquire a language. This revision brought to the so-called Principles and Parameters approach, which postulates the existence of a network of general principles for language that leave undetermined a number of parameters. The specification of these parameters depends on the specifics of the developmental process of language acquisition (thus determining the particular first language acquired). Such approach has further distilled the so-called Minimalist Program, in which the principles of language are assumed to be unique to the human cognitive system but, at the same time, to be embedded in a complex cognitive system with (many) other subsystems. One of the aims of the Minimalist Program is to ascertain the relations between the principles of language and the characters of the other cognitive subsystems.

Chomsky and Searle may be seen as representing a shift of focus in the study of language where the *analysis* of meaning hand over the priority to the *production* of meaning and its underlying cognitive processes.

Philosophy of Language and "Science and Religion"

Language and the Natural Sciences

Language, especially if regarded as "production of meaning" requires to be studied as inserted in the broader context of the vast array of human cognitive faculties. Contemporary scientific research lines provide crucial insights in such

cognitive faculties, their anatomical substrates and their evolutionary origins. Few insights in such a direction are worth be mentioned here.

To begin with, Chomsky's follower D. Bickerton pointed out the relevance of the evolutionary origin of language for the proper understanding of such a faculty. Evolutionary biology (already at the time of C. Darwin himself) treats the phylogenetic processes that brought to *Homo sapiens*. Nowadays, research in scientific anthropology and *Homo* evolution provides further insights in the evolutionary processes leading to human language. There is mounting evidence that language evolution is strictly linked with another key (and peculiar) human cognitive ability: tool making and using. In particular, language could be coevolved together with the cultural transmission of tool making procedures within social groups. (The interested reader may refer to Nowak and colleagues' 2002 *Nature* paper; Corballis' *From Hand to Mouth*, 2002; Cela-Conde and Ayala's *Human Evolution*, 2007; D. Normile 2012 *Science* article).

Additional evidence for the connection between language and tool using/making comes from the cognitive development of infants. Language acquisition and learning to use objects as tools happen during the second year of human life according to parallel stages and depending on the available environmental and social stimuli. Such developmental studies (which may be traced back to J. Piaget's works) help complementing the Chomskyan "innatist" view. It could be maintained that human being possesses innate neurological and anatomical structures indispensable for language; however, stimuli coming from the children's social environment are as much crucial for acquiring language, thus suggesting that language acquisition is a biological and cultural process.

Cognitive neuroscience provides further insights in the matter. A recent burst in "neurolinguistics" research stems from the discovery of "mirror neurons." G. Rizzolatti and his group at the University of Parma (Italy) found a special kind of neurons in the area F5 of the macaque monkey that are activated both when the monkey

executes an action and when it observes a similar action performed by another monkey or by the experimenter (hence, "mirror" neurons). Successive research ascertained that an analogous system matching observation and execution of hand grasping movements exists also in the human brain and includes Broca's area. This area is since long known to be involved in language production and in processing grammatical or syntactical aspects. Moreover, Broca's area is specifically activated both in naming and in observing tools. The involvement of this area both in language and in the mirror system for action recognition prompted the formulation of the "Mirror System Hypothesis" aiming at suggesting that the mirror system in the Broca's area might provide a bridge between the ability of learning gestures and the present-day human linguistic abilities. (The interested reader may refer to M. Arbib's "From monkey-like action recognition to human language," *Behavioral and Brain Science*, 2005, no. 28).

Language and Anthropology

Tool using/making is certainly distinct from language in many respects. However, besides the connections between language and tool making envisaged in the previous section from the standpoint of some current scientific research line, these two activities have many other analogies too (Auletta (2011), Chaps. 19 and 23). Both are intentional and goal related. Both display a certain detachment from the immediately present reality (man-made tools have no obvious analogue in natural objects and language may convey meanings with no representational counterpart – e.g., notions like infinity and imaginary numbers, and even virtue or God). Syntactic and hierarchical organization is evident for language, but it is also required for complex tool making procedures requiring the planning and coordination of several steps. Both language and tool making (or, more generally, "technology") are fundamental dimensions of human culture. This suggests that tool making and language share fundamental traits of the *symbolic* faculty. Language, however, is the higher manifestation of such symbolic capability. It is difficult to

conceive symbolic thinking without any form of language. Indeed, symbolic capabilities not only need specific anatomical and physiological characters and cognitive faculties but also the possibility of combining external physical items: Typically, phonemes and graphemes are items of such a kind.

From this perspective, philosophy of language assumes a specific relevance for “science and religion.” Indeed, questions concerning the human being (the status of the human person, his nature, and his position in the universe) are central to such a field of investigation. Language, in its connections with the symbolic capability and with human culture, is to be considered one of the peculiarities characterizing the human being. Therefore, the philosophical investigations on language, especially if enriched by current scientific findings, play a central role in understanding the nature of human being, thus contributing to the (philosophical and theological) anthropological research.

Cross-References

- [Biological Anthropology and Human Ethology](#)
- [Developmental Psychology](#)
- [Meaning, The Concept of](#)
- [Philosophy of Mind](#)
- [Philosophy of Science](#)
- [Physical Anthropology \(Paleoanthropology\)](#)
- [Semantics](#)
- [Speech](#)
- [Truth](#)

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Philosophy of Mind

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Description

Philosophy of mind is a branch of philosophy primarily dedicated to analyzing conceptual and metaphysical issues regarding categories of mind, soul, self, representation, intentionality, thinking, consciousness, self-consciousness, and emotion. Although philosophy of mind is properly understood as a branch of philosophy, it is closely connected to psychology and other cognate disciplines in the cognitive sciences. Historically, philosophy of mind has roots in the writings of Plato and Aristotle, both of whom put forward theories of the human person and made distinct proposals concerning the nature and characteristics of the soul (*psyche*). In the early modern period (seventeenth to eighteenth centuries), philosophers showed new interest in questions pertaining to philosophy of mind, much of this work reacting to the original proposals of René Descartes, who argued that mind and body are distinct substances, with the mind described as a non-extended thinking thing, distinct from the mechanical operations of the body. Interest in the primary questions of the philosophy of mind as now understood waned during the nineteenth and early twentieth centuries but resumed shortly after the 1949 publication of Gilbert Ryle's *The Concept of Mind* (Ryle 1949).

Ryle famously mocked Descartes' mind-body dualism as a "ghost in the machine." Since Ryle, philosophy of mind has been primarily preoccupied with providing accounts of the reality and relation of psychological properties within the framework of philosophical naturalism. Early work focused on explaining the content and character of mental representations as well as the basic question of the relation of mind and brain. By the mid-1980s, consciousness became a major category of theorizing and reflection. More recent work has included understanding the relation of emotion and cognition as well as the concept of self with respect to the environment and new technologies.

Self-identification

Science

Generally speaking, philosophy of mind does not consider itself a science but rather a branch of philosophy. Despite this, the distinction between philosophy of mind and related areas in the sciences (psychology, cognitive neuroscience, artificial intelligence) is not very sharp, and some philosophers of mind have published articles in scientific journals, collaborated with scientists, or engaged directly in scientific research. Specific philosophical theories of mind have on occasion strongly influenced scientific practice, and scientific theories and experiments have historically been of considerable importance for the philosophy of mind.

Characteristics

Philosophy of mind is distinguished from other branches of philosophy by its subject matter, although there are inevitable overlaps between different subdisciplines (e.g., theories in moral philosophy or political philosophy may rely on claims about human nature that intersect with theories in the philosophy of mind). Although important overlap exists between philosophy of mind and related fields in the sciences, philosophy of mind is

distinctive in its emphasis on metaphysical, logical, and conceptual questions, rather than on empirical research.

Relevance to Science and Religion

Philosophers of mind have shown very little interest in religion in general or in the relation of science and religion. Because most philosophers of mind embrace philosophical naturalism, they are skeptical of religious theorizing about the human person that invokes supernatural categories, which they will point out tend to suffer from important evidential objections as well. Not all philosophers of mind are philosophical naturalists however, and so individual philosophers of mind may have an interest in science and religion issues, whether or not these are seen to pertain to their work in the philosophy of mind. In addition, the recent development of the new field of cognitive science of religion has drawn the attention of some philosophers of mind (e.g., Daniel Dennett), where the aim is to use the tools of cognitive science to explain why people hold to religious beliefs.

Sources of Authority

Categories of reason, logic, and empirical evidence are the primary sources of authority for philosophy of mind. When study of philosophy of mind reemerged in the mid-twentieth century, the primary influences were those of Anglo-American analytic philosophy and the work of Ludwig Wittgenstein. Although references were made to empirical data, the primary considerations were perceived to be logical and rational, clarifying the meaning of concepts and their implications. More recent philosophy of mind continues to employ this approach, but significant strands are importantly influenced by empirical data. More controversial are the roles of introspection and thought experiments, both of which are widely utilized but also much criticized.

Ethical Principles

The ethical principles of philosophy of mind are those that pertain to academic publication and discourse generally. There is no separate philosophy of mind society and no distinct code of ethics. Philosophers that do engage in empirical research are expected to abide by the standards of the relevant empirical disciplines they are participating in, including ethical guidelines for the treatment of animal and human subjects.

Key Values

Key values of the discipline are those generally found in academic professions, a concern to expand our knowledge and understanding of the world and ourselves. Clarity and precision is highly valued as well as original insight and the ability to bring a fresh perspective to interesting problems. Beyond this, individual values of individual philosophers may, and do, vary greatly.

Conceptualization

Nature/World

Philosophy of mind does not directly engage in defining or conceptualizing the categories of nature and world, although such conceptualizations inform the approach to research, the questions asked, and, to some extent, the answers given. Since most philosophers of mind are philosophical naturalists, the primary conceptualization of the world is in the terms that philosophical naturalism expresses. Since philosophy of mind is closely connected with cognitive science, the categories of science are important for interpreting what counts as natural. An important task of the philosophy of mind is coming to an understanding of the ontological character and status of mental properties and, more generally, the realities explored by the cognitive sciences generally. On this issue, there is considerable disagreement.

Human Being

There is no one theory of human beings put forth by the philosophy of mind. Rather, the philosophy of mind is centrally engaged in exploring the nature of human beings and, to a lesser extent, other cognizing creatures. Contemporary philosophers of mind bring an array of insights, models, and metaphors to understand human persons. Since most philosophers of mind reject any form of substance/supernatural dualism, the primary understanding of human beings is as purely natural creatures, sharing an evolutionary origin with the rest of life on the planet. Thus, the mind just is the brain or at least is realized in the brain in the context of body and environment. Philosophy of mind continues to be significantly influenced by information processing models of mental activity. Although earlier work was inspired by the relatively new advent of digital computers and the theory of computation underlying them, contemporary philosophy of mind is more inclined to speak of information processing in terms of parallel distributed processing and/or neural networks. Beyond this point, positions in philosophy of mind become more difficult to generalize. Philosophers of mind have historically attempted to take the vocabulary of our folk psychology, using terms such as thought, representation, emotion, and self and either clarify their meaning, provide them with some broader theoretical underpinning, or, in some cases, do away with them completely in hopes of finding a better alternative. In this theorizing, the cognitive sciences play an important but not necessarily determinative role.

Life and Death

Questions of life and death tend to be peripheral to the philosophy of mind but are not completely absent. Although philosophy of mind is not centrally concerned with definitions of life, its concern with definitions of mental properties such as thinking and consciousness lends some relevance to this task. Philosophers of mind have extensively explored to what extent computers or robots might be said to think or be conscious, and this is true to a somewhat lesser extent with animals, cellular automata, and possible alien

intelligence. Philosophy of mind can also have some relevance to debates about abortion in moral philosophy, since some arguments depend on claims made regarding the personhood of the fetus, and these in turn can rely on claims about when a fetus or infant can be said to think, be conscious, or experience pain. Similarly, philosophy of mind can also be of relevance to debates concerning euthanasia, especially those cases that involve claims about brain death, vegetative states, and the loss of personhood due to degenerative brain disease, stroke, or injury. An extensive literature in the philosophy of mind deals with the concept of self and continuity of the self, which relates strongly to the conceptualization of death and the possibility of an afterlife. An information processing model of the mind can be suggestive of the possibility of connecting brains to computers and, speculatively, replacing brain tissue with computer chips or even downloading the contents of one's self to a computer or robot.

Reality

A central question in the philosophy of mind is how to categorize the reality of mental properties, which seem *prima facie* problematic from the viewpoint of philosophical naturalism. Broadly speaking, mental properties may be understood to be either nonexistent or useful fictions, they may be understood to be identical with physical properties, or they may be understood to be realized in physical properties but not identical with any one set or configuration of physical properties (token identity) or real but not identical with physical properties at all, in which case some form of strong emergence or substance dualism would be entailed (Hasker 2001). There exists an extensive philosophical literature on how to characterize qualia (the qualitative contents of consciousness, e.g., the redness of a rose) and the extent to which they can be considered real and physically realizable.

Knowledge

Philosophy of mind approaches knowledge as a feature of cognition. Human beings know, and this knowledge is made possible by the interactions of the brain with the body and its

environment. As such, philosophy of mind is partially concerned with characterizing how its perceptions give rise to belief, how these beliefs are stored, and how knowledge is retrieved and utilized. In contemporary philosophy of mind, theories of knowledge may be deeply informed by discoveries and theories in cognitive science, as well as by preexisting philosophical commitments as to what counts as knowledge. Central issues may involve the relationship between knowledge and conscious representation, knowledge and language, and the relation of knowledge to categories of belief, memory, and understanding.

Truth

Philosophy of mind does not centrally engage in theories of truth, though it is informed by such theories and, as in the case of knowledge, may also inquire as to how truth is represented in a particular philosophical theory of mind. The tendency of philosophers of mind is to be realist in their orientation and to hold to either a correspondence or coherence theory of truth. In this respect, philosophers of mind's attitudes toward epistemological questions are sometimes closer to those of scientists in the cognitive sciences than to those in some other branches of philosophy.

Perception

Theories of perception have been of historical and continuing importance to the philosophy of mind, although that role has changed over time. Early modern empiricists such as John Locke were centrally concerned to provide theories of perception in order to provide a solid basis for a theory of knowledge. By the end of the twentieth century, the empirical study of perception had been largely taken over by psychology and neuroscience, which made significant advancements during this time. The data from this work, however, continues to play an important role in thinking about consciousness, representation, and intentionality. While there is broad agreement on key points in psychology and neuroscience, significant disagreement remains on those issues at the heart of philosophy of mind.

Time

Time has not been a central category for the philosophy of mind, although one area of interest has been the subjective experience of the flow of time and how temporal relations are processed by the human subject.

Consciousness

Consciousness as a separate category of philosophical reflection can be found in the writings of René Descartes and the philosophers of the seventeenth and eighteenth centuries who were influenced by or reacting to the claims made by Descartes. When renewed interest in the philosophy of mind began in the mid-twentieth century, theorizing about consciousness was conspicuously absent, likely due to the fact that the dominant philosophical and psychological approaches of the time were either indifferent or actively hostile to consideration of consciousness as a distinct kind of problem. Only by the time of the 1980s did it become increasingly acceptable to theorize explicitly about consciousness, and the 1990s saw widespread publication and consideration of consciousness.

An initial problem is being clear about what consciousness is, with most definitions having a kind of circularity to them, so that consciousness is described as subjective awareness, or the ability to have experience at all, or even the quality that is lost when one falls asleep. Definitional issues are connected to relational ones. Conceptually, consciousness seems like it should be linked to other psychological categories such as perception, thought, representation, and self-consciousness, yet consciousness does not seem to be identical with any one of these; for some philosophers, it seems possible that one can be conscious but unable to see, one can be conscious but not capable of thought, and so on. This difficulty of defining consciousness and stating its relation to other mental properties has led some philosophers to suggest that the concept of consciousness is either not intelligible or must be defined differently.

Granting that there is such a thing as consciousness, a major issue has been the ability of the physical sciences and, more generally,

a philosophically naturalistic philosophy to provide an adequate explanation of consciousness (Flanagan 2003). Explanations generally take one of four forms. The first is to assert that there is no problem at all and that consciousness is at best a useful fiction. Eliminative materialists argue that consciousness is one of those terms that derive from a prescientific folk psychology and that, as science advances, we should expect our existing folk psychology vocabulary to be gradually replaced by a scientific one. A second approach is to affirm the existence and reality of consciousness and mental properties in general but to assert that the properties are realized or supervenient on physical ones. A dualism is affirmed in this case, but it is a property dualism, rather than substance dualism. On these accounts, it is not unusual to affirm a token identity – any given mental event just is a physical event – but not type identity: consciousness cannot be identified with just one kind of physical structure, because of the multiple, perhaps infinite ways, that consciousness can be realized in the physical (in human brains, in chimpanzee brains, in robot brains, etc.). This form of dualism is understood to be non-reductive in the sense that the reality of consciousness is affirmed (it is not eliminated by reducing it to its constituents) but still physicalist, as it denies that there is any separate substance that constitutes consciousness and mental properties. Despite the attractiveness of this approach for many philosophers of mind, it has drawn sharp objections over the years, with a major line of argument being that property dualisms, relying as they do on information processing models of cognition, cannot adequately account for the qualitative richness (often referred to as *qualia*) of conscious experience and perception (Chalmers 1997).

The third route is to give up on existing physicalist models. One option is to argue that the answer to the explanation of consciousness lies at the level of physics, either in quantum mechanics or in some new theory yet to be discovered, a line of argument that has been prominently put forward by physicist Roger Penrose, among others. Similarly, advocates of what is called strong emergence argue for emergent properties

or realities that emerge only under specific conditions. Barring the success of either of these approaches, the only alternative would seem to be to return to a substance dualism, which continues to hold a small number of advocates. The seeming intractability of providing a satisfactory explanation of consciousness has led some to conclude that the problem is in fact unsolvable, perhaps because we lack the very cognitive resources to achieve a sufficient level of understanding. These new mysterians thus express some degree of skepticism about the whole enterprise of the philosophy of mind.

Rationality/Reason

Like consciousness, rationality is of considerable importance to the philosophy of mind, as the two are not infrequently linked. This linkage is found already in Descartes' *Discourse on Method*, where he argues that the presence of reason and language are signs of consciousness, and since animals allegedly do not show signs of either, other animals do not possess conscious awareness. The study of rationality leads further to the question of what exactly rationality consists in, as it is strongly related to concepts such as learning, logic, intelligence, insight, memory, understanding, and even less obvious concepts such as representation. Each of these represents separate areas of inquiry and debate, although the concepts are clearly linked. Underlying much of the philosophy of mind literature is an information processing model of cognition, understood either literally or metaphorically from existing models in the computational sciences. Some early philosophers of mind took the digital computer (a Turing machine) as a straightforward model, but as it has become clear that the human brain does not resemble a digital computer, models employing parallel distributed processing and neural networks have been employed (Churchland 1996). Even so, the model of the digital computer retains appeal because of its apparent similarity to the serial quality of conscious thought, and so philosopher Daniel Dennett has spoken of a virtual Turing machine that is realized in conscious thought processes (Dennett 1991).

Although rationality would seem to be inextricably linked with consciousness, it is commonplace to speak of the cognitive unconscious, as evidence from neuroscience and psychology shows that a great deal of information processing appears to go on in the brain below the level of conscious awareness. Although the cognitive unconscious of modern psychology is not the same as Sigmund Freud's conception of the unconscious, there are strong parallels, even though much of Freud's theorizing has very weak empirical support.

Two continuing areas of interest and controversy address how rationality is embodied and the question of mental causation. Beginning with the work of Noam Chomsky, one strand of thought among philosophers of mind, linguists, and psychologists has been to argue for a modular understanding of human rationality. In the case of language, it has been proposed that there exists a separate language module, located either in a specific area of the brain or in a coordinated set of areas, that explains the ease with which human beings are able to learn languages, an ability not shared with other species. This thesis has since been expanded to account for the variety of forms of reasoning that human beings are capable of engaging in as well as to explain why we seem to be particularly good at some reasoning tasks but not others. Contrasting with this approach is one that emphasizes the unitive character of rationality, which sees the different cognitive abilities of human beings as deeply connected in a single system.

The question of mental causation addresses a very different concern, which is whether and to what extent we can be said to be responsible for the thoughts that we have and whether in turn our thoughts can be said to have any causal power in the physical world. This issue is closely related to that of the issue of consciousness and the theories employed to explain consciousness. If physicalism is true, then it follows that consciousness and rationality are properties that emerge from and are supervenient on the physical. On a standard philosophical naturalist account, the world at the level of the physical is causally closed: for any given event, there is a physical explanation,

a physical cause or set of causes, for that event. But if mental properties supervene on physical properties, the question arises as to how mental properties could be said to cause anything, since a causal explanation is already provided by the physical. Accordingly, it is not thoughts that cause other thoughts, but rather the physical events underlying them, and if our thoughts do not have any causal relation to one another, it follows that there is no basis to have confidence that any of our thoughts, our reasons, are true (Kim 2000). For this reason, theories of consciousness tend to also be theories of rationality, and the problems that arise for how consciousness may be physically realized also arise for rationality.

It is important to note that while theories of rationality tend to be focused on human rationality, they also have important implications for how we think both of animal rationality and also the possibility of genuine artificial intelligence. As already observed, Descartes rejected the claim that other animals are capable of rational thought, but this view has been rendered considerably difficult by the now extensive data available on the cognitive abilities of other animals, especially social mammals. There also exists an extensive literature on the possibility of artificial intelligence. Although this literature directly addresses the possibility of computer or robot thought and consciousness, it not infrequently serves as a testing ground for what we mean by words such as consciousness, thought, and learning, for if computers can be said to think, it would suggest that we ourselves are but sophisticated, biological computers.

Mystery

Mystery does not typically occur as a central concern for the philosophy of mind, although it has been invoked by “new mysterians” who argue that the phenomenon of consciousness is beyond human grasp, and so genuine self-knowledge is impossible. This label is possibly misleading, however, since the new mysterians generally share the physicalist convictions of their opponents, differing only in their explanatory optimism.

Relevant Themes

Free Will: Although arguments and theories regarding the freedom of the will have not been part of the philosophy of mind proper, theories and arguments occurring in the philosophy of mind can have strong implications for conceptions of free will.

Emotion: It is only more recently that emotion as a category has been the subject of examination within the philosophy of mind, paralleling an increase in interest in related areas of cognitive science. This is partly due to a long-standing view in the history of philosophy that saw the emotions as subordinate to reason and grounded more in the body than in the mind, the effect of which was largely to cloud the ability to think. More recent theories engage the relation of biology and culture in understanding emotions, whether the human emotional repertoire is universal or culture specific, and by theories that examine the positive role of the emotions in reasoning and even as the result of rational processes themselves.

Ethics: The study of ethics is separate from the philosophy of mind, but some philosophers of mind apply current theories to issues in ethics. Theories in philosophy of mind can have clear implications for issues such as moral responsibility and agency, as well as specific issues in applied ethics, including abortion, euthanasia, and animal rights.

Cross-References

► [Functionalism](#)

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Philosophy of Organism

► Process Theology

Philosophy of Religion

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Related Terms

[Religious beliefs and philosophy](#)

Introduction

In the brilliant book *The Little Prince* (1946) by the French author Antoine de Saint-Exupéry, the author claims, in the voice of the little Prince, that children ought to have a lot of patience with grown-ups. If, for example, the little Prince tells grown-up persons what is the proof of his existence, that is, that he laughs and that he wishes to have a lamb, they shudder. But if the little Prince tells them about his origin in the language of numbers and facts – then they believe him. The conclusion to be drawn, the little Prince argues, is that those who understand life do not care for numbers.

Hence, we may ask whether a person dedicated to philosophy is claiming to understand life according to the little Prince or according to grown-up persons and their interest in number and facts.

Description

Philosophy of religion as a wisdom, therapy, or way of life is dated back to antiquity and the Greeks. The cradle of our history and culture, also when it comes to philosophy of religion, are the three important philosophers, *Socrates* (470 BCE–399 BCE), *Plato* (427 BCE–347 BCE), and *Aristotle* (384 BCE–322 BCE). But there are also several philosophical schools like the Stoics, the Epicureans, for example, that are crucial in the history of the philosophy of religion. We are still nourished from these wells whether we are philosophers or philosophers of religion. However, the way our questions have been formulated has developed from *why*-issues (the questions of origins) to *how*-issues (the questions of how things are connected) to issues of meaning (what does something mean?). By the help of these questioning words we can perceive important changes in interests and topics.

Contemporary philosophy of religion is a branch of philosophy but involves all main areas of philosophy: epistemology, ethics, logic, metaphysics, philosophy of history, language, law and politics, science and sociology, phenomenology, existential philosophy, etc. Philosophy of religion is founded on a long history of Western philosophical thought (Quinn and Taliaferro 2002). Philosophy of religion is not the same as philosophical theology which concerns using philosophical tools within a theistic perspective. Philosophical theology is often referred to as *faith seeking understanding* (Quinn and Taliaferro 2002). Furthermore, philosophy of religion is neither religious philosophy nor a philosophical religion (Dalferth 2000). Philosophy of religion is not a religious enterprise at all. However, the core of the academic discipline has changed over time. The most important change is perhaps the shift from philosophizing

about God to philosophizing about religion. This was a concern for G.W.F. Hegel, who complained that “[...] we at least hear much talk [...] about religion, and therefore all the less about God Himself” (Hegel 1962 [1832]; Westphal 2002). Nevertheless, Westphal writes, “it is ironic that we owe to him more than to anyone else the notion that there is a subdivision of philosophy called the philosophy of religion, that he develops this in his *Lectures on the Philosophy of Religion*, [...]” (Westphal 2002). Hegel’s lectures consisted in three parts: firstly, on “The concept of religion”; secondly, “determinate religion”; and lastly, “Consummate Religion.”

Contemporary philosophy of religion does not belong to any specific religious tradition. It has to be pursued as investigations independent of confession or specific ways of doing religion. A philosopher of religion writes *about* religion but needs not to have any bond to specific religious interests or practices. This implies the following about the philosophy of religion:

1. It is *normative*, which means that religions and their secular equivalents are not only subject to description but also to critical examination.
2. It is *pluralistic*, which implies that all religions, new as well as old, are studied by philosophers of religion.
3. It is *non-confessional*, implying that the philosopher of religion does not need to have any bond to the religion (or secular equivalent) he or she is studying.
4. It is *anti-confessional*, in the meaning that philosophy of religion would dictate that the philosopher may not share the belief he or she studies.

The task is to reflect upon what distinguishes and defines religion and religious phenomenon. A central question is the criteria of what is “religious” in comparison to what is considered to be “social” and “cultural.” Another related question is how religious experience differs from experience in general. Hence, the method of philosophy of religion consists in both conceptual and contextual analyses (semantic and hermeneutic tasks) as well as argumentative analyses (epistemological tasks). Philosophers of religion

may use work in other areas of philosophy such as metaphysics, ethics, philosophy of mind, logics, and so on (see above) to address the philosophical problems of their own subject matter (Quinn and Taliaferro 2002).

In such a matter, philosophy of religion seeks to find reasonable and acceptable ways of reflecting upon and talking about what is supposed to be of divine nature, and secondly, to discuss critically those assumptions that are already made. To *what* and to *whom* do these propositions refer, which claims do refer to the divine? Even though *epistemological* (is belief in God justified, is it rational to belief in God?) and *ontological* (is there a reality independent of the human mind?) questions are still in the foreground within the discipline the last 20 years have meant an interesting change in interests, due to, among other things, a linguistic turn. Questions are raised such as, do religious propositions or sentences refer to something beyond what we see and if so, to what?

Contemporary philosophy of religion is not without tensions. Indeed, four tensions can be identified: firstly, the tension that is a consequence of a meeting between religion and philosophy taking place; secondly, the tension consisting of philosophy of religion working with classical questions while at the same time reflect upon its own identity; thirdly, the tension due to the character of the discipline itself, namely, it operates with time and eternity, what is final and what is not; fourthly, the tension resulting from the discipline being to a certain extent ahistorical while the questions at the same time often are of historical origin.

Philosophy of religion is not static. The linguistic turn, the influences from postmodern and feminist thinking, the influence of the advances of science (neuroscience, cognitive science, microbiology, quantum physics), as well as a newborn interest for existential questions have opened up the discipline to new questions about life and society and interdisciplinary collaborations. Taken together, these tendencies imply a critical attitude to what assumptions that have been considered authoritative and to any unquestioned claims about truth and objectivity.

Different approaches influence and create new ways of questioning reality, knowledge, language, truth, and the meaning of life. Even though we have new questions and perspectives, the old ones are yet not to be forgotten. What keeps philosophy of religion together as a scholarly field, of time and change, is the theoretical attitude, the ability to argue and the continuous questioning and analysis of how a religious reality might be perceived and described.

Self-identification

Science

Philosophy of religion is related to the sciences due to contemporary philosophers of religion taking part in the debate of science and religion. The sciences they relate to both belong to the natural (e.g., neuroscience, evolutionary biology, and physics) as well as to the social sciences (e.g., sociology, anthropology, and psychology). Philosophers of religion may also take part in interdisciplinary research groups of which scientific disciplines take part. Typically, the philosopher of religion will engage in a critical conceptual and contextual analysis of the study or experiments, results and conclusions drawn by scientists studying religious phenomena and practices.

Religion

Philosophy of religion is a discipline that studies religions with critical methods (be it an analytic philosophical, a phenomenological, or continental philosophical method).

Characteristics

Firstly, as mentioned above, philosophy of religion is a branch of philosophy but involves all the main areas of philosophy. Secondly, it is distinctive among the other areas of philosophy because of its subject matters of study which enclose everything that concerns the question *what it is to be a human being*?

Relevance to Science and Religion

See also section Self-identification above. Philosophers have always been interested in natural, psychological, and social/political phenomena. Philosophers of religion became especially engaged with science when Charles Darwin's *The Origin of Species* was published 1859. The argument that every species is a development from previous species, which clearly implies that humans could have evolved from earlier and different forms of life, changed the way of thinking about life, including religion drastically. In *What is Darwinism*, 1874, the perhaps most influential theologian of the Princeton Theological Seminary of that time, Charles Hodge, wrote "In using the expression Natural Selection, Mr. Darwin intends to exclude design, or final Cause" (Livinstone 2001). The problem was that Darwinism was not only in conflict with Christianity but also with Natural Religion defended by Paley and others. The philosophical problem can be framed as *can two such conflicting be related and if so, how, at what price?* Even though the debate is still alive, contemporary philosophers of religion have other scientific fields of interest. Indeed, thanks to modern scientific technology, scientists, not least neuroscientists, have the possibility to study human phenomena that before were only discussed on the philosophers' tables, e.g., consciousness, free will, and religious experiences to name a few, but also gene manipulation, stem cell transplantations, cloning, etc. are subject to analyze by the philosophers of religion. Philosophers of religion also critically analyze fundamentalistic views such as ► [fundamentalism](#) itself, ► [creationism](#), ► [intelligent design](#) on the religious side, and different types of ► [scientism](#) on the scientific side.

Sources of Authority

There are many authorities, however, of great importance for contemporary philosophy of religion.

Logical Positivism or the Vienna Circle. The members of the circle were Moritz Schlick

(1882–1936), Otto Neurath (1882–1945), Herbert Feigl (1902–1988), Rudolf Carnap (1891–1970), Kurt Gödel (1906–1978), Friedrich Waisman (1896–1959), and Hans Reichenbach (1891–1953) and A. J. Ayer (1910–1989) as one of its foremost advocates in the English-speaking world. Ludwig Wittgenstein was invited by Schlick but did not become a member of the circle. What makes this source authoritative? Even if they all had different views, the main impact on philosophy of religion was to challenge the *meaningfulness* or religious language. This view became the source for dismissing metaphysics, theology, and religion as systems that make statements which cannot be verified. Perhaps the best known contemporary philosopher of religion endorsing this view is *Don Cupitt* who defends “anti-realism.”

Ludwig Wittgenstein (1889–1951). His idea of philosophy was that it should not involve explanation. Philosophy should be principally a contemplative activity. Perhaps the best known philosopher of religion following in Wittgenstein’s footsteps is the late Dewi Zephaniah Philips (1934–2006). Philips opposed to both skeptics dismissing religious beliefs as meaningless and apologetics trying to demonstrate the existence of God in different ways. To him, the task of a philosopher of religion is primary to help understand religion.

Feminism: It was a reaction against the dominance of men designing philosophy (of religion) during the seventeenth to nineteenth centuries. As Appellos argues in the present encyclopedia, “[The] emergence [of ► [feminist philosophy of religion](#)] as a sub-discipline in its own right is fairly recent. For several reasons feminist philosophical reflections on religion took place within departments of theology and religious studies long before they reached the departments of philosophy, where neither religion, nor gender were in high priority. Eventually feminist philosophers began interesting themselves in the subject of religion, in spite of feminism’s in general critical stance towards religion, largely identifying religion with patriarchal oppressive systems. Also the need rose within feminist theology for more philosophically stringent work.”

Ethical Principles

There are no distinctive ethical principles that are unique to philosophy of religion.

Key Values

Its broadness.

Conceptualization

Nature/World

God stands over nature: The classical view that God created nature and sustains it. This view can be dualistic in essence or dualistic in propositions. This view also reflects classical theism.

God and nature are one: This view is related to pantheistic religions, such as Buddhism, but has also influenced Western philosophers such as, for example, Baruch Spinoza (1632–1677), who saw all material to be parts of God. There are three main understandings of pantheism: (1) God is everything and everything is God (Owen 1971). (2) Everything that exists constitutes a unity and this all-inclusive unity is in some sense divine (MacIntyre 1967). (3) Every existing entity is, only one being. All other forms of reality are either modes (or appearances) of it or identical with it (Owen 1971).

God as in-and-above nature: It is a panentheistic view and a view today defended by many contemporary philosophers of religion. The term was coined by Karl C. F. Krause (1781–1832). One view is that the universe is the body of God but God’s awareness is greater than the sum of all the parts of the universe. All parts have some degree of freedom in cocreation with God.

Human Being

Philosophers of religion do not define human being but ask questions about what it is to be a human being. Is a human being different from other species, why or why not and in what sense? What does it mean to be a person? Also the question of ► [free will](#) is important in this connection. Do humans possess free will? If so, do

they possess this capacity entirely or partly and in what sense? Similarly, is there a difference between human ► [empathy](#) compared to other animal-empathy? How to understand human culture, religion, societies? Is human language unique or just a part of evolution open to other species? What does it mean to be conscious and to possess self-consciousness?

Life and Death

Because religions have their specific doctrines concerned with life and death, philosophers of religion investigate such assumptions. Most religions (if not all) have a doctrine that secures life after death in one or another way. Some claim that a physical resurrection will take place, others maintain that it is the soul, not the body that continues in eternity, and yet others see life after death as a part of natural processes in the sense that energy cannot be destroyed, hence, all life is energy, all life continues in one or another natural manner. Again others argue that immortality is to be found in the memory of others. Typically for philosophy of religion, these views are studied by way of conceptual and contextual analyses.

Reality

Earlier most philosophers of religion were occupied with ontological and metaphysical questions, which meant, how the world was created, how religion was “invented” and which reality is real. Metaphysics do no longer dominate the scene in the same way as before. But ontology is still gaining attention. Significantly, the ontological questions do not only focus on the metaphysical reality alone any longer; but around the existential situation and context of the human being. For a broad explanation on reality within philosophy of religion see the entries on ► [realism](#) by Eberhard Herrmann and Kees Van Kooten Niekerk.

Knowledge

As already mentioned above, a philosopher of religion works with questions concerning whether there is a reality independently of the human mind or not, if and on what ground it is

possible to gain knowledge of a reality different from the immediate and the observable world. Another but equally important question concerns whether religious propositions or sentences refer to something beyond what we see and if so, to what? Other questions raised are, for example, what does it mean to think and to have knowledge; what is the difference between belief and knowledge?

Truth

The question of truth was previously in the foreground. Contemporary philosophy of religion is rather interested with the *what*-question: what does it mean when someone says that God exists and what do we understand by that proposition. A distinction needs to be made between believing that something is true and that something actually is true. This line of thinking leaves open the possibility of errors. For instance, Hilary Putnam argues that “is true” can never be substituted by any other predicate P, for example, “is believed by us to be true,” since it is always possible to find a statement S such that S might have the property P and still not be true” (Putnam 1978; Strandberg 2005). Truth is not seen as a final goal for human development because that goal is not reachable; however, the cautionary use of “true” is always meaningful (Davidson 1999; Rorty 1991; Strandberg 2005).

Perception

The problem of perception is related to the problem of truth, especially in philosophical investigations of religious experiences. One view is that the experiencer is always passive in relation to her experience, i.e., the world presents itself to the experiencer. . . . Alston, for instance, argues that “to perceive a house is for a house to be directly presented to one’s experience” Alston (1991). McDowell (1994) calls a perceptual experience an “openness to the world.” The problem is that one can be mistaken about one’s perception, something which might be especially the case with religious experiences. This means that in order to tackle these problems theories of perception “need to [give] an account of perception which preserves what they take to be the

central, important or essential features of perception” (Crane 2011). But this apparent fact of openness is threatened by the existence of certain actual or possible phenomena – typically known as illusions or hallucinations. Hence philosophical theories of perception need to respond to this threat by giving an account of perception which preserves what they take to be the central, important, or essential features of perception. Theories that are put forward are the Sense-Datum Theory, The Adverbial Theory, and The Intentionalist Theory. Simply put, the sense-datum theory holds that if somebody has a sensory experience, there is something of which this person is aware (Broad 1923; Moore 1910; Crane 2011). The Adverbial Theory Suggests that when somebody experiences say something red, something is modified in a certain way, but there is no need to involve mysterious sense-data. This theory has less problems than the sense-datum theory because most agree that there are experiences but find sense-data controversial (Ducasse 1942; Chisholm 1957; Crane 2011). Finally the Intentionalist Theory (Or representationalist theory of perception) treats perceptual experiences as a form of intentionality or mental representation. However, there are several versions of the intentionalist theory, Crane (2011) considers the most important to be Anscombe (1965), Armstrong (1968), Dretske (1969), Pitcher (1970), Peacocke (1993), Harman (1990), Tye (1992, 1995), Lycan (1996) and Byrne (2001).

Time

The problem of time within philosophy of religion can be formulated as “If God is understood to be atemporal, timeless, how then could God act in temporal world, i.e., a world that is time dependent?”

Consciousness

It the core issue of the philosophical mind-body problem. Philosopher of religion treats this problem in the same way as philosophers of mind and phenomenologist do.

See entry on the The Problem of Consciousness by Harald Wallach.

Rationality/Reason

The problem of rationality and reason stand aloof from the philosophical movement of ► [rationalism](#). Reason denotes the human capacity to draw conclusions from a set of premises. Rationality concerns our propositions, beliefs, decisions, actions, behaviors, plans and strategies, persons, and so on. Stenmark (1995) makes a distinction between three types of rationality:

1. *Theoretical rationality*, he argues, is concerned with what we (or some other kinds of beings) should believe or accept.
2. *Practical rationality* concerns what we (or some other kinds of beings) should do or perform.
3. *Axiological rationality* then is concerned with what we (or some other kinds of beings) should value or prefer.

The main philosophical question is – What does it mean that a (religious) belief, person, decision, . . . is rational.

Mystery

Mystery can be defined in philosophy of religion. Subject matters of investigation are mysticism (Mystic experiences) (see entry on ► [mysticism](#) by Catharina Stenqvist) and ► [miracles](#).

Cross-References

- [After-Metaphysical Theology](#)
- [Feminist Philosophy of Religion](#)

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Philosophy of Science

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Description

Philosophy of science is concerned with philosophical questions that arise from reflection upon the scientific enterprise. The term encompasses both general philosophy of science, which deals with the epistemological and metaphysical foundations of the empirical sciences, and philosophical study of particular sciences, such as philosophy of physics, philosophy of biology, and philosophy of cognitive science. This entry is concerned with the field picked out by the former, more general sense of the term. To give an idea of the nature of this field, it is useful to survey a range of important problems and trends that have shaped the field and its development over time.

Logical Positivism

Philosophy of science emerged as a distinct area of professional philosophy in the first half of the twentieth century. Its rise was fueled and deeply influenced by a movement known as logical positivism, which originated in Europe, principally Vienna and Berlin, in the 1920s. The logical positivists were deeply impressed with the progress of science, especially physics; they were also struck by what they saw as the lack of progress characteristic of most traditional philosophy. They took this difference between science and traditional philosophy to be explained by the empiricist idea that all knowledge is ultimately based on experience: scientific claims are testable, hence can be known to be true or false by means of observation; philosophical claims – particularly those of traditional metaphysics – are not testable, and hence are not knowable. The positivists elevated this empiricist idea to the status of a basic principle, and asserted that only statements that were in principle testable by empirical means had “cognitive significance.” Any statements that were not testable were meaningless, in the sense that they could be neither true nor false. (Such “meaningless” statements can properly be used to express emotions or attitudes, but they do not *assert* anything.) The positivists believed that such a criterion revealed the emptiness of many domains of discourse previously thought to be meaningful – notably metaphysics, ethics, and theology. This was to be the basis of a program of reform that would convince the world to abandon inquiry in domains that did not admit of truth or falsity, and confine its discourse and its research to the verifiable and the scientific.

Over time, enthusiasm for the positivist notion of cognitive significance waned, as repeated attempts to turn the intuitive notion of empirical testability into a precise criterion of significance failed. No formulation put forward could both count as meaningful the more theoretical statements of the sciences and still exclude the statements of metaphysics it was intended to disqualify. These difficulties contributed to the development of a more moderate movement

known as logical empiricism, which dominated the philosophy of science until the 1960s. A central project of the logical empiricists was to analyze the logic of scientific methodology, with the aim of articulating canons of rational inference that would show how scientific knowledge was justified.

Induction, Confirmation, and Falsification

Scientific knowledge is supported by evidence drawn from observation and experiment, and hence inductive inferences are ubiquitous in the sciences. What characterizes an inference as inductive, in the broad sense of that term, is that evidence is taken to support the conclusion without establishing it with deductive certainty. Such an inference is also called *ampliative*, which term emphasizes that the conclusion goes beyond simply restating something contained in the premises. Questions about induction are also discussed under the heading of *confirmation*, a term used to indicate that the evidence under discussion lends some support to a hypothesis. An account of confirmation aims to specify how an observation must be related to a hypothesis in order to count as evidence for it.

One influential account of confirmation is known as hypothetico-deductivism, according to which a hypothesis is confirmed when consequences deduced from it are found to be true. This picture of confirmation seems to fit with the many cases in the history of science when a theory has become widely accepted because a variety of its predictions have been tested and found to be correct. But if any true consequence confirms a hypothesis, as hypothetico-deductivism would have it, unpalatable results follow: take any well-confirmed theory *T* and conjoin to it any hypothesis *H*, no matter how irrelevant. Then, since any correct prediction that follows deductively from *T* alone also follows from the conjunction *T*-and-*H*, it follows that every correct prediction deduced from *T* also confirms *T*-and-*H*, even though *H* is utterly irrelevant to the theory. Or again, any theory *T* deductively implies *T*-or-*O*, where *O* is any observable fact. Observation can then show that *T*-or-*O* is true, which would confirm *T*. Thus an intuitive

notion of confirmation very quickly begins to look unacceptable when formulated in terms of a purely logical relationship between evidence and hypothesis. The work of Carl G. Hempel (1905–1997) to formulate criteria for confirmation in purely logical terms revealed how extensive were the difficulties confronting this kind of project.

An influential response to the problem of confirmation was developed by Karl Popper (1902–1992). Guided by the insight that a test qualifies as a genuine test only if there is a real possibility of failure, Popper asserted that scientific testing should be seen as an attempt to falsify, rather than to confirm, the hypothesis under examination. He took the distinguishing mark of a scientific statement to be falsifiability; theories or belief systems that claim to be confirmed by empirical evidence, but do not expose themselves to the risk of empirical refutation by making precise predictions, are only pseudoscientific. Emphasizing the conclusive nature of falsification and the provisional nature of the decision to accept a theory that has not yet been falsified, Popper declared that the scientific enterprise does not rely on confirmation at all, but only on strictly deductive reasoning. If a prediction derived from a hypothesis turns out to be false, then the hypothesis is conclusively refuted. If on the other hand the prediction is found to be correct, then the hypothesis can be accepted provisionally and subjected to further testing. On Popper's view it is a mistake to take any number of successful tests to show that a hypothesis is true or probable; a hypothesis that has passed all tests so far has simply not yet been shown to be false.

Since on his view science does not involve confirmation or any form of inductive reasoning, Popper claimed that his account of scientific reasoning avoided the philosophical problems surrounding confirmation and induction. But Popper's rejection of confirmation gives rise to a serious objection: his account cannot justify scientists' reliance on a theory that has passed repeated tests in preference to an untested theory, when it comes to practical applications requiring predictions about the future. If the only measure of the acceptability of a theory is whether or not it

has failed a test in the past, then all theories that have never yet failed a test must be judged equally acceptable.

An important point about theory testing that was articulated by physicist and philosopher Pierre Duhem (1861–1916) and brought to the attention of the philosophical community by W. V. O. Quine (1908–2000) illustrates the complexities of falsification and confirmation alike. A typical scientific hypothesis has no directly observable consequences on its own, but must be conjoined with some combination of background assumptions, accepted theories, and auxiliary hypotheses in order for it to be put into contact with experience. For example, assumptions about the workings of a device such as a telescope are involved in making predictions about what will be observed by means of the device; and hypotheses about processes of decay and fossilization are required to determine whether a postulated prehistoric organism would have left fossil remains behind. This point may seem obvious, given how far removed from immediate experience most scientific hypotheses are, but it has important consequences. For one thing, it shows that it is a mistake to classify an individual hypothesis as testable (or untestable), except relative to a given body of background knowledge. It also implies that falsification is not as unambiguous as it might at first seem to be. A prediction made for the purposes of testing a particular hypothesis is actually derived from the conjunction of multiple hypotheses, and a negative test result entails only that at least one hypothesis in the set is false. Logic alone does not force the rejection of any particular hypothesis, and so scientists must rely on other considerations – such as how well confirmed they take the various hypotheses in the set to be – to determine which one to reject.

Theory Change

The focus by philosophers on the *logic* of science, conceived of as something that could be understood in abstraction from the circumstances within which theories are actually formulated and evaluated, faced a wave of opposition in the 1960s. A number of thinkers contributed to a shift

that turned the focus of philosophers back to the history of science; notable among them is Thomas Kuhn (1922–1996), whose 1962 book *The Structure of Scientific Revolutions* has come to be seen as a pivotal work in reshaping the philosophy of science (Kuhn 1996).

Kuhn rejected the conception, prevalent within the logical approach, of a scientific theory as a set of sentences from which predictions could be deduced, and he introduced the term “paradigm” as the label for his own richer conception of a theory. The core of a Kuhnian paradigm is a concrete scientific achievement that serves as a model for the solution of problems within a particular field. This past achievement is the central element in a broad framework of group commitments, which includes not only the explicitly stated laws emphasized by the logical approach, but also a variety of other commitments common to a particular scientific community – such as commitments to instruments and methods, metaphysical commitments, and shared values.

According to Kuhn, two fundamentally different kinds of process are evident in the history of science, normal science and scientific revolutions. Normal science is science as practiced under a single accepted paradigm. Normal scientific research is not intended to test the fundamentals of the theory – either in the sense of aiming to confirm or to falsify them – but instead takes these fundamentals for granted and seeks to resolve problems from within the framework based on them. The problems worked on are those that the theory itself suggests are both valuable and tractable, and a failure to solve a problem is seen as a failure of the scientist, not of the theory. Within normal science, progress is cumulative and obvious.

A scientific revolution is precipitated when a new paradigm arises as a rival to an accepted paradigm. A debate over fundamentals ensues within the scientific community, and adherents of the rival paradigms strive to persuade their fellow scientists of the superiority of one over the other. If the majority of the scientific community eventually accepts the new paradigm, then a revolution has taken place, and the new paradigm

replaces the old as the basis for normal scientific research.

The most controversial aspects of Kuhn's account have to do with his claim that different paradigms bring with them different standards of evaluation. According to Kuhn, a paradigm determines which problems are considered scientific and what qualifies as an acceptable solution. As a result, the competition between rival theories during a revolutionary period cannot be settled just by appeal to a single accepted set of standards. Where earlier views had portrayed a choice among competing theories as settled solely by appeal to logic and experiment, Kuhn instead used the language of "persuasion" and "conversion" to describe how scientists came to accept a new paradigm, and he insisted on the role of such factors as cultural views, historical accidents, and personal experience in the process.

Critics attributed to Kuhn the view that theory choice is not a rational process; he replied (e.g., in the Postscript written for the second edition of *Structure*) that this was a misunderstanding, due in part to the erroneous notion that theory choice, if rational, would have to be explicable in terms of a method that would uniquely favor one theory over another. Kuhn said that theory choice should instead be thought of as a decision about which problems are most important and about which of the available theories would be more successful in guiding future research. Such a decision can be made for good reasons; notably, it can be guided by values universally accepted in the sciences – values such as predictive accuracy, simplicity, and fruitfulness. But since it is in effect a kind of value judgment, theory choice is liable to the same kinds of disagreements as other value judgments (such as disagreements over how to apply standards in individual cases, and how to weigh considerations of particular values that pull in different directions).

Scientific Realism

Debates about scientific realism are concerned with the aims and epistemic reach of scientific theorizing. Realists contend that science aims at a true description of reality, and that it is reasonable to think that contemporary science succeeds,

to some degree, in revealing the hidden structure of the world. Antirealists reject these statements.

Antirealist motivations come from a variety of sources. One source is a belief in the limited reach of human knowledge. Traditional empiricism, with its emphasis on subjective experience as the source of all knowledge, tended to suggest that human beings are trapped behind a "veil of ideas," without sufficient resources for achieving knowledge about a world behind the appearances. A second source of antirealism is reflection upon the history of science. Larry Laudan (1996/1981) appeals to a long list of examples of once successful but now rejected theories to make the case that throughout the history of modern science, even the core elements of the most successful theories have eventually been rejected as a result of the continued progress of science. Taking the past as a guide to the likely fate of contemporary theories, it is argued, shows that confidence in the essential correctness of current theories is unwarranted (an argument known as the pessimistic induction from the history of science). A third source of antirealist motivation is reflection about the aims of the scientific enterprise. Bas van Fraassen's "constructive empiricism" is a notable contemporary antirealist view based on the contention that scientific theories are human constructs used for a variety of purposes – making predictions, manipulating nature, and explaining what we observe – and that theories can serve these purposes provided that they are correct in what they say about the observable world. Truth about the unobservable is not required for a theory to be successful; hence, there is no benefit to taking the additional epistemic risk of claiming that a theory is correct even in its account of what is unobservable (van Fraassen 1981).

Realists too have argued for their position in a variety of ways. Drawing on the way scientists often argue for the truth of particular theories, realists such as Ernan McMullin (1984) claim that even though predictive success alone may not warrant confidence in the approximate truth of a theory, various other theoretical virtues such as explanatory power, coherence, and especially fertility – characterized by a theory's ability over

time to guide scientists to successful novel predictions and explanations of phenomena outside the theory's original domain of applicability – do warrant such confidence. Current realist discussions tend to argue for realism with respect to individual theories or domains of scientific inquiry, rather than presenting arguments intended to support realism with respect to all of contemporary science. Anti-realist arguments have also led some scientific realists to characterize their views not in terms of truth of theories, but in terms of the reality of entities (so-called “entity realism”) or mathematical structures (“structural realism”) posited by scientific theories. (See Papineau (1996) for a number of influential articles concerning scientific realism, and Psillos (1999) for a defense of realism that examines arguments on both sides of the debate).

Self-identification

Science

Philosophy of science does not self-identify as a science, but rather as a part of philosophy. However, there is no firm boundary between scientific and philosophical inquiry. Historically, the natural sciences arose out of philosophy itself, in conjunction with various technical and practical disciplines such as mathematical astronomy and medicine. Only after the development of a framework of theory and technique that allowed a community of specialists to use empirical methods to systematically investigate domains of inquiry previously classified under “natural philosophy,” did particular sciences such as physics and chemistry come to be thought of as empirical disciplines distinct from natural philosophy.

Even within the natural sciences as we know them, philosophical questions arise. The theoretical and methodological questions that confront a scientist who is constructing a theory or choosing between rival theories are often philosophical in nature, and many great scientists, including Galileo, Isaac Newton, Charles Darwin, Albert Einstein, and Neils Bohr, have made influential contributions to philosophical thought about nature, scientific theory and method, and human

knowledge. Today, philosophers who specialize in the study of particular scientific theories, such as quantum mechanics or evolutionary theory, work to clarify conceptual issues that arise within the theories they study, often in conversation with scientists.

Characteristics

Philosophy of science is distinguished from other subfields within philosophy only by its specific focus on questions that arise from reflection on the scientific enterprise. In fact, there is extensive overlap between philosophy of science and other subfields of philosophy. For example, many of the issues studied in philosophy of science are concerned with knowledge, and hence belong to epistemology. Others are concerned with the nature of reality, and hence belong to metaphysics. Still others belong to philosophy of language, logic, or social philosophy, to name only a few other areas that overlap with philosophy of science.

Philosophy of science also overlaps with fields outside of philosophy, notably history of science and sociology of science. In addition, there is considerable overlap between the philosophy of particular sciences and the more conceptual or theoretical parts of these particular sciences themselves.

Relevance to Science and Religion

One area in which philosophy of science has had significant impact on discussions of science and religion is in discussions of so-called criteria of demarcation, i.e., criteria by which scientific theories can be distinguished from nonscientific theories or belief systems. This is a question of long-standing interest to philosophers of science; the logical positivists and Karl Popper developed influential responses to this question in the first half of the twentieth century, as discussed above. The treatment of this issue by philosophers of science has had more than purely academic significance as well: In the United States, court cases

challenging the constitutionality of laws mandating the teaching of Creation Science and Intelligent Design as alternatives to evolutionary theory in public school science classrooms have seen expert testimony from philosophers of science. In two well-known cases tried in federal courts, namely *McLean v. Arkansas* (1982) and *Kitzmiller v. Dover* (2005), philosophers of science were called upon as expert witnesses to articulate distinctive features of science, and the judges in these cases explicitly drew upon the philosophers' testimony in their decisions, both of which asserted that the theories at issue – Creation Science and Intelligent Design – did not qualify as science and were instead inherently religious belief systems. It should be noted, however, that most philosophers of science regard it as impossible to identify strict criteria for distinguishing science from non-science.

A related issue sometimes treated by philosophers is usually discussed under the heading of "methodological naturalism." The intuitive version of the idea is that a scientific theory cannot appeal to God or other supernatural beings to explain natural phenomena. Philosophers have tried to give precise formulations of this principle, and to present or evaluate reasons why it should (or should not) be considered an essential characteristic of science (see, for example, Boudry, Blancke, & Braeckman (2010)).

Sources of Authority

As in all other areas of philosophy, argument plays a dominant role and authority a comparatively small role. It could be said that rational argument is the primary source of authority for philosophy of all kinds.

In philosophy of science specifically, currently accepted scientific theory and the consensus of the relevant scientific community are quite authoritative. There is a sense that philosophers should be guided by scientific practice, rather than trying to legislate for scientists. Philosophers of science also look to the history of science, and in particular the brilliant scientific

successes of the past, as authoritative sources regarding what qualifies as good scientific reasoning. In a similar way, the philosophical contributions of eminent scientists who have reflected on the nature of the scientific enterprise, on scientific methods, and on the philosophical implications of their theories – thinkers such as Einstein, Darwin, and Newton – are held in high regard and often held up as sources of particular insight.

Ethical Principles

Philosophy of science is guided by the same ethical norms that guide academic philosophy more generally. To pick out these norms, it is helpful to identify virtues that a philosopher should pursue. These would include virtues related to the cultivation of knowledge, such as willingness to cultivate talent and generosity in sharing results; virtues related to the exchange of ideas, such as intellectual humility, charity in interpreting others, and respect for one's interlocutors; and virtues of intellectual honesty.

Key Values

Philosophers value the pursuit of knowledge for its own sake, and in their work they value particularly cogent argumentation, clarity, precision, and insight. In the philosophy of science, the quest to develop philosophical accounts of various aspects of science has tended to be guided by two values that often seem to be in tension with each other, namely, generality and accuracy. More general accounts have tended, other things being equal, to be favored over accounts that are less general (e.g., accounts applicable to a broad segment of the natural sciences have been tended to be sought after as more desirable than accounts specific to one narrow scientific field). But faithfulness to the actual details of science as practiced is also valued, and it is increasingly common for philosophers of science to object to general accounts on the grounds that these fail

to respect the marked differences between the particular sciences.

Another key value of philosophy of science is a very high regard for science. Indeed, the rise of this field as a distinctive part of philosophy is partly motivated by the view that science is an extraordinarily powerful way of gaining knowledge, so that study of this way of knowing might reveal something fundamental about the very nature or extent of human knowledge.

Conceptualization

Nature/World

'Nature' is often identified with the totality of what exists in space and time; it is sometimes identified, more restrictively and more tendentially, with whatever can in principle be described or explained by the natural sciences (where physics, chemistry, and biology are typically assumed to be the paradigmatic natural sciences) or with that which is subject to natural law.

Human Being

Philosophy of science seeks to understand how human beings come to know about the world via scientific inquiry. Therefore it is concerned with human beings insofar as they are the developers and practitioners of this complex, socially organized, way of exploring the world, and beings who construct scientific knowledge. Of course, human beings are also the *objects* of scientific study, and our understanding of such things as human perception and reasoning and social institutions is properly shaped and informed by sciences including biology, psychology, and social science. Therefore philosophy of science considers human beings as both the creators and objects of scientific knowledge.

Life and Death

Philosophy of science looks to biology to define life and death. Hence life is understood as the presence of (or capacity for) biological activities such as metabolism and reproduction, and death as the absence of these activities.

Reality

Philosophers of science typically take the empirical sciences to be particularly authoritative sources of knowledge of reality. This high regard for science inclines many philosophers of science toward a scientific realism that accepts the theoretical claims of the sciences as accurate descriptions of reality. Scientific anti-realists, on the other hand, are skeptical of the ability of the sciences to provide knowledge of what is unobservable, and accept as accurate descriptions of reality only the claims of the sciences regarding what is observable.

As to the question whether there is anything beyond the natural world: ontological naturalism, which identifies reality with the physical or the natural world, is a fairly widespread view among analytic philosophers in general and among philosophers of science in particular. But this is by no means a universal view, and the question whether reality contains anything beyond the natural world is largely irrelevant to the way most philosophy of science is practiced.

Knowledge

A working definition of knowledge commonly used by philosophers says that knowledge is *justified true belief* – that is, in order to count as knowledge, something one thinks or believes must be *true*, and one must have *good reason* for believing that it is true. This definition of knowledge is subject to some famous counterexamples, but it still widely used as a working definition.

Truth

The nature of truth is a topic of perennial philosophical debate. In contemporary philosophy of science, this issue arises especially in the context of discussions about scientific realism. One traditional way of thinking about truth takes it to be a kind of correspondence between language or thought and reality; critics have always claimed that this conception of truth presupposes what is impossible, namely, a standpoint from which humans could observe both their thoughts and mind-independent reality, and compare the two. Kuhn voiced a contemporary version of this

objection when he noted that, as all knowledge of the world is informed and mediated by theory, scientists have no way to compare a theory directly against some theory-free version of reality. Combining this skeptical response to truth as traditionally understood with Kuhn's emphasis on the social nature of scientific knowledge, some philosophers and sociologists of science embraced the view that what is true for a community is whatever is accepted by that community; but relativism of this sort is hardly recognizable as a conception of *truth* at all. Some philosophers have responded to the deep and divisive debates over the nature of truth by maintaining that we should eschew theories of truth altogether. Arthur Fine (1996/1984) has advocated a version of this position as the proper response to debates over scientific realism: what he calls the "natural ontological attitude" endorses the claims of currently accepted scientific theories, but refuses to burden this endorsement with commitment to any substantive theory of truth.

Perception

Scientific knowledge depends on empirical evidence which itself is ultimately known by way of sense perception. But perception cannot be thought of as a source of data that is wholly neutral arbiter of competing theories. All observation, all perception is theory-laden, in the sense that an observer's prior beliefs about what she is looking at will both direct her attention to certain features of it and inform the way she identifies what she sees.

Time

In most scientific theories, time is represented as a parameter or a dimension according to which physical events are ordered. Intuitive features of time that are not captured by such representations, especially the passage of time and the asymmetry between past and future, have long been subjects of interest to philosophers of science. Some philosophers have argued, for example, that the passage of time is an illusion, since the way time is represented in fundamental physical theories does not include or give rise to

a notion of passage. Others have sought to explain how these features could be grounded in, or reconciled with, scientific representations of time in which they do not appear explicitly.

Consciousness

Questions about the nature of consciousness belong primarily to philosophy of mind rather than philosophy of science, where consciousness is typically thought of as grounded in the neurophysiological structures of complex biological systems. Philosophers of science do discuss questions about the relationship between consciousness and the underlying biological or neurophysiological processes—whether, for example, consciousness and other psychological capacities are reducible to, or emergent from, such processes. These issues are continuous with more general questions belonging to philosophy of science about relationships between properties or systems described by different sciences or at different levels, e.g., between biological systems and their physical components.

Rationality/Reason

Philosophy of science is deeply interested in making sense of the standards of rationality that govern (or should govern) scientific reasoning. Traditional attempts to make sense of the rationality of scientific inference have sought rules specifying which inferences are, and which are not rational. By far the most popular system of this kind today is called Bayesianism, after English clergyman Thomas Bayes (1702–1761) and the theorem in probability theory that bears his name. Bayesians construe rationality as a matter of conforming one's degrees of belief to the probability calculus; rationality is then a matter of adjusting one's degrees of belief by the appropriate amounts (specified by Bayes' theorem) each time some evidence comes in.

Critics of this kind of approach maintain that the rationality of scientific inferences cannot be assessed solely in terms of universal rules. Some philosophers argue that a scientific inference is typically so dependent on background knowledge specific to the particular domain in question that strictly local standards of evaluation must be

invoked. (For a defense of a local approach to inductive inference, as well as a brief description of Bayesianism, see Norton (2005)).

Another important approach to rationality in philosophy of science follows Kuhn in emphasizing the social nature of the scientific enterprise. On this view, it is a mistake to think of rationality in terms of principles of reasoning that could in principle be applied by individual scientists. The contributions of an individual scientist become part of accepted scientific knowledge only through a complicated process involving the critical evaluation, modification, and application of the individual's ideas by the scientific community. Thus to explain or assess the rationality of scientific knowledge and the process that produces it, one must examine the community structure of science (see Longino 1990).

Mystery

The term “mystery” is not commonly used in philosophy of science, but it might be used informally to mean what is not yet known, or what may never be known.

Relevant Themes

Philosophy of science is concerned with understanding and articulating general conditions under which an empirical fact constitutes evidence for (or against) a theory or hypothesis; it is also concerned with identifying distinctive features of the scientific enterprise; and it shares with all branches of philosophy an emphasis on the formulation and evaluation of reasoned arguments. So it is natural that some philosophers of science deal directly with disputed questions having to do with science and religion in which arguments about evidence and the nature of science play a central role. Philosophers of science have written extensively in recent decades about evolution and creationism, and more recently about evolution and intelligent design theory. They have also written on classic and contemporary design arguments that take scientific knowledge about some particular kind of order within the natural world—e.g., the complexity of

functional systems within living things, or the way that the fundamental physical constants of our universe are “fine-tuned” to allow the existence of life—as evidence for the existence and purposive action of God. It is fair to say that most philosophers of science who treat such topics are critical of arguments that purport to show that religious beliefs can be scientifically justified; they are likewise critical of arguments that attempt to support alternative hypotheses primarily by denigrating accepted scientific theories.

Philosophy of science is also concerned with formulating accounts of concepts such as *natural law* and *causation*. This makes it relevant to any topics in the domain of science and religion in which such concepts play a central role, including the topics of miracles and of divine action.

Cross-References

- ▶ [Classical and Quantum Realism](#)
- ▶ [Critical Realism in Theology and Science](#)
- ▶ [Epistemology](#)
- ▶ [Metaphysics](#)
- ▶ [Naturalism, Ontological and Methodological](#)
- ▶ [Philosophy of Mind](#)
- ▶ [Physics](#)
- ▶ [Rationality \(Philosophical\)](#)
- ▶ [Religion and Pseudoscience](#)

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Physical Anthropology (Paleoanthropology)

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Related Terms

[Biological anthropology](#)

Description

Physical Anthropology (or Biological Anthropology) is the biological branch of Anthropology that studies human and primate evolution, adaptation, and variation. This discipline includes a variety of subdisciplines such as primatology, paleoanthropology, paleoneurology, molecular anthropology, human biology, osteology, paleopathology, forensic anthropology, and archaeoethnology. Physical Anthropology was

developed in the second half of the nineteenth century and was supported by the first discoveries of human fossils and the general acceptance of the notion of the evolution of species (► [Evolution](#)). At the beginning of the twentieth century, the concept of race and the (mis)use of anthropometry in the assessment of behavioral characteristics were widely spread. These typological approaches were strongly criticized after the Second World War and are currently obsolete. This critique led to a renewal of the discipline (Henke 2007).

Self-identification

Science

This discipline self-identifies as a natural science. Its methodological and analytical approaches to the study of the human body, human fossils, and populations are the same as any other science. Although some works from the nineteenth and beginning of the twentieth centuries were influenced by philosophical and religious considerations (such as the relationship between consciousness and original sin), anthropologists today emphasize scientific rigor. New discoveries sometimes necessitate a revision of earlier concepts or explanations of human evolutionary history. Such revision is always delicate because a large amount of geological and biological data must be taken into account.

Physical Anthropology proceeds according to the scientific method; new data are routinely integrated into hypotheses, and these hypotheses are revised when they do not explain new facts (Washburn 1953; Henke 2007).

Religion

Because of its interest in the human origin, this field is sometimes confronted with religious and philosophical questions (Origin of Life; ► [Creationism](#)). Although questions about the development of human cognitive abilities are usually approached with biological data, this discipline can address philosophical issues. Moreover, the question of the unique or multiple origins of modern humans has some theological

and philosophical implications and has long been a controversial topic in paleoanthropology. Reliably dated hominid specimens suggest that anatomically modern humans developed in Africa. There is, however, an ongoing debate, sometimes more philosophical than scientific, about the possibility or degree of interbreeding between modern humans and other penecontemporaneous fossil groups, such as European Neanderthals.

While Physical Anthropology does not define itself as a religion, this science is often confronted with delicate questions that relate to religious concerns.

Characteristics

Physical Anthropology is at the intersection of the natural and social sciences. Over time, it has moved from descriptive studies to the investigation of processes and behavior; this change was brought about by the integration of the problems of human evolution into the field of mammalian evolutionary biology (► [Biological Anthropology and Human Ethnology](#)). However, discussions of the issues raised by this discipline should integrate data and results from paleontology, genetics (DNA), population genetics, and diverse medical sciences, as well as from Cultural Anthropology disciplines like archaeology, ethnology (► [Ethnology](#)), or even linguistics.

Relevance to Science and Religion

As mentioned earlier, Physical Anthropology is interested in the philosophical and theological boundaries of questions about the origins of *Homo sapiens* and the development of consciousness and language (► [Humanities](#); The Problem of Consciousness).

Sources of Authority

The main sources of authority for this discipline are empirical data stemming from fossil remains and from extant modern human populations.

In addition, the work of several prominent scientists has contributed to the emergence and development of this discipline. For example, Charles Darwin's (1859) discussion of natural selection as the mechanism of evolution was reinforced in 1900 by the rediscovery of Gregor Mendel's work on the laws of heredity. Throughout the nineteenth century, increasing archaeological evidence of the antiquity of humankind was found (e.g., Schmerling 1833; Boucher de Perthes 1847–1864; de Puydt and Lohest 1887). Paul Broca, the founder of the Société d'Anthropologie de Paris (1959), established Biological Anthropology as a scientific discipline and was one of the first to use statistical concepts to understand anatomical patterns of variation (Spencer 2007).

Around 1930, R. Fisher, J. Haldane, and S. Wright developed the basic principles of population genetics. Later, the Russian geneticist and evolutionary biologist T. Dobzhansky, the American paleontologist G.G. Simpson, the German evolutionary taxonomist E. Mayr, and the British biologist J. Huxley founded the synthetic theory of evolution that help to reconstruct phylogenetic processes (Henke 2007).

The success of the theory of punctuated equilibrium, proposed by N. Eldredge and S.J. Gould (1972), and the impact of cladistics (a method of classifying fossils and living organisms based on shared homologous derived traits), have contributed to conceptual changes in the representation of human evolution.

Finally, peer review currently helps to produce authoritative research in which new scientific ideas are developed and evaluated.

Ethical Principles

Physical anthropologists face a variety of ethical issues since their research deals with human and animal subjects (► [Deontology](#); Turner 2005). In research focused on genetics and extant human diversity, physical anthropologists follow the bioethical principles established by the Nuremberg Code (1947), the Declaration of Helsinki (1964), and the Belmont report (1979).

In the USA, the Animal Welfare Act (1985) set ethical principles for primatologists. Finally, there are several codes of ethics from anthropological associations for skeletal biologists working with local populations and for paleoanthropologists who face questions about access to and ownership of fossil material. These include the codes of ethics from the AAA (American Anthropological Association), the AAPA (American Association of Physical Anthropology), the BABAO (the British Association for Biological Anthropology and Osteoarchaeology), and the AAS (Australian Anthropological Society). The NAGPRA (Native American Graves Protection and Repatriation Act, 1990) regulations also apply to Native American artifacts and skeletal remains, and the UK Human Tissue Act (2004) makes provisions about activities involving human tissue or the transfer of human remains from museums.

Key Values

Because the main goal of Physical Anthropology is to clarify the biological emergence of humankind and the processes of human evolution and adaptation, the field requires the following key values: integrity, empiricism, curiosity, ethical behavior regarding the subjects of research, open-mindedness, idea reappraisal, and doubt.

Conceptualization

Nature/World

Nature is the living environmental frame, and the world is the geographic and geological frame within which human evolution occurs.

Human Being

The classical definition of a “human being” is a member of the genus *Homo*. Following recent developments (Wood and Collard 1999), a specimen can be included in this genus only if it has (1) an estimated body mass and proportions that are more similar to *H. sapiens* than to *Australopithecus*, (2) human-like obligate bipedalism and a limited facility for climbing,

(3) a modern, human-like extended period of growth and development, and (4) a masticatory system closer in relative size to that of modern humans than to *Australopithecus*.

Life and Death

Life refers to any entity that manifests self-sustaining biological processes such as metabolism, growth, reproduction, or adaptation.

Death is defined as the cessation of these biological processes. Among past and extant human populations, the death of one member of a group is often associated with funerary practices (Death, anthropological view). Through the study of taphonomical processes that occurred after the deposition of a dead body, one branch of Physical Anthropology (Archaeoethanatology) tries to identify and reconstruct these practices.

Reality

Reality is considered to be the physical world and living nature in which humans evolve and interact.

Knowledge

Knowledge comes from the empirical study of the reality.

Truth

The empirical experience on which Physical Anthropology relies cannot be exhaustive. As a consequence, our knowledge about human origins, evolution, and variation is limited by accessible data. Our conceptions are changing and adapt to new discoveries and new ideas. Ultimate “truth” in Physical Anthropology is therefore unreachable, although empirical data offer true sources of information.

Perception

Perception is the way we feel about reality. It is based on the biological senses but is subject to individual interpretation.

Time

Time, and particularly geological time, is one of the main dimensions of the discipline. It is an

important point that integrates the notions of development, variation, and evolution.

Consciousness

The apparition, development, and degree of consciousness in *Homo* and closely related primates are ongoing and elusive questions in Physical Anthropology (The Problem of Consciousness). Consciousness is probably related to a combination of factors, including the development of the brain, language, socialization, empathy, abstraction, and introspection. Most of these factors cannot be investigated with biological data alone.

Rationality/Reason

As in every scientific field, rationality/reason is one of the primary mental tools used in the analysis of data. Physical anthropologists must apply the basic inductive-deductive rules of science. However, because Physical Anthropology involves the understanding human origins and evolution (i.e., *our own* origins and evolution) subjectivity and irrationality are dangerous possibilities. We must separate ourselves from the subjectivity produced by the close relationship between ourselves and our subject of study.

Mystery

The term “mystery” could be used when a new discovery disrupts the established ideas of the discipline; the discipline will attempt to clarify the new discovery rationally.

Relevant Themes

The evaluation of the development of consciousness during human evolution and the related notion of the origins of “humanity” and “human-kind” are central questions for Physical Anthropology and engage with questions of science and religion. While Physical Anthropology relies on empirical data, some interpretations of these data could cross the critical boundary between science and religion.

Cross-References

- [Biological Anthropology and Human Ethology](#)
- [Creationism](#)
- [Deontology](#)
- [Ethnology](#)
- [Evolution](#)
- [Humanities](#)

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Physical Determinism and Indeterminism

- [Determinism and Indeterminism](#)

Physical Knowledge

► [Physics in Catholicism](#)

Physical Optics

► [Electromagnetism and Optics](#)

Physical Suffering

► [Pain Medicine](#)

Physicalism

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A narrower view than naturalism, although it holds similar views, in ruling out the supernatural. It restricts reality in a metaphysical way to the physical world, and defines the “physical” in terms of what is within the reach of (actual or possible) physics. In contrast to “naturalism,” it thus restricts reality not just to what is natural, or accessible to the natural sciences, but specifically to what is explicable by physics. It champions a reductionist position, according to which all science can, and should, be ultimately couched in the language of physics, which can produce a “Theory of Everything.” There are no emergent properties, or different levels of reality, open to different forms of scientific investigation. Physics rules supreme, and what cannot be translated into its terms does not exist.

Physics

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Related Terms

[Laws of nature](#); [Matter](#); [Physics in Judaism](#)

Description

Physics is the science that forms the foundations for the other sciences and for much of engineering. It is based largely on mathematics—more so than most other sciences. It therefore has a reputation for being difficult. This is apparently at odds with the most thoughtful definition: Physics is that science which considers the simplest systems and then tries to achieve a complete description of them. It is the aim for completeness that causes the difficulty. A biologist cannot hope to produce a complete description of even a single cell. It should be evident that physicists are adept at looking for simplifications. If none appears without oversimplification, then the problem is generally turned over to a different science.

Self-identification

Physicists have considerable self-awareness of their participation in their science. They have undergone a training that emphasizes the unity of the field, in spite of the existence of numerous specialties and subspecialties. Whenever physicists meet, they can find common ground for discourse, even if they specialize in different areas.

Characteristics

Physics is academically a well-defined program, but the boundaries are fuzzy.

Interdisciplinary areas abound: physical chemistry, chemical physics, biophysics, astrophysics, physical oceanography. What makes physics distinctive is the common grounding, in both pre-1900 studies – mechanics, heat, sound, electromagnetics, optics – and post-1900 studies, concerning molecules, atoms, nuclei, fundamental particles, all held together by quantum mechanics. A physicist is expected to have a fundamental grasp of all these in addition to deeper understanding in at least one narrower subspecialty.

Relevance to Science and Religion

Physicists have been participants and leaders in the dialogue between religion and science. To mention only four examples, Ian Barbour, Willem Drees, Robert John Russell, and John Polkinghorne have all been leaders. It happens that all four have professional qualifications in theology as well, but in each case, the initial educational effort was in physics (each has a doctorate in physics; only Drees has a doctorate in theology).

Much of the science/religion interest in physics has centered around cosmology, especially the early universe and its connection to the theology of creation. Physics has a deep interest in investigating the “laws of nature,” including many interesting questions, for example: (1) Why are there laws of nature? (2) Why is there something rather than nothing? (3) Which of the “constants of nature” are truly fundamental, and which are secondary? (4) Why do those constants have the values that we measure? (5) Do any of those “constants” change very slowly? (6) Could the universe run in any interesting way with different values of those constants (a test of the validity of anthropic principles)?

Some physicists believe in God, and some do not. Many are not sure. A common attitude is belief that God created the universe and the principles by which it runs; it is our task to find out how (not why) God did it, and to learn those operative principles.

Sources of Authority

Recent articles in peer-reviewed journals are the strongest authority, but only if they are corroborated either by several independent experiments or by strong internal self-consistency. The history of the discovery of the positron is a good case in point. Experimenters in Britain, France, and the United States almost simultaneously observed evidence that was best interpreted by postulating a particle with the same mass as the electron but with positive charge. Such a particle had been predicted theoretically a year earlier by P. A. M. Dirac (1931), but the Americans were unaware of the prediction. Three independent experiments and an elegant theoretical prediction were sufficient to convince all serious physicists that the effect is real (Anderson 1932; Blackett and Occhialini 1933).

Other situations have not been so clear-cut. A large-scale problem in epistemology about a very small-scale question is whether quarks exist. Most physicists would answer “yes” to that question, but the issue is still a bit cloudy, resting on the question of how much authority does it take to convince people of the existence of these subatomic particles (Albright 1982).

As in any walk of life, certain individuals in physics have developed enormous prestige, so that you can often terminate an argument by invoking a result from that authority. One of the most often quoted has been Albert Einstein, whose influence on physics and its philosophy has been immensely beneficial. Yet Einstein made a few mistakes; just because he said something does not mean it is correct.

Ethical Principles

The first ethical duty of physics is to tell the truth, no matter what comes of it. This principle may seem simple enough, but on occasion, it has raised controversy on questions of how much truth should be made public. A celebrated case involved maintaining secrecy about nuclear energy and its potential for weaponry

(Moore 1985, ch. 17). Other occasions have arisen in the middle of large, interesting, and important experiments where the principal physicists maintain secrecy about the results, since they want no premature disclosures that they may later have to retract.

Key Values

High among the key values is logical consistency. Physicists expect this at the root of what they do. Some of the finest advances in physics have come about because there was a basic inconsistency, and the task of setting it right led to a significant unexpected insight. Special relativity, general relativity, and quantum mechanics all came into being because of the desire to eliminate contradictions. The biggest contemporary gap is between general relativity and quantum mechanics, which cannot both be correct in their present form. Quantum mechanics insists on linearity; general relativity is inescapably nonlinear. These are discrepancies crying out for resolution.

Another key value is symmetry. For example, uniform motion of an object in time, space, or angular rotation leaves the object invariant. These symmetries imply (Noether's theorem) (1918, that for a system whose Lagrangian has a particular symmetry; there will be a corresponding conserved quantity), conservation of energy, linear momentum, and angular momentum, respectively (Toretti 1999, 127). The discrete symmetries of charge conjugation, parity, and time reversal were once thought to be enduring, conserved values for a fundamental particle. Since the 1950s, it has been known that in the weak nuclear interactions, these symmetries are not maintained; for electromagnetic and strong interactions, they are valid to a high degree of accuracy.

A really important value is beauty or elegance (Dirac 1939). A theory that is beautiful will look good when written in mathematics. It should be no more complicated than necessary, and it should encompass a wide variety of experimental results, some of which may well be unanticipated. Some theorists have become quasi-religious with

claims that God did not make the universe to run according to ugly principles. The difficulty about beauty as a criterion for excellence is that you cannot really define beauty in an objective way.

Conceptualization

Nature/World

Physics usually means by *world* the entire universe, since this is considered the range of validity of the laws of physics as we know them. Astronomical observations have been scrutinized to find faraway deviations from the properties of matter and energy as we see them here on earth. Such deviations have not appeared, and this lack of evidence is not from want of searching.

Human Being

Most of physics is concerned with nonliving entities (except in biophysics). Study of the human as a system is much too complicated for most physicists.

Life and Death

Living systems are too complicated for most physicists, again, except for biophysicists.

Reality

Most physicists who have thought much about the problem of reality end up calling themselves critical realists. There is a strong streak of operationalism: If you cannot – even in principle – measure a quantity, then it is not real. The original spirit of quantum mechanics began by restricting concepts to measurable ones. This attitude did not last long. Quantum mechanics employs many entities (wave functions, raising or lowering operators, absolute phases, and so forth) that cannot be measured, and yet are useful in calculating other entities that can be measured.

Knowledge

It is fitting for a science that purports to study completeness to ask: What constitutes a complete description of a system? The answer varies from one subdiscipline to another. In *classical mechanics*, an expression of the coordinates as

functions of time for every part of the system constitutes complete knowledge.

In *electromagnetism*, if you can express the components of the electric field and three components of the magnetic field as functions of time and the three space coordinates, you have complete knowledge. In *thermal physics*, complete information for a single-component system can be known if you can express the internal energy as a function of the entropy, the volume, and the number of moles. Legendre transformations can change the variables to quantities such as temperature or pressure without loss of information. In *quantum mechanics*, a knowledge of the wave function, ψ , as a function of space and time constitutes complete knowledge of the system – at least as complete as possible. The possible knowledge in quantum mechanics is less than in classical mechanics. In fact, quantum mechanics denies the possibility of attaining the knowledge that classical mechanics would call complete.

Truth

Ultimate questions of truth in physics are settled in the laboratory. Experiments are the Supreme Court of physics. Close to the frontiers of knowledge, it is difficult and expensive to set up the apparatus and to make the observations. Statements about the outcomes can sometimes be made only in the form of probabilities, especially in cases where independent measurements of the same quantity appear to disagree.

Perception

The concept of perception means a great deal to physicists, since human senses are so limited in scope. Experimental physics is perennially extending the senses. Vision is extended beyond the range of the human eye to infrared, microwaves, radio waves, ultraviolet, X rays, and gamma rays; intensities of light too bright or too dim can be detected by well-designed instruments. Sound waves can be measured outside the frequency and intensity range of the human ear. The sense of touch is extended by many types of thermometers.

An extremely important question at the root of the philosophy of physics is whether nature is

continuous or discrete in the small. Schools of philosophy in ancient Greece argued about this and could not reach a scientific conclusion because human senses are too crude to perceive things at such a small scale. In the nineteenth century, chemistry showed that matter is made of atoms and molecules; it is not continuous. One after another, the quantities in physics were shown to be quantized (i.e., discrete, grainy, not continuous): electricity, light, sound, energy levels in molecules, atoms, and nuclei. All these conclusions were reached by extending human perception.

Time

In classical physics, time plays a crucial role, even though it is essentially beyond definition. One can measure time without being able to define it. Newtonian mechanics differs from Aristotelian by proper use of the second time derivative (acceleration) instead of the first (velocity) to be proportional to the force. From this change flows a stream of correct results for mesoscopic phenomena. Electricity and magnetism were unified by James Maxwell, who added the time derivative of the electric field to Ampère's law, and thereby included light in the subject.

A simple and useful way to state the second law of thermodynamics is that the entropy of a closed system increases with time. This fact provides the famous "arrow of time."

Not only classical physics, but also quantum mechanics (Schrödinger equation, Dirac equation) exhibit explicit time dependence. Furthermore, these two equations join with the Maxwell equations and Newton's laws of motion (without friction and consequent heating) in having the property of time reversal. So physics is microscopically time-reversible, but macroscopically not so. It is not easy to visualize how this can be.

Time is also crucial to the special theory of relativity, constructed by Albert Einstein to treat time on the same footing as the individual space coordinates. It is noteworthy that this change allows one to carry Maxwell's equations into special relativity with notational and no other change. The Schrödinger equation contains time, but does not treat it on par with the space coordinates; the

correct treatment of this asymmetry leads to the Dirac equation, which in turn predicted the spin of the electron, its magnetic properties, and the existence of antimatter (Dirac 1931).

Consciousness

There is no consensus in physics about the hard problem of consciousness. It is after all a subtle property of the brain, the most complex entity per unit volume that we know.

Rationality/Reason

Mathematical reasoning has such a marvelous track record for effectiveness that physicists tend to believe that someday, we will have a theory of everything. It is clear that we are far from that position now. It is likely that new forms of mathematics will need to be invented in order to solve some of the problems that physics faces.

The two great theoretical advances of the twentieth century were relativity (special and general) and quantum mechanics. Both of these required not so much novel mathematics as a reformulation of the prevalent physical ideas of space, time, matter, observation, etc. The result was that these theories at first met with disbelief because they were considered irrational. With passing years, much work was done to improve the quality of the logic of these innovations, and now they are looked on as pillars of rationality. Even so, quantum mechanics and general relativity are incompatible; no one expects a move toward irrationality in the future. Rather, one or both of them will need to be modified.

Mystery

In physics, the concept of mystery is taken to mean some question to which the answer is not readily apparent. Several of these come ready to hand; the collective ignorance and hence mystery is not from lack of work. Most of these questions have been the objects of intense scrutiny for a generation, at least.

- (a) What is the best way to interpret quantum mechanics? Attempts include the Copenhagen interpretation, collapse of the wave function, many worlds, and others. In many cases, the various interpretations agree on the

mathematical results; it is the descriptive interpretation that is different.

- (b) A good theoretical framework for understanding *nuclear structure* is still lacking. Great quantities of data exist, and phenomenological theory is adept at fitting certain types of data. There is no beautiful overarching theory to admire.
- (c) The *fundamental constants of physics* are always a great source of mystery. Why do they have the values that we measure? Are they really constant? A partial list: electron charge, electron mass, Planck's constant, the speed of light *in vacuo*, the gravitational constant, masses of other elementary particles.
- (d) As mentioned above, general relativity and quantum mechanics are incompatible. General relativity is the best theory of gravity we know. Why is it so hard to merge gravity into a system with the other fundamental particles and fields?
- (e) How can we understand the *unreasonable effectiveness of mathematics*? Multiple possibilities exist: (1) Perhaps it is just a coincidence. (2) Perhaps a Higher Power made things to run that way. (3) Perhaps physicists are conditioned to look only for the easy solutions to their problems and to use the mathematics that they learned in their younger days. (4) Perhaps we are forever widening our definitions of mathematics to include whatever structures we need in physics.

Relevant Themes

Additional Issues for Science and Religion

- (a) Issues of causality, chance, determinism, and free will have been around for centuries. They are still not widely understood, even among scientists.
- (b) *Nonlinear science* is a relatively new field because in a precomputer age, its mathematics was too laborious to be attractive. Solitons, fractals, chaos, and complexity are subjects that fit under this heading.
- (c) How much responsibility do scientists have for the *technology* that results from scientific

discovery? This became a large-scale ethical problem after the development of nuclear weapons during the Second World War. Since then the issues have not gone away; they have multiplied.

- (d) How can physicists fruitfully engage in the process of explaining to the public that the religious fundamentalist assumptions about the origin of the universe are incorrect? The earth is old, not young – plenty old enough for evolution to have taken place.

Cross-References

- [Causality in Physics](#)
- [Classical and Quantum Realism](#)
- [Energy in Physics](#)
- [Gravity](#)
- [Mechanics](#)
- [Ontology](#)
- [Philosophy of Religion](#)
- [Philosophy of Science](#)
- [Quantum Theory](#)
- [Relativity](#)
- [Space and Time](#)
- [Time](#)

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Physics in Buddhism

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Related Terms

[Buddha](#); [Quantum physics](#)

There is no widely accepted consensus about the relation between Buddhism and physics. Most physicists and many Buddhists would probably deny that there is any relation at all. Nevertheless, in recent years, a number of authors have argued that there is an affinity between physics, especially quantum theory, and some aspects of Buddhist thought.

The most prominent of these authors is the present Dalai Lama, Bstan-'dzin-rgya-mtsho. Since 1987, he has held a number of dialogues with scientists under the general heading of Mind and Life Conferences ([Mind and Life Institute](#)). The 1997 conference focused on physics and cosmology, and a record of the conference was eventually published in book form (Zajonc and Houshmand 2004).

The Dalai Lama's own book on Buddhism and science, *The Universe in a Single Atom*, was published in 2005 (Lama 2005). In the third chapter, he remarks, "If on the quantum level, matter is revealed to be less solid and definable than it appears to be, then it seems to me that science is coming closer to the Buddhist contemplative insights of emptiness and interdependence" (p. 50). He discusses the role of the observer in quantum theory and compares it to the interdependence of subject and object, observer and world, in the Prāsaṅgika-Madhyamaka school of Buddhist thought: "In this Prāsaṅgika-Madhyamaka view, although

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the reality of the external world is not denied, it is understood to be relative . . . The notion of a pre-given, observer-independent reality is untenable. As in the new physics, matter cannot be objectively perceived or described apart from the observer – matter and mind are co-dependent” (p. 63).

The Dalai Lama discusses the phenomenon of entanglement in quantum physics as another example of interdependence that is in accord with the Buddhist principle of dependent origination. In this phenomenon, two particles, for instance, that have interacted become “entangled” in a way such that a measurement on one is instantaneously correlated with a measurement on the other, no matter how far apart the particles may have become. The Dalai Lama comments, “There seems, according to quantum mechanics, to be a startling and profound interconnectedness at the heart of physics” (p. 65).

The Dalai Lama concludes this chapter of his book by discussing the problem in physics of reconciling our ordinary world of objects, which seems to be well described by classical physics, with the bizarre world of quantum theory. He suggests that something like the Buddhist notion of “two truths,” conventional and ultimate, might be applicable here. He concludes that whether this is so or not, “What the Buddhist philosophy of emptiness can offer is a coherent model of understanding reality that is non-essentialist” (p. 69).

Some younger Tibetan lamas also have an interest in modern physics. For example, Yongey Mingyur Rinpoche briefly discusses physics in his book, *The Joy of Living* (Mingyur Rinpoche and Swanson 2007). He mentions the role of the observer in quantum theory and asserts, “If we are to take the discoveries of modern science seriously . . . we have to assume responsibility for our moment-by-moment experience” (p. 91).

In addition to the Dalai Lama’s conversations with Western scientists, another interesting example of East–West dialogue is the series of discussions between the Vietnamese-born astrophysicist Trinh Xuan Thuan and the French Buddhist monk Matthieu Ricard recorded in *The Quantum and the Lotus* (Ricard and Xuan Thuan 2001).

Trinh remarks, “The concept of interdependence [in Buddhism] states that things cannot be defined in absolute terms, but only in relation to others. This is, in substance, the same idea as the principle of relativity of motion in physics . . .” (p. 277). He goes on to say, “The notion of interdependence leads us directly to the idea of emptiness, which does not mean nothingness, but the absence of inherent existence. Since everything is interdependent, nothing can be self-defining and exist inherently . . . Once again, quantum physics has something strikingly similar to say” (Ricard and Xuan Thuan 2001). A quantum object like an electron or a photon can manifest as a particle or a wave, depending on what type of experiment is being done or, in other words, what kind of measurement is being made. Thus “... quantum mechanics has radically relativized our conception of an object, by making it subordinate to a measurement or, in other words, an event” (p. 278) Trinh also compares the Buddhist idea that all conditioned things are impermanent with the ubiquity of dynamic processes of change in physics’ picture of the world.

While most comparisons of physics and Buddhism have focused on quantum theory, William Ames, an independent scholar, points out that one can see parallels between classical physics and Buddhist Abhidharma (Ames 2003). Abhidharma systematically analyzes the world into momentary mental and physical phenomena called “dharma,” which are connected by various causal relationships. Similarly, classical physics explains the physical universe in terms of particles of matter that interact through forces described by deterministic mathematical laws. Of course, there are also important differences. “Dharma are known through examining our own experience . . . Particles and fields are known through being part of a theory that is found to be consistent with experiment” (p. 292). Also, most dharma are mental rather than physical, and they are momentary, unlike the unchanging material particles of classical physics. Ames goes on to compare the transition from classical to quantum physics with the emergence of the idea of emptiness and the rise of the Madhyamaka school in Buddhism.

The late astrophysicist Victor Mansfield was the author of *Tibetan Buddhism and Modern Physics* (Mansfield 2008). His chapter on “Quantum Mechanics and Compassion” discusses the indistinguishability of particles of a given type in quantum theory and compares it with the Buddhist belief that sentient beings are indistinguishable in their desire for happiness and freedom from suffering. “In Tibetan Buddhism, this level of indistinguishability is at least as important as the indistinguishability of particles in quantum mechanics because it is the foundation for universal compassion” (p. 33). A later chapter, “The Physics of Peace,” explains how the phenomenon of quantum entanglement implies that entangled quantum systems, no matter how far apart they may become, can influence each other instantaneously and, so, do not really exist independently of each other. Likewise, in Buddhist thought, emptiness means that things do not have independent or inherent existence, and when applied to sentient beings, this fact implies a need for compassion.

Alan Wallace, an independent scholar and former Buddhist monk, has been writing about Buddhism and physics since the publication of *Choosing Reality* in 1989 (Wallace 1980).

In his later book, *Hidden Dimensions* (Wallace 2007), he makes the important point that “[o]ne fundamental difference between scientific and Buddhist views of the universe is that science traditionally seeks to describe the physical world as it exists independent of any observer, whereas Buddhism is concerned only with the world of experience ... which is inseparable from conscious subjects” (p. 87). Moreover, Buddhists use systematic contemplative inquiry to investigate the nature of experience, while physicists use quantitative measurements and mathematically formulated theories to examine external phenomena. Thus “... the methods by which they have drawn their conclusions could hardly be more different” (p. 98). Hence, it is all the more surprising that they have reached similar conclusions about the phenomena that they investigate. In both the Madhyamaka school of Buddhist thought and modern physics, phenomena do not have independent or inherent

existence. “Particularly in quantum physics, when one seeks out the nature of a physical entity as it exists independently of any system of measurement ... one discovers that such an independent entity doesn’t exist” (p. 95).

Even if quantum physicists and Buddhist contemplatives arrive at some similar conceptual insights, Wallace sees an important difference in how these concepts are applied. Buddhist methods of meditation make it possible to integrate conceptual insights into one’s life in a way that transforms the meditator. “Indirect, conceptual understanding dispels our previous conceptual errors. Then we apply the stability and vividness of meditative quiescence to the conceptual insights ... As a result of such sustained, experiential familiarization, the veils of conceptuality gradually lift, giving way to direct, nonconceptual realization of the empty nature of phenomena” (p. 99).

Wallace breaks new ground in the comparison of Buddhism and physics when he draws an analogy between Dzogchen, or the Great Perfection, and some advanced ideas that link quantum field theory and cosmology. According to the latter, “... over the course of cosmic evolution after the big bang, empty space gradually ‘froze,’ so that it has taken on internal structure like that of an ice crystal. From empty space emerged gravity, quarks, elementary particles, fields, and all other configurations of space-time and mass-energy” (p. 109). The original state of the universe is described as a “melted vacuum,” while its present state is a “frozen vacuum.” The melted vacuum “... embodies the laws of nature in their ideal, perfectly symmetrical state, while the frozen vacuum state of the universe in which we dwell reflects the current laws of nature” (Wallace 2007).

Wallace reiterates the point that physicists seek to understand the universe in an observer-independent way, “... so their understanding of the melted and frozen vacuums is necessarily devoid of any notion of consciousness” (p. 110). In the Great Perfection, on the other hand, the universe emerges from the “... primordial unity of space, consciousness, and energy ...” (Wallace 2007). Wallace explains that here, “[t]he absolute space of phenomena is not to be confused with

relative space; rather, it is the ultimate dimension of reality out of which space, time, energy, matter, and mind all emerge . . . This luminous space is the ground from which all possible worlds appear, and it is the ultimate nature of every observer's mind" (Wallace 2007).

Wallace continues, "Much as physicists describe the current universe as 'frozen' with respect to the perfect symmetry of the melted vacuum, so do Buddhists characterize our current minds as frozen with respect to the perfect symmetry of primordial consciousness" (Wallace 2007). He quotes from the present Dalai Lama and the nineteenth-century Great Perfection teacher Dudjom Lingpa to show that even the same analogy of water and ice is used. In this case, symmetry-breaking occurs when phenomena and the mind are taken to have their own separate realities. The mind then reacts to phenomena with desire or aversion or indifference, leading to a chain reaction of karmic action and result, but since even the dualistic, grasping mind is ultimately of the nature of primordial consciousness, the Great Perfection holds that there is a way out. "The way to return to the perfect symmetry of primordial consciousness is to realize how all phenomena fundamentally emerge from and are of the nature of absolute space" (p. 112). As is always the case in Buddhism, this cannot be a purely conceptual understanding. Such understanding must be followed by meditative contemplation in order to produce a nonconceptual, transformative realization.

Cross-References

- [Buddhism in the West](#)
- [Classical and Quantum Realism](#)
- [Consciousness \(Buddhist\)](#)
- [Cosmology](#)
- [Dependent Arising](#)
- [Modernity in Buddhism and in Islam](#)
- [Physics](#)
- [Quantum Theory](#)
- [Reality in Buddhism](#)
- [Science in Buddhism](#)

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Physics in Catholicism

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Related Terms

[Catholic church](#); [Physical knowledge](#)

The Nature of Catholicism

What could uniquely characterize the Catholic vision? One certainly needs to point out at first the harmony of reason and faith and the capacity to put the communion of all before anything that could lead to focusing on one's difference. This vision has something apophatic about it, since it

is easier to see what the Reformation has rejected from Catholic beliefs on particular points than it is to see what surplus there is in the unhampered essence of Catholicism.

During the modernist crisis, at the onset of the twentieth century, Maurice Blondel partly succeeded in the articulation of such an interpretation by speaking of a tradition that can be implicit but that is also self-consciously facing denials. Marian dogmas such as Immaculate Conception (defined 1854) and the Assumption (defined 1950) show that there is place for an implicit to be disclosed.

Catholicism is a tradition that values the human element in the human-divine union and as such recognizes the need for a visible presence, institutional or through the testimonies of the lives of the faithful, despite all the risks that could be encountered in the process of the unfolding of God's plan of salvation. This means that, while there have been important mystical figures in this tradition, the emphasis has not been on a non-mediated access to God. Christ is the mediator, but the Church also is since she is "Jesus Christ diffused and communicated" (Bossuet). There is therefore a role of tradition in illuminating Scripture, which entails that our situation is *made* meaningful by the Word of God but that it also *gives* it meaning. The Ecumenical Council Vatican II (1962–1965) reasserted the position originally defined at Trent (Session 5, 1546) concerning the Church's role in the interpretation of Scripture but made clear that the Church is to place Christ above both the written word and tradition, however important, since both flow from a unique divine wellspring (*Dei Verbum* §9).

The Question of the Development of Science

When the subject of science and Catholicism is treated historically, some of the following accusations are often raised against the Catholic Church. It dominated the dark and barbarous Middle Ages, whereas Protestantism freed the Western mind from bondage since, by securing

religion in a heavenly realm, it permitted its faithful to fully engage in the development of science and technology. One will also hear that the modern world was built around the Protestant work ethic.

Catholicism always maintained that there was a troubled state in the religious relationship between man and God which is located in the *will* but that human *nature* had kept, in a profound sense, its integrity. There is a rational optimism which is part of Catholic convictions, although the ways in which this "faith in the world" has come to play are quite complex. It is remarkable that some religious orders, such as the Jesuits, have had in many cases a tendency to keep looking for a universe directly symbolic, almost hieroglyphic, even if it might have entailed at times an incapacity to give sufficient autonomy to the natural course of things (Ashworth in Lindberg and Numbers 1986:156; Hellyer 2005:221; Principe in Numbers 2009:104–105).

Historians have shown the untenable nature of the exclusively conflictual scheme "science versus religion" even if popularizers of science sometimes still have recourse to it (Cantor 2003). Religion is not an obscurantist force while science would be an expression of freedom; those categories are too wide and are "reifications" (Denton 2005). The problem has to be broken into a look at particular Christian confessions. Each one of those has had its historians who have been vehicles of apologetics. Fr. F. Russo for instance, while complaining about this situation, made himself guilty of it nonetheless in posing as a Catholic Hooykaas (Russo 1963:319). He highlighted the fact that if one reads the Dutch historian of science, the impression one gets at times is that it is Protestantism *as it differs* from Catholicism that has served as a force to promote modern science. To this, he objected that if indeed the former has produced several examples of observation and experimentation, modern science has built itself *against experience* more than it would have looked to confirm it passively (as Koyré, and also Bachelard, argued quite correctly) (Russo 1963:308).

If one looks at the question from the angle of the faith confessed by a practitioner of physics, inquiries have shown that the personal worldview instilled by one's denominational creed was not the most important factor and also that, perhaps contrary to some commonly held assumption, the Catholic faith is fairly permissive in that department if some fundamental dogmatic theses, few in number, are recognized.

Historical Outlook at Some Transitional Moments

For the Greeks, the universe was undergoing cycles of progress and decay, and if they promoted some technology, they were responsible for very little experimental science (otherwise one would incur the wrath of the gods). As J. Abelé recalled, the slaves were associated with the physical basis of geometry, measurements, and as such with the corresponding idea that those never carried with them the perfection of disembodied archetypes, which was an impediment to science's development (Abelé 1961:54). In metaphysical terms, it has been necessary to go through a de-spontaneization of nature as a condition for a confidence in the human capacity to understand her workings. The idealization that has been necessary to launch the modern scientific revolution could have happened easily a thousand years earlier as Whitehead saw. There is still discussion on the motivations for this delay, but certainly, one cannot avoid thinking about the panpsychism that is implicit in the idea of nature as a productive force. The main idea that had an influence on minds, in the physics that came to be diffused and systematized by Aristotle, and which had to be overcome, was that of a motion necessary obtained through application of force by a mover. There was also the attribution of a divine nature to the heavenly bodies and the idea of the perfection of circular motion.

Experimental methodology started at Oxford in the thirteenth century. It took until the seventeenth century for some of Aristotle's ideas in physics to be repudiated. What was physics like

at that point? Was it tied to something the Church had to protect and preserve? For Aristotle, no overarching scientific method and demonstrations were possible since one was not to mix entities from different genera. He refused all that is the basis of calculus-oriented physics: the idea of a rate of change was dismissed as confusion while the rise of the concept of fields of smooth, continuous quantities is what unlocked classical physics (Funkenstein 1986:305–306). The changes that took place and configured progressively the modern conception of the laws of nature implied a shift from contemplative knowledge to the capacity to *do* things, a form of “ergetic” knowledge (Funkenstein 1986:296–297).

Galileo and the Consequences of a Thought Revolution

The Catholic Church decree of 1633 against Galileo has been the object of much attention. Although the matter is a complex one, there was more to it than contradicting the prevalent understanding of the reading of Scripture. As Russo observed, Catholics and Protestants would be in the same boat regarding the interaction of astronomy to Scripture, the Protestants having put historically more restrictions on allegorical interpretation of Scripture. It is now clear with hindsight that Galileo had inconclusive arguments, lacked proper means of observation, and refused to declare his vindication of Copernicanism only a theory, stating that knowledge would be true when obtained through observations and necessary demonstrations (Galilei 1957:182–184). In fact, Copernicus' system gave to circular motion an exclusive place; it contained eccentrics and epicycles although he freed himself of their need to account for planetary retrogressions.

Along with the Eucharistic dogma, entailing for Catholics a special presence of Christ to his Church, A. Kojève has argued that the dogma of the Incarnation of the λόγος is the most important conceptual shift that has permitted modern science to appear: the world is no longer unworthy of the presence and descent of God in it (Kojève 1984). To study it directly means learning

something about God's wisdom (Principe in Numbers 2009:105).

The systematization of the great principles of the new physics of Newton carried with it the need for the integration of all phenomena, electrical, magnetic, and chemical. Not only successes will be obtained: if matter attracts matter, how to account for its structural stability? The applicability of Newton's ideas was impressive. For instance, one can think of the Coulomb potential which governs the interaction between electrically charged particles as a particular application of the inverse square law which one could verify all the way from the macroscopic level of pith balls to the minutest components of matter. The overthrow of ancient physics implied the destruction of special qualities that would have accounted for properties inherent in bodies; it replaced essences that bodies, animate and inanimate, were supposed to be striving toward by focusing on systems that operate according to general laws and deploy their effects from initial conditions. If the clock is the metaphor of this era, we must remember that it presupposes for its function mechanisms rightly calibrated and organized, as well as hands that are set correctly, making the clock analogy *mathematical* rather than mechanical. There was a tendency in Newton of retrieving a natural theology by seeing in the order and the stability of the solar system, which it cannot itself account for on its own, a sign of divine intervention.

The next step that is worth noting is the nebular hypothesis and the formation of the solar system which P. S. de Laplace claimed he could account for by positing that the perturbations in the orbits of planets, considered by Newton to be cumulative, were periodic and would self-correct. Laplace conjoined a parable involving an omniscient demon with the idea of an intrinsic conditional probability, later to be replaced by two extrinsic and converse conditional probabilities. His first idea was that chance as epistemic limitation rendered it possible by its progressive eradication to detach the worldly regularities from the decrees of the divine. One could often hear that he eliminated the God hypothesis, but as studies of R. Hahn and others have shown, it is

not atheism that one ought to find in Laplace but rather a determination of the fact that a first cause will never be accessible to the scientist's outlook, something more obscure to be kept for the work of theologians.

Thus, there was a passage from a system where we draw theological conclusions directly from the disposition of things to another form of thought where a certain metaphysical determinism, hypothetically applied to reality, makes superfluous the invocations of a divinity *in the natural sciences*. If one can sometimes notice that a God such as conceived by the deists has a tendency to disappear since he becomes useless in serving as a tool for physical explanation (Polkinghorne 2001:53), deism is far from removing its metaphysical necessity, since the world as mechanical and as a machine smacks of a clever engineer.

If we summarize and ask what conditioned the development of classical physics, we can think of:

- The abandonment of an attempt to find general intentionally defined concepts and the adoption of universally workable magnitudes.
- An idealization from local motion to in-principle accessible ranges of experience.
- Temporal sequences coming to replace substantial forms.
- Induction from experiments (promoted in different ways by both Descartes and Newton).

When Dogma Meets Science

It was already pointed out that the Catholic Church did not impose a natural philosophy on her faithful. She did show concern however for the dogmatic consequences of some metaphysical positions. One cannot say that Christian churches, upon hearing of the word "atomism," uttered condemnation. As a matter of fact, an ontology of particles of a Democritean kind was adopted by P. Gassendi, a devout Catholic priest, without being worried. Some Protestant theologians (N. Taurellus, C. Vorstius) did the same in an attempt to defend the Calvinist belief in the Eucharistic presence which entailed the rejection

of that part of the Lutheran account that had kept modified Aristotelian natural philosophy categories (Leijenhorst and Lüthy 2002:395–397). If one shifts the ground and thinks of the tradition of the *plenum*, that of Descartes, Huygens, and Leibniz (the most metaphysically ambitious who sought to reconcile continuity and discreteness), one will find that atomistic elements *with the overarching metaphysical determinism he adduced to them* could be said to have caused some problems to Descartes and later his disciples such as Fr. Méland. To have relegated everything real to primary qualities, while in the Eucharistic dogma only secondary qualities are said to subsist (Hellyer 2005:105–111; Leijenhorst and Lüthy 2002:396) meant that, defining matter as extension, secondary qualities were by the same token defined out of existence.

There remained a difficulty in assessing what was the thesis in ontology that brought trouble to those who like Galileo defended Copernican astronomy, especially when we consider that Copernicus, himself a canon, was asked by Pope Leo X to study discrepancies in the calendar and did it without anything being brought up against him. In view of the awkwardness of a papal commission gathering experts and working intensely for a month to condemn something they helped promote, it has been suggested that the main bone of contention for Galileo might have been not his defense of Copernicanism, of which alone he would have been accused to *protect* him, but rather his adoption of an atomistic conception in natural philosophy (Redondi 1987:165, 247–249).

The Council of Trent (1545–1563) seems to have favored peripatetic categories in some of its definitions regarding the Eucharist, but “substance” in those, in particular that of transubstantiation (session 13, Chap. IV, 1551), is not to be understood as having the technical sense it had in Aristotle’s philosophy (Hellyer 2005:108). One can either say that there are different Aristotelianisms and that the meaning of such a natural stance shifted (Leijenhorst and Lüthy 2002:378), or like E. Schillebeeckx that the dogmatic Eucharistic definition never had that technical philosophical sense, as indeed many of the Trent

Fathers would have avoided it if they could have (Schillebeeckx 1966:331). If “substance” meant what one encounters in peripatetic physics, this would signify that Christ’s body is still submitted to properties known in human experience, and as such, theologians would hardly have been in a position to blame Galileo or Descartes.

W. Ashworth asserted that nothing in the realm of ontology is refused to a Catholic because he would confess that faith (Ashworth in Lindberg and Numbers 1986:147) and thus was led to look at institutional impediments as more significant concerning hindrance to the development of science. This sociological criterion might imply that Catholics are closer to creatures of mere obedience, but the case of Pascal, which he himself analyzes, testifies otherwise (Ashworth in Lindberg and Numbers 1986:143). Worldviews carry metaphysical implications, such that one cannot believe in metempsychosis and be Christian, as the case of Giordano Bruno would illustrate, irrespective of any judgment on the means by which he was silenced.

If one can say, judging from examples of historical practice of physics by Catholics, that “... the term ‘Catholic Science’ ... has no meaning whatsoever” (Ashworth in Lindberg and Numbers 1986:147) and if J. Polkinghorne in a similar fashion can dismiss the very idea of a “Christian physics” (Polkinghorne 2001:40), it is important to keep in mind that our usual understanding of the cohabitation, in one’s mind, of one’s religious conviction, and one’s worldview is often oversimplified. The last statement especially only makes sense after centuries of efforts to find the delimitation of respective provinces of inquiry. In this sense, it might be tempting to judge as simplistic whomever would look for a conception of space and of bodies’ extension that allows to preserve the meaning of the dogma, particularly the Eucharistic one – sometimes fighting Aristotelianism and sometimes adapting it – but one must not forget that a universe with a beginning in time was deemed repugnant by cosmologists such as A. Einstein, A. Eddington, and F. Hoyle for reasons that have everything to do with metaphysical preferences. As S. Barr argues (Barr 2006:43), this would imply

a metaphysics and might hint at a form of religious commitment with which some of them wanted to have nothing to do. A “Eucharistic physics” is no more an impediment to science than this interference of a religiously-based pagan metaphysics (Hellyer 2005:105–113). G. Lemaître, a Catholic priest who proposed a model of cosmic expansion that went beyond the limitations inherent in the models of Einstein and De Sitter, later to be termed by himself the “hypothesis of the primeval atom,” ironically fought against Einstein in the name of truth as harmony with rationally and empirically established facts, while the most famous physicist of the twentieth century was found clinging to theological presuppositions hampering the reconciliation with experimental evidence.

Contemporary Physics and the Worldview of Catholicism

Short of capturing the essence of contemporary physics in a few words, one can identify three clusters of significant work: (1) cosmology, models of the universe and astrophysics; (2) microphysics and quantum theory, and (3) computational chaos and the studies in complexity and self-organization.

Physical Research on the Very Large

The first cluster includes theories of the infinitely large, with general relativity and astrophysics, all the way to string theory and supersymmetry. Einstein understood that the laws of nature must be expressed so that they look the same to all observers, no matter where they are and how they move. Newton’s laws of motion would have retained their form only for special observers moving in a simple way, without acceleration or rotation. There happened an important redefinition of purely intellectual evidence around the criticism of absolute simultaneity.

We can summarize the *first* constellation of work in physics by highlighting the following features:

- A modification of the Galilean principle of relativity, affecting the correct idea of an

indifference to uniform motion, that had maintained a relationship to elapsed time from one referential to another which could not be salvaged in the context of electromagnetism.

- Inversion of the order of priorities of the physics of the day, since instead of studying properties of matter and aether accounting for those of space and time (contraction of rods and rulers), Galilean relativity was abandoned with the introduction of new transformation formulae.
- Since special relativity forbids traveling faster than the speed of light and Newtonian gravitation was considered to act everywhere instantaneously, a contradiction had to be solved: the result was general relativity, wherein gravity is associated to the curvature in the fabric of space-time itself, described using Riemannian geometry.
- Relativity receives early on a mathematical formulation characterizing it by the action of groups of transformation (the Poincaré group) and becomes the geometry of space-time that underlies all the current work on fundamental particles.

In the years of its early popular dissemination, after World War I, accusations were voiced against relativity, and some, like Cardinal W. O’Connell of Boston, saw in it a contribution to the erosion of the moral sense and an atheism camouflaged as pantheism (Holton Fall 2003:30–31). What was happening in reality had eluded the prelate: here was the challenge put in front of the Catholic Church to state to what extent the God she proclaims is an “outsider” to this creation. The difficulty is formidable indeed since, as previously stated, Catholics have always striven to maintain a harmony of nature and grace, alongside that of reason and faith.

There was with the implications in ontology of general relativity an installation of a rational transparency at the heart of reality which recaptures for man an important and seemingly forever lost place, altering the “principle of Copernicus.” The human thinker through his mind is reinstalled at the heart of things, far from being chased from them (Gingerich in Harper 2005:60;

Danielson in Numbers 2009:50–58). Contrary to the Cardinal's fear, it is not a relativization of morality and personal philosophy that was fostered but an absolutism of the knowledge claimed from who has played with God's wisdom in creation (Prov 8), in other words a revival of the claim of Galileo almost three centuries earlier: the God of redemption cannot in his holy books require us to dismiss what is disclosed by the (Pythagoreo-) Christian book of a nature written in mathematical language. As argued by D. Dubarle, with Einstein, we reconnect in a better way with the original Galilean insight into inertial reference frames and we get rid of the encumbering uniform space and time of Newton. Even more beautifully, we find the vindication of a Keplerian epistemology centered on the descriptions of different observers with covariance of the *maßbestimmung* (Dubarle 1971:21).

The universe models invented around Einstein's general relativity are manners of reinserting the local in the global, and one must understand the implications of field equations that define a model of a universe for all the different situations represented. This dialogue between mass-energy and space-time is profoundly intriguing. The to and fro motion between local and global implicit in the Kaluza-Klein geometry insights that opened the road to adding additional dimensions into the existing understanding of space-time – leading to explorations in topology that were to develop into Calabi-Yau manifolds with many more unobservable dimensions – certainly has theological significance. The attempt at generalizing that was done amounted to the adoption of a geometry dictating its properties to the universe. This idea of a perfect rational transparency and predictability as it survives in relativity is that of the lifting of the veil which hides the mystery of things: they become accessible to the scientist achieving salvation through knowledge. The price paid is that the idea of creation and that of miracles become supremely abhorrent. Yet for this to happen, geometry first had to be made commensurable to its object. One would rightly see in this an intimation of the union of two natures signified at the heart of cosmological reality.

R. Feynman asserted numerous times that we do not know what the concept of energy really entails and that it is incomprehensible that there can be so many different ways to measure it. We say that electrical or mechanical work, then heat, are different forms of energy, with a total amount that remains constant. Different forms of energy are measured in different units, and one could draw an analogy with different forms of money measured in so many currencies. When we exchange them, they undergo a conversion *rate*, and this can be considered to have been fixed. The possibility does not always exist to convert them one into the other, since there are exchange restrictions. That restriction in physics is the second law of thermodynamics. If one disregards its effects, one is led to an "it from bit" universe that is a gigantic canvas of information which we could term for short Wheeler's universe. In such a case, there does not subsist any nonformal substratum, with a consequent evanescence of substance. This troubled Einstein himself toward the end of his life, with space-time understood as a structural quality of the field, and is sometimes referred to as the "hole problem," which attempted to show that no generally covariant field equation can be satisfactory. If one were to ask: "how can we keep matter in the picture?," it would be found that the same Catholic faith (in the wider sense including Orthodox Christians and many Anglicans) which at times seemed tilted toward some emphasis on an other-worldly spirituality is in fact the more "materialistic" of the world religions, as emphasized by W. Temple and Derwyn Owen. Not only does she affirm God making himself a part of his creation and abiding by her laws, but she insists on the sacramental continued presence of God to this same world and, far from teaching its disappearance or illusory character, awaits in hope a transfiguration of this our earthly body.

Physical Research on the Very Small

The *second* great constellation in physics is that of the infinitely small, where we have come to realize that energy exchanges which constitute the substratum of the world are done in

consequence of a distribution which does not obey the continuist logic that allowed to imagine metaphysical determinism as prevailing everywhere. In the new picture, even the most established principles such as that of the conservation of energy are *approximately* true, holding on average. It is not that science has grounded, or proven, freedom as we sometimes hear but that it has brought an end to a lasting obstacle to its being physically significant.

If we try to summarize important elements of this reconfiguration of physical knowledge, we find that:

- A distinction had to be made between measurements carried in the microworld and macroworld, since we are too heavy to pretend we could observe subatomic elements without disturbing them; although some magnitudes (e.g., mass and spin) might be obtained with arbitrarily high precision, conjugate magnitudes cannot be simultaneously obtained.
- There is the problem of weak objectivity: we always knew in classical science that our measurements were idealizations, but we thought that we could disregard that which is left out of the initial conditions.
- New rules of probability that are nonlinear.
- Incomprehensible effects in the material universe that can suddenly be explained through quantum tunneling, since there is a nonzero probability that through an interplay of the energy/amplitude relationship, particles behaving as waves will be found to exist outside potential obstacles.
- We realize with hindsight that the universe of classical physics had no inherent stability; the building-up of the internal structure of atoms could have been done in any haphazard way, which means that, had it really predicted the structure of the universe, we should have witnessed a chaos (little did Newton realize that his unease in front of the stability of planetary motions in the solar system in fact applied to the constitution of matter as picturable in his own system of physics).

Physical Research on Chaos and Complexity

The *third* constellation is conceptually related to the second just reviewed, and we can summarize it as follows:

- Unrestricted determinism was found to be unattainable from a calculation viewpoint, following a study of the properties of gases and by drawing the implications of inherent limitations to our retrieving information from the microworld.
- H. Poincaré working on the 3-body problem demonstrated that, for a question to be formulated with classical equations, a multiplicity of possible trajectories would be generated, that were affected by extremely small changes in the setting of initial conditions.
- With more advanced computational techniques, the meteorologist E. Lorenz formulated a more general theory of deterministic chaos.

As Dubarle also noted, the conditions which are required for the grand cosmological models of our first category to work (T-symmetry, equivalence of energy balance) are part of the initial Galilean idealization, but in our universe, which is hospitable to life, they are rarely if ever met. A freedom and an interplay of chances seem to lead to stabilization of structures (Dubarle 1971:25–26).

Fr. P. Teilhard de Chardin (1881–1955) anticipated relativistic physics early on in thinking of matter as a manifestation of energy. The mass-energy convertibility has an operational sense and it was known even before relativity. In Teilhard, it had acquired a religious and a metaphysical sense. How can we capture this difference? Einstein's vision seems to entail pantheism, it affirms our immortality but as impersonal energy distributions in a universal manifold along some fourth dimension (think of his letter of March 1955 to Michele Besso's widow, where he claims that ultimately the difference between past, present, and future is a persistent illusion), whereas for Teilhard, stretcher-bearer during World War I, a vindication of our going down and a resurrection of the flesh was awaited with the rising of dead soldiers. The blood of their sacrifice was the cement of the walls of the New

Jerusalem. It is precisely in the Eucharistic mystery that he found this conviction. The Spinozistic universe which smiles at us and is only hospitable in not ruling out the possibility of our presence shows a supreme indifference to the singularity manifested in our selves and to what we call personhood.

What Catholicism has to say about this is not forthcoming in the guise of one or many categorical statements; however, it helps us see in hindsight that a universe which transformed man into a being made up of aether or celestial matter, regaining a body as a sort of elementary minerality, amounted to an evacuation of human reality. It was to be judged with reference to some Empyrean heaven which never would have seen beings existing in their individuality but only as a species eternally less than some absolute postulated to be perfect according to a geometric archetype of circular motion. It is not that the quantum theory lays ground for an ontology that would replace the one which is behind general relativity, as is commonly assumed; in fact, relativity is needed to assess some elements that make the internal cogency of quantum mechanics. It is more that, as M. Heller says (Harper 2005:228), Einstein tried to save his view of a universe which is all there is, and when we realize that both relativity and the quantum theory are derivable from Noether's theorem, we come to see that the question is not to have established the reign of stochasticity but rather, as Cantor first indicated with his meditation on transfinite fractals, that the principle of plenitude, liberality, and generosity (*not* a human natural inclination) lay under the fabric of this world. The universe is not only discrete but, as M. El Naschie has argued, it is transfinitely discrete. The notion of transfinite discreteness is homomorphic to fuzzy topology, foliation, and fractal geometry (El Naschie 2005; Nottale 2007).

There is thus an interesting convergence between the rediscovery of the role of time in science – as factor of irreversibility – and this manner for man to imagine that human individual destiny, that of the human nervous system, of the encounters that have brought humanity about must subsist with humanity itself, anticipating

a resurrection that would mean infinitely more than some angelization. The very idea of a history of salvation where we can cooperate to what happens to us requires a universe which has a certain openness to the unpredictable.

Awaiting a “Grand Narrative” and the Final Vision of Harmony

Physics and an Unfolding Revelation

The intimations of God in the harmony of the laws and their immanence in the universe, related to our first cluster, are not at odds with the Catholic vision. Some elements speak in favor of this ideal, for example, the fact that God in the Catholic tradition is said to be more dissimilar than similar to us and as such beyond person as we know it (Lateran Council IV, Chap. 2). For Einstein, religion could powerfully influence science, suggesting harmony, flight into the eternal and the perfect, but science could not influence religion, since it describes what is, as much as possible without prior biases, and is value neutral (Einstein 1950:21–24). The Catholic vision achieves a balance between the insertion in the whole that is not encountered in many forms of religious particularism, and the legitimate claims of an individual-centered vision of perfection in some atemporal present. The thrust of all this is to get closer to the idea of a continued revelation mediated through our effort to better formulate the operation of nature's laws and their openness to mutual interactions making possible the coming of improbable and unanticipated states of affairs.

In a Catholic conception of time and of the role of the Spirit informing the Church as the soul of the body she is, information is all given in the enacting of the events of salvation: the event infinitely intelligible for us has taken place, but the development of this information will need the history of the universe and the action of the Holy Spirit to deploy itself. This presence, in its balance with the work of the Son, is a trait characterizing Catholicism, a continuation and a valorization of the in-between, the time of history, and that of the Church acquiring a celestial value.

The universe revealed to us through deterministic chaos, our third constellation, is one where all is interrelated and where we can insert not only contingently inconsequential actions but make do with a sort of hypothetical necessity, understanding that this necessity might be discovered and oriented by gestures that are minute, in the manner of the interventions of the divine in a world of which it would respect all the laws.

The common representation of quantum spontaneity at the heart of atomic disintegrations, a factor of chance in all fundamental interactions, can be pictured as some historical march destabilizing our self-image which turns out looking more like the efflorescence of a decorative effect. Yet this can also reveal a transposition introducing itself in the universe in being patient without dismantling anything, as would a lure.

The Conversation with Process Thinking

Attempts have been made to articulate D. Bohm's vision, which had Einstein's approval, to a Catholic theology valuing the hiddenness of the divine in a cosmic process of enfolding and unfolding (Schindler 1986). If it is customary to see physicists draw connections between oriental Hinduistic or Buddhist teachings and contemporary quantum physics (such as G. Zukav or F. Capra), something to which Bohm himself was driven at times, preceded by Schrödinger, one must say that there is no rigorous basis to establish them. There would be as many reasons to draw connections between Bohm's "holomovement" and the Augustinian and Anselmian tradition, present in Catholicism, which looks at the universe as a gigantic system of signs; this vision suffered an eclipse with the rise of nominalism and the enclosing of the allusory character of the sign within the mind of the signifier but impressive, and as yet unexplored, means of revitalizing it can be found in the semiotics of C. S. Peirce (Auletta in Harper 2005:185–186).

What is likely to complement this search is a renewed account of process (Schmitz in Schindler 1986:119). The organicist philosophy of A. N. Whitehead in this regard has been and will remain a source of inspiration but might very

well be found wanting in the end, since firstly it does not respect a necessary apophatism in the knowledge of God (Hill in Schindler 1986:88), and secondly, one might consider that it surreptitiously inserts *our* form of psyche in nature (Shimony and Malin August 2006:272–273). A Catholic outlook on the question would militate for the value of all creatures, since their model is in the *λόγος* and, welcoming insights of natural theology along with the majority of her theologians that has so interpreted Paul's teachings on the way of the mind to God from the world (*Romans* 1:19–21), recall that there is more to God's relation to this created universe than fulfilling the aspirations of human beings.

A Creation-Centered Spirituality

As already shown, there existed all along another attitude of mind in the Church, which finds the exclusion of the divine from the world distressing and thus seeks to see it present not so much in gaps of scientific explanations (something almost universally reprobated) but rather in an attraction of all things toward their final goal and "solidity" to be achieved only in Christ, who is the archetype through which they were made. It has expressed itself in the search for a creation-centered, cosmic spirituality. It is not unremarkable that chaos theory, through strange attractors, has rediscovered something of this exploration and stabilization around regimes of spontaneous order. The Church asserts the reality of the world, its value in the plan of God when it will pour in the bosom of eternity all of its fruits and time, as suggested by J. Moltmann, "will roll up like a scroll." The Catholic faith is not a vehicle of other-worldly spiritualization but asserts our common destiny with the cosmos through the belief in the resurrection. If it is remarkable that the Church has never condemned a theorem of mathematics and by the same token respected the autonomy of the science of physics since as we saw conceptions of natural order have only been questioned when they clashed with the absolutely central dogmas by which she lives, the transhumanist attitude which makes us a mind by analogy to a computer and a disembodiable software is not in her spirit

(Gagnon 2012). Refraining from any condemnation of mathematics, the Church also never condemned the theory of the evolution of organic forms on earth, only restricting its acceptability for her faithful to forms that have not degenerated in a materialistic philosophy of the self-sufficiency of the process.

Along with fractal ontology and the principle of an order that is coming from order all the way down (Barr 2006:78–9), the Church with her doctrine of the hypostatic union and the conceiving of all intelligible forms in the $\lambda\acute{o}\gamma\omicron\varsigma$ through the Spirit can help the science of physics live up to the challenge of reconciling conflicting understandings of cosmic order. If one were to object to this last statement that very often order is, in the words of S. Kauffman, “for free” (Belousov-Zhabotinski reactions, self-regulatory networks), one would have to account for its usability. The real problem is not just the generation of patterns and redundancy but the “fire in the equations,” the breath not so much of life but of a self-referring intimation of personhood wherever the trace of God’s creative action is said to extend, which is unbounded like the universe and also limitless.

Cross-References

- [Astronomy](#)
- [Astrophysics](#)
- [Christian Cosmology](#)
- [Cosmology](#)
- [Mathematics and Religion](#)
- [Natural Theology](#)
- [Physics in Christianity](#)
- [Physics in Protestantism](#)
- [Process Theology](#)
- [Quantum Theory](#)
- [Relativity](#)
- [Worldview](#)

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Physics in Christianity

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The discussion on “Physics and Christianity” represents a subtopic of a wider issue on “Science and Christianity” (or Science and Religion). Its aim is not to bring into a simple, naïve correlation the content of contemporary physical practices and theories with the written, verbal, and practical teachings of the Christian Church (its theology) in order to establish a hierarchy in scientific and religious views of the world. The aim is to enquire in the essence and meaning of such a discussion. Indeed, the enquiry into the relationship between physics and Christian theology is counterintuitive: If one adopts a position that physics deals with nature, understood as the visible of this world, accessible to sensible, empirical verification and based in rationality related to the notion of objectivity (i.e., to a conviction that physics has access to reality as it is in itself, independently of the conditions of observability and subjectivity of the enquiring physicist), this runs against the sense of theology whose claims about the world and humanity have deep foundation in a different type of experience of personal communion with the Divine, experience which not only exceeds the capacity of the senses, but also makes reason (including scientific thinking) inadequate and incomplete in

apprehension of this experience. Understood in this way, a comparison of physics and Christian theology does not have sense since it attempts to relate two types of human experience by means of a mental procedure. To succeed in this attempt would imply to transcend both physics and theology and adopt a sort of generic (let us say philosophical position) which would incorporate both of them. However, this hypothetical position can only be an abstract suggestion with no means of justification, because it is problematic to imagine an experience which would exceed both, experience of the world through science and experience of God as well as of the world through communion. This is the reason why the topic of physics and Christianity must be approached in the conditions of its concreteness in the human condition incarnate in material events and history of the spirit. In this case, the problem of physics and Christianity is seen as an existential issue of overcoming different experiences and attitudes to the world in being of one and the same human person. More precisely, the dialogue between physics and theology appears as an encounter of two *traditions* of the human spirit, the traditions which in their apparent fragmentation follow some common *teleology*, which the dialogue attempts to articulate.

Tradition in Theology and Physical Sciences

Elements of History

Tradition in theology means the integrity of religious experience within the Church, its intrinsic catholicity, which is affirmed through the interaction of ecclesial community with the Spirit of God. For theology, tradition is not only constant reassertion of religious events commemorated liturgically or through reciting Scriptures and texts of the Fathers of the Church. It is the constant invocation of the presence of God in the Church and in the world which carries an ontology of forming and sustaining the reality of the Church and its theology (Nesteruk 2008).

Science also follows a tradition which dates back to the inception of Classical philosophy.

To follow tradition here is to be faithful to a particular outlook and the ways of investigation of the world. The very possibility of science, its foundation, and its facticity are related to the philosophical tradition in the West. In this sense, the discussion on physics and Christianity establishes itself through interaction (dialogue) between two historical developments: religious and philosophical traditions. A secular mind which would pretend to be free from all traditional forms of thought and to be “objective” and “dispassionate” here and now would forget that its very ability to transcend the immediately given and to place itself in a sort of transhistorical meta-discourse is ultimately connected with the place of this mind in the overall development of the human spirit in which the split between scientific and theological intentionalities represents, not simply a historical fact, but rather the fundamental antinomy of God’s revelation in the world, the antinomy endorsed through the Church’s complicated position, as being in this world but not of this world.

The appeal to traditions demands one to position the problem of “Physics and Christianity” in a historical context of interaction between science and Christianity tracing it back to the very beginning of the Christian Church (Nesteruk 2003). There are two different opinions as to the role of Christian thought as regards “secular” knowledge (which included the natural sciences) at the beginning of the Christian era. One of them was that the Church proclaimed the authority of Scripture over all aspects of human experience, rejecting freedom of investigation and any independent judgment on the nature of things. Another opinion argues that Christianity was the only social force able to release pagan science from its view of a divinized nature and which made it possible to develop the natural sciences, which led to modern state of knowledge and technology. Neither of these opinions reflects adequately the historical reality of the interaction between Christian theology and the sciences. The important point to remember is that Christianity preserved, transferred, and transformed the Classical tradition and its forms of knowledge.

Since its very inception, Christianity did not enter a vacuum; it encountered different aspects of the classical Hellenistic culture, including the sciences such as mathematics, physics, music, etc. Christian thought had to explain the function of Christianity with respect to the different aspects of contemporary culture and, conversely, the natural sciences as aspects of this culture had to be interpreted with respect to Christian faith. Christian thinkers spent considerable effort relating their teaching to Hellenistic philosophy which claimed that it had access to truth. The Fathers of the Church, being its spiritual leaders and educated in philosophy, understood well the limited nature of secular knowledge and the “sciences” in what concern their ability to talk about true nature of things and ultimate truth. The major stance was on what nowadays is called apophaticism in knowledge, namely, that knowledge’s significative meaning does not exhaust the sense of what is signified. Knowledge deals with contingently given things without being able to address the issue of the very facticity of this contingency. Since then all ancient philosophical hypotheses on the ultimate reality and truth were treated as mere possibilities with no apodictic justification. Christianity attempted to break the futility of any enquiry on the ultimate source of being of things by referring through faith to God as creator and provider of sustenance and sense of things.

Christian thinkers were looking for indications of the presence of the divine in nature, but they never allowed their thought to degenerate into pantheism by maintaining the belief that the transcendent God of the Scriptures created the world *ex nihilo*, but that he is present in all created things through his effected words (*logoi* – the underlying and forming principles) (Lossky 1957). They interpreted the laws of nature as if they were established by God at the origin of the world, that the will of God lies behind the movement of nature. It did not imply that God “set the clock in motion” and then let it run on its own resembling thus deism. God, having created the world, still participates in it through His *logoi* and His grace, guiding the whole nature to its consummation. However, the laws of nature

(e.g., mechanical or thermodynamic laws) are not theologically necessary. They could be different, as could the structural units that are based upon these laws. The laws of nature are providential, for they indicate the purpose of existing things and the way these things receive their most favorable outcome. All knowledge of natural phenomena is incomplete if it is not seen from the perspective of the final causes that are mysteriously present in the deep structure of the natural world.

Science and Philosophy as Cooperating in Truth

Apophaticism in Physics

The attitude to the natural knowledge, originating from physics, is based on a major stance that knowledge, as the transmission of facts and statements about these facts using logical reasoning and shared language, contributes to ultimate truth, the truth based in faith. The usefulness of philosophy and sciences for faith was based upon understanding of truth (related to faith, that is to God) as something which is all-embracing, something which includes all particular kinds of truth. Truth is one, and it is God's truth. Philosophy of scientific truth cannot be identified with divine truth; rather, it is a partial truth. Truth is not attainable from within philosophy or the sciences, though they can contribute to the comprehension of truth. Correspondingly, there is only partial truth in the sciences. Thus, the function of the sciences is to be understood as that of a cooperating cause leading to knowledge of the truth. By cooperating in truth science and philosophy can easily be incorporated by the latter for the purpose of deepening and extending Christian faith (Lossky 1957).

Thus physics has an apophatic sense of delivering partial knowledge of things without exhausting their ultimate truth. But physics itself is based in indemonstrable premises, that is in beliefs which sustain physics but as such cannot be articulated scientifically. Indeed, since ancient times the Aristotelian method of a scientific "demonstration" (similar to syllogism, where

from established premises a new proposition is deduced which is of the same certainty as were the premises, in spite of the fact that the new proposition was not certain before the syllogism had been carried out) was used. In cases where some truth is already established, demonstration means that one tries to find an argument which, by starting from things already believed, is able to create faith in things as yet not believed. This kind of demonstration cannot be applied, however, to the ultimate principles that constitute the basic premises of any demonstration. Since physical knowledge is based on demonstration emerging from the first principles (such as existence of the world and its knowability) that cannot themselves be demonstrated, this knowledge itself cannot be demonstrated. This in turn implies that the very possibility of any knowledge requires the acceptance of first principles, which means faith in them. In this way, knowledge depends on something that is not knowledge, and this is faith. It is faith that allows one to formulate the first principles in a proper way and to assert things that are not seen in the course of demonstrable knowledge. Demonstration then follows after faith, but not the other way around. One needs to explicate faith in existence of the world and its knowability in order to link it to Christian faith.

Hidden Beliefs (Commitments) in Physics

Physics is based in beliefs in reality. This means that the stuff physics studies is already donated to *human* comprehension and through this physics takes it for granted that the material universe exists. In spite of its obvious nature, this belief is indemonstrable and inexplicable in terms of physics itself. In this sense, the reality of that which is called "physical universe" is relational upon those beliefs as well as corresponding historical practices of exploring nature. The theoretical apparatus is thus not a description in the ordinary sense, as presentation of an entity, supposedly given, and of its properties, it is the characterization of something which is not a thing, but a structural path along which a thing comes, from the ultimate horizon of every givenness, to the actual presence in which it is

effectively given to apprehension. Thus the intended “subject matter” of physics (the universe of material things) exceeds the scope of the physical sciences for it refers not only to the content of what has already been manifested, but to the conditions of this manifestation which are not part of the physical description *per se*. Here is a different level of affirmation of the incompleteness of the physical description of being which follows from the fact that that which is signified by physics is never exhausted through its signifiers (Yannaras 2004). The content of physical theories delivers us only that which is manifest, but not the conditions of this manifestation. Seen in this perspective only, the phenomenal reality is a sort of a static image in the ongoing process of manifestation. By its constitution, physical theories provide us with a particular, logically and physically accessible pattern in the interpretation of the world which, however, does not exhaust the whole sense of human presence in the universe of things as conditions for their manifestation. Here the transcendental sense of physics arrives from the recognition that the universe of things is *the manifestation* related to humanity (Ladrière 1972). In this sense, the universe of physics is always our universe. By its sense, the discourse of physics has to comprise not only the current scope of observations and theories but the whole history of formation of views on reality as well as all philosophical and theological issues on the conditions of its knowledge, the telos of this knowledge, and its value. The universe of things as manifestation implies a constant participation or communion with it which is tantamount to saying that the world as manifestation means life. And it is this life which is gifted to man in the Divine image.

The Possibility of Physics and a Christian Archetype

The belief in existence of the physical world is accompanied by another indemonstrable conviction that knowledge of the world is possible. More than that the major mystery lies in the fact that there is a certain commensurability between the embodied human subjectivity and physical

reality at micro-, macro-, and mega-scales. This conviction is not obvious on purely physical grounds, for the size of the human brain is incomparably smaller than the astronomical universe as well as it is incomparably bigger than atoms and elementary particles. In other words, the knowability of different levels of physical reality implies that human consciousness possesses a property on non-locality and a potency for transcendence beyond the sphere of its actual embodied existence in a human person. Summarizing, the facticity of human consciousness capable of articulating the plurality of physical forms is that ultimate ground and source of physical knowledge. Physics, however, cannot explicate consciousness because it itself works in the conditions of consciousness’ givenness. It is here at this point that a Christian conviction that human being was made in the image of God, which provides a theological reference, a belief in the ultimate source of a potentially infinite capacity of human subjectivity.

The analogy comes from two directions: On the one hand it is an indication of a pre-lapsarian archetype of humanity being in the likeness of God, according to which the primordial man knew the world as if he was “all in all.” Secondly, the Christian archetype gives an indication of humanity’s tendency to restore the knowledge of the wholeness of the world in a post-lapsarian sense through the fact that Christ, through Incarnation, being fully human and fully divine created a precedence of non-locality in space (and in time) when knowledge is possible on scales beyond the limits of embodiment. The epistemic non-locality of a human being and its physical containment by the universe forms a content of the famous paradox of the human condition (Nesteruk 2008).

Christian theology reacts to this by appealing to the Chalcedonian definition, according to which Christ himself, by being fully human, that is through His belonging to the created world, exhibited the presence of the above paradox. On the one hand Christ was a historical person in ancient Palestine in a particular location in space and time of the universe; on the other hand he was still near the Father, thus holding

and governing the whole creation throughout its space and time (Torrance 1997). By his human nature Christ was contained in the universe, while by his Divine nature he was not contained by anything in the universe. By being the person of the Logos of God, he made visible to humanity that the Divine can be united to the human and created. And the power of upholding the entire universe while being on this planet, which can be explicated in spatial topological terms related to the geography of the Holy history and the entire universe, can be interpreted as an anticipatory sign of what the Divine humanity is endowed with in its microcosmic constitution: namely, by the power of its comprehension human being can hold the entire universe in the integrity of its intersubjectivity, referring thus the universe to its transcendent God-creator. In the same way as the presence of Christ in a particular location in space and time in the universe did not prevent him, as the Logos, from being present everywhere in the universe, the presence of humanity in a particular location in the universe does not preclude this humanity to be present everywhere in the universe through the “inherence” of the universe in the hypostasis of humanity, whose archetype is Christ himself (Nesteruk 2003). The Incarnation of the Logos in flesh at one particular point of the universe, and his simultaneous “presence” everywhere in the universe, including all layers of its intelligible counterpart, provides us with the archetype of how the all-penetrating human subjectivity can affirm itself in the physical universe from a particular position on the planet Earth.

Physics and Eucharist

By relating humanity to Christ, whose hypostasis, after the Pentecost, was transmitted to the Church, theology implicitly affirms that the Christ-event as central for our comprehension of the possibility of knowledge of the entire universe has some cosmological significance. Then one can conjecture that the development of the physical universe has, theologically speaking, a drastically different meaning before the Incarnation of the Logos on Earth, and, after it. It was

necessary for the universe to be in a state of constructive development in order to sustain life on Earth and to allow God to assume human flesh in order to initiate the new stage of salvation history. Humanity then can only be understood in the context of the promise of God for its salvation as constituting the locus point of the meeting of God and His creation, as the mediating agency, which is supposed to bring the whole universe through its genuine knowledge to new creation. In the same way as through Liturgy Christians experience an eschatological presence of Christ, the ecclesial wisdom in the knowledge of the universe through physics discloses to men the presence of the hypostasis of Christ. This wisdom reinstates the existing split between the ecclesial and scientific intentionality in studying the universe to their eucharistic unity, that is unity in communion with God, revealing thus the work of physicists as a *para-eucharistic work* (Zizioulas 1997).

Here the wisdom of Christian Church makes itself distinct from philosophical and scientific wisdom. Philosophies and sciences do not feel the modes of gratitude and thanksgiving as a beginning of thought. If for the ancient (pre-Christian) thought there was nobody who had to be thanked, for the modern thought it has always been a fight against the transcendent who might be thanked. The lack and loss of the eucharistic intentionality in scientific vision of the world results in a desire for unlimited possession of knowledge of things in order to use them for utilitarian goals. To restore eucharistic intentionality in knowledge one requires to exercise *metanoia* (change of mind, repentance) when abstract knowledge and ideas become manifestation of the *image* of God who stands in communion with the human spirit. This *metanoia* represents a mode of ecclesial reality so that the Church as eucharistic mystery gives the knowledge of a universe which was created to become a Eucharist. The physical universe acquires the sense of sacrament, thus being a correlate of the eucharistic intentionality. The Christian Church as carrying and sustaining this intentionality reveals itself as that ultimate multihypostatic

subject (community of scientists) which unfolds the universe in the state of communion and loving relationship.

Cosmic Eucharist

Contemporary dialogue between physics and theology attempts to answer a fundamental question: Can science provide an inference to the Divine, or can science transcend? In other words, what indications of the Divine can be detected by science? Within the Christian frame of mind it was a conviction that the very rational structure of the universe, its knowability point toward the Divine Logos, the second Person of the Holy Trinity, by whom and through whom, according to the Christian Creed, everything was made. The world was created by the Word (Logos) of God, everything exhibits his presence, and the principle of this presence is Christ who is both God and man. It is through his Logos that God gave an order to the universe that it is comprehensible by man, and it is through this comprehensibility that man can know about God from *within* creation. Ancient writers made use of astronomical examples such as the regular motions of the sun and the moon, the stars, the sunrise, etc., in order to infer that there is a consistent order in the universe, where opposite motions and differentiated objects are not ordered by themselves, but have a maker distinct from themselves who orders them. The order among things is not self-produced, but is maintained by God by means of uniting, balancing, administering, ordaining, and reconciling created things. However, according to the teaching of the Church Fathers, it was not enough for God just to create an ordered world in order to teach men about the God-Father. It was the role of the Son-Logos of God, who by his ordering of the universe reveals the Father, through his Incarnation, thereby using another means to teach those who would not learn from the works of his creation about God. Indeed through the affirmation of the unique position of Christ in the world as being in body locally at a given point in the vastness of cosmic space, and still being co-inherent at every point in space because He is in everything as the Word of God one can infer an implicit principle of order in the

universe which ensures that every place in the universe, as a place of the “presence” of the Word, is theologically co-inherent with the place where God is bodily incarnate, i.e., on earth.

The problem that arises is how to understand the presence of the Logos within the created realm and to what extent can physics advance the manifestation of this presence? Christian approach to physics lies in the conviction that the world in its entirety and in every detail is an effected word (logos), a personal creative activity of God. The contemplation of the logos is not the same as either empirical perception or mental comprehension. It is a mode of spiritual vision of reality, where the ontological roots of things and beings are seen as having their grounds beyond the world. This Christian contemplation of creation as it were “from above,” or “from within” – and not through external sensible or internal mental impressions – is significantly different from what is now normally accepted as taking place in scientific experience. Indeed, science usually thinks of itself as starting from experiments and measurements, from things which constitute our sense of ordinary reality, though sometimes mediated by experimental apparatus. There is, however, another aspect of all scientific investigation which involves the shaping of contingent empirical findings into a theory. This requires access to symbolic language, that is to mathematics, which makes it possible for us to talk about the entities standing behind the outcomes of our measurements. This takes place regularly when physics invokes the notions of elementary particles, fields, global geometry, the totality of the universe, etc. All these “objects” are known to us only through their effects, and are representable in our mind only by means of symbolic images. In other words, their physical existence is affirmed in terms of their symbolic images. The reality of matter in this case is an effected event accessible to man as a possibility of reason. We understand at present that this way of looking at reality corresponds to what we call rationality as a meeting of human reason with another reason. The knowledge of nature is thus analogical, or dialogical. The source of this rationality is hidden in reason

which is characteristic of the human person, understood as an initial possibility of existence, the source and ultimate foundation of any other eventuality of hypostatic actualization. It is human persons who meet God's creative command "Let there be light" which contains the meaning of the world and its temporal beginning (even though it should, according to physical cosmology, be billions of years away from now) in the inmost core of personal existence, because there is in human person that the personal bearer of this command is revealed, the Logos, Word of God, Jesus Christ. It is because of this that the truth of the physical world is for the community of the Christian Church inseparable from the knowledge of God, that is from the person of Christ (Yannaras 1998). This movement of man into the spiritual contemplation of the unity of things, their purposes and ends in Logos-Christ can be qualified as communion with God through nature as an effected word of God as a liturgical process on a cosmic scale: the "cosmic liturgy."

Cross-References

- [Classical and Quantum Realism](#)
- [Divine Action](#)
- [Energy in Physics](#)
- [Philosophy of Religion](#)
- [Philosophy of Science](#)

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Physics in Judaism

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Related Terms

[Judaism and physics](#); [Physics](#)

Description

Physics and Premodern Jewish Religious Thought

A clear sense of the historical relationship between physics and Judaism must be guided by an understanding of three fundamental historical facts.

The first involves the relative developmental timelines of physics and Judaism. Although it has some roots among the ancient Greeks (e.g., Aristotle, Archimedes, etc.) the broad contemporary field of science known as physics began to develop in the sixteenth and seventeenth centuries in the work of such iconic figures as Copernicus, Galileo, and Newton, and grew to its current level of depth and breadth in the twentieth century. By contrast, the broad set of religious traditions, laws, values, and community structures known as Judaism is rooted firmly in the Hebrew Bible, composed in the first millennium BCE, and then experienced massive growth and development in the Talmudic period (the four to five centuries following the destruction by the Romans of the Temple in Jerusalem in 70 CE), and had laid down much of its classical philosophical and religious literature by the end of the Middle Ages. Thus, by contrast to Protestantism, for example, which began to flourish just as the modern field of physics was coming into existence, or to Roman Catholicism, which began an important developmental phase at the same time (at least in part as a response to the Protestant Reformation), Judaism had settled comfortably into its classical phase at least a century before

Copernicus began to describe a heliocentric universe. This means that many of the doctrinal and political conflicts that characterized the early relationship between the Church and physics because of the confluence of their early developmental stages had no homologue in Judaism.

The second fundamental fact of relevance to the relationship is that several of the founders of modern physics, most notably Copernicus, Galileo, and Newton, were closely associated with the Church. This meant that their scientific work was inevitably closely watched and evaluated by Church leaders to determine its theological ramifications. During this period in European Jewish history, however, there was significant mistrust between Europe's Jews and the Church. The Roman Catholic Church's relationships to Jews and Judaism can be fairly, if somewhat broadly, characterized by the anti-Jewish sentiments and actions of the Crusades and the Inquisition (Steinberg 2008). And the Protestant Reformation's attitudes toward Judaism, as attested, for example, in the writings of Martin Luther, were likewise filled with vituperation and hostility (Oberman 1983). This historical picture meant that Jewish thinkers and scholars in the formative period of physics, because of their fear and mistrust of, and resultant isolation from, the Christian intellectual world, were little aware of its discoveries and little affected by the revolutions it fomented in how we see the universe in which we live. (On the lack of awareness of the work of Copernicus among Jewish astronomers, for example, see "The Astronomy of Rabbi Moses Iserles" in Langermann (1999).)

But by far the most important fact that should inform one's sense of the relationship between physics and Judaism is the way Judaism, as it developed in the Talmudic period, deals with doctrinal truth regarding all matters, including the understanding of Scripture. Talmudic Judaism clearly based itself on an absolute belief in, and adherence to, the words and principles of the Torah, which it considered to have been revealed directly to the people of Israel by God. Yet it was equally clear in its commitment to the notion that the understanding of, and therefore, obedience to, the Torah required human (i.e., rabbinic)

interpretation. In a sense, the entire religious program of the Talmudic era was devoted to the creation of a vast system of interpretation that would transform the Torah into a document that would guide every imaginable aspect of the life of the Jewish people. Such interpretation was necessary because the Torah often seems to provide only a bare minimum of guidance, omitting the details that would be necessary in order to live a fully compliant life. Thus, to cite just a single, very common example, the Torah absolutely prohibits work on the Sabbath. But it is all but silent on what constitutes work. In order for Sabbath observance to become a cornerstone of Jewish life (as, in fact, it did), a tremendous amount of interpretive detail had to be added to the system. The sum total of this added interpretive detail was referred to by the rabbis as the Oral Torah (Hebrew: *Torah she-b'al peh*), as distinct from the Written Torah (Hebrew: *Torah she-bikh'tav*), and although the rabbis often made claims for its divine origin, it is quite clear that the Oral Torah is the product of human analysis, interpretation, and creativity. This Oral Torah is concerned almost exclusively with matters of correct understanding of and compliance with Jewish law (Hebrew: *halakha*), and cares rather little about matters of belief. Thus, the Talmud and the legal literature it spawned in the centuries following its completion focused on proper observance of Sabbath and festivals, of dietary laws, of ethical conduct between persons, of civil law and criminal jurisprudence, of laws governing the human life cycle (e.g., circumcision, marriage, divorce, and the rituals and requirements surrounding death), of agriculture, of prayer, and of many other such behavioral issues. But these literatures have little to say about the doctrinal aspects of Jewish life. They provide no creed and lay down no specific requirements for belief. (See below for Maimonides as an exception to this generalization.) Thus, for example, the Oral Law presents a plethora of intricately detailed requirements regarding the recitation of daily prayers. These include the times of recitation, the texts to be recited, whether the recitation should be audible or silent, whether the worshipper should stand or sit, what sorts of locales are appropriate, and

which are inappropriate for prayer, what to do if one is prevented from praying at the proper time, what sort of mental attitude one must maintain during prayer, and much more. But it says little about what one ought to *believe* about prayer or its effect on God or the world. This has led many to claim that the most traditional forms of Judaism should be referred to as Orthoprax (meaning “correct practice”), rather than Orthodox (meaning “correct belief”). In addition to its nearly exclusive focus on behavior and its virtual silence regarding doctrinal matters, the Oral Torah is characterized by a complete tolerance for – it may not be an exaggeration to say a *love* for – multiple interpretations, differing opinions, and multiple truths. Rabbinic literature is filled with accounts of major disagreements among the sages over every conceivable issue. And far fewer than half of such disputes are resolved. Instead, after examining both sides in depth, the text moves on, satisfied to leave the issue unresolved. Thus, in the rare cases in which the rabbis express themselves on matters of belief, they generally maintain a great tolerance for alternate opinions and interpretations. Therefore, unlike the case in the relationship between the Church and physics, Judaism, to the extent that it was aware of them, never saw revolutionary ideas about the universe as threats to doctrinal orthodoxy, since it cared little about such orthodoxy and, on the rare occasions when it did, it was little perturbed by nonstandard views.

An important exception to the foregoing observations is found in the work of Moses Maimonides (also known as Rambam, 1135–1204, Spain and Northern Africa). In his 14 volume legal work, entitled *Mishneh Torah*, he broke with tradition and set down simple legal rulings, without citing either earlier sources or alternative views. This radical approach led many to condemn the work when it appeared, although in subsequent generations, it gained enormous influence and is hailed today as a major landmark in the development and codification of Jewish law. In his other works (his *Commentary on the Mishnah* and his philosophical magnum opus *Moreh Nevukhim* or *Guide to the Perplexed*), he does present what he deems required beliefs for all

Jews. So influential were his views that his creed, in two poetic settings (the song *Yigdal* and the so-called 13 Principles of *Ani Ma’amin*), are included in almost all traditional Jewish prayer books to this day. Nevertheless, even Maimonides’ views could never have led to major conflict in the face of the discoveries of modern physics, since he went to great pains to teach that the human mind can know nothing of any certainty about God. Rather, when we make statements about God, we are actually describing not God’s attributes but God’s *negative attributes*. Thus, for example, when we say that God is One, all that we really can mean is that God is not many. In other words, because God is unique, we cannot compare God to anything else, or even imagine that a word applied to God means the same thing that it does when applied to something else. This view prevents any possibility of reading Scripture literally.

In light of all that has been said, the following statements may be made regarding the historical relationship between physics and Judaism:

1. Because the revolutionary discoveries of physics from the sixteenth century onward have little bearing on the practice of everyday life, Judaism as it developed in the Talmudic era and the centuries following the completion of the Talmud has been little concerned with these scientific discoveries. This is quite unlike the case of biology, where new discoveries often have legal and ethical ramifications about which Jewish legal tradition cares a great deal (e.g., issues of definition of life and of death, palliative care, reproductive medicine, and so on).
2. Because Judaism, as it developed in the Talmudic period, has maintained a high tolerance for multiple views regarding theological issues, even if the discoveries of physics had posed challenges to Jewish orthodox beliefs, those challenges would have been of relatively minor consequence.

Medieval Jewish Thinkers

These conclusions are not meant to imply that Jewish thinkers and writers throughout history had no interest in the issues of physics.

Indeed, there has been consistent interest in, and attention paid to, issues of cosmology since the Talmudic era. Specifically, the questions of whether the universe is eternal or was created in time, and whether its creation was *ex nihilo* (Hebrew: *yesh me-ayin*, literally, existence from nothing) became focal points for much debate among medieval Jewish philosophers. So, for example, Solomon Ibn Gabirol (eleventh century, Spain), although his sympathies lay with neoplatonism, nevertheless tried to argue for creation *ex nihilo*, while Saadya Gaon (early tenth century, Baghdad) couched his laborious arguments in favor of creation *ex nihilo* in terms very similar to those of the proponents of Kalam. Maimonides declares that the question of whether the universe was eternal or created in time cannot be definitively determined by the philosophers or by reading the Torah, and thus chooses to adopt a belief in temporal creation solely because doing so is compatible with maintaining a belief in God's ability to perform miracles and make free decisions, and these beliefs are crucial to Jewish life (see his *Guide to the Perplexed* 2:25). This reasoning is important, for it shows that, although medieval Jewish philosophers argued about questions of cosmology, they did not regard them as being terribly central to Jewish belief. What was most crucial to them, and, generally speaking, to all premodern Jewish thinkers, was maintaining the system of Jewish life, with correct practice based on obedience to God's commandments (Hebrew: *mitzvot*) as expressed in the Written Torah and interpreted in the Oral Torah. As long as questions of the origin of the universe and the circumstances surrounding it did not materially affect the integrity of a life lived in accordance with the Torah, the philosophers never saw such topics as being critical to Jewish doctrine.

Modern Jewish Physicists

With the dawn of modernity, and especially under the influence in Europe of the Enlightenment and Emancipation, many Jews abandoned traditional Jewish belief and practice to a greater or lesser extent, and opted instead to participate fully in the cultural and intellectual life of the

societies in which they lived. This historical shift led many Jews to seek secular education, and one result was that a very large number of Jews became distinguished physicists. In the twentieth century, this was the case especially in pre-Nazi Germany, in the Soviet Union, and in the United States. The list of important figures in the development of modern physics who came from Jewish families is remarkable. It includes (the following is only a partial list):

Niels Bohr, David Bohm, Max Born, David Deutsch, Bryce DeWitt, Albert Einstein, Richard Feynman, Murray Gell-Mann, Sheldon Glashow, Alan Guth, Robert Jastrow, Lev Landau, Benoit Mandelbrot, Albert Michelson, Hermann Minkowski, John von Neumann, J. Robert Oppenheimer, Wolfgang Pauli, Arno Penzias, Saul Perlmutter, Boris Podolsky, Ilya Prigogine, I. I. Rabi, Carl Sagan, Julian Schwinger, Lee Smolin, Edward Teller, Steven Weinberg, Eugene Wigner.

This list includes only those whose names are known to the wider, nonscientific population, and constitutes only a small fraction of the total number of prominent Jewish physicists. To put the numbers in perspective, as of 2009 the Nobel Prize in Physics has been awarded to 187 individuals, of whom 44, or about 23.5%, have been Jews. These Jews have been and are, for the most part, uninvolved in and occasionally even hostile toward Jewish religious life. The group includes a number of individuals from intermarried families (i.e., with one Jewish and one Gentile parent), and some instances of conversion (Pauli's father, born Jewish, converted to Catholicism before his marriage to Pauli's mother who was raised by her Catholic mother and Jewish father; Wigner's family converted from Judaism to Lutheranism when Wigner was in his teenage years). One of the few well-known exceptions to this overall lack of involvement in religion in general or Judaism in particular was Albert Einstein, who considered himself religious (although he defined this as "veneration for this [subtle, intangible, and inexplicable] force beyond anything we can comprehend..." (Jammer 1999a)) and spoke

often of God. He felt a close kinship with the pantheistic thought and commitment to absolute determinism of Baruch/Benedict Spinoza, the famous, mid-seventeenth-century Dutch Jew who was ultimately excommunicated by the Dutch rabbinate. He was not drawn to traditional Jewish religious practice or belief, although for a period of his youth, from about the age of 6 to the age of 12, perhaps inspired by a private Jewish tutor engaged by his parents to teach him the fundamentals of Judaism, he did observe Jewish ritual enthusiastically. Throughout his career, he made frequent references to God. Most famously, in a 1926 letter to Max Born, he wrote, “(quantum) theory says a lot, but does not really bring us any closer to the secret of the ‘old one’ (i.e., God). I, at any rate, am convinced that *He* does not throw dice.” On the specific question of the relationship between religion and science, Einstein asserted that, “science without religion is lame, religion without science is blind.” Although his views on religion were often condemned by the Christian community, they were often embraced by the liberal Jewish community in the United States. In response to a 1930 essay by Einstein in the *New York Times Magazine* entitled “Religion and Science,” Rabbi Nathan Krass, a well-respected liberal rabbi and professor of homiletics in New York City, said in a sermon, “The religion of Albert Einstein will not be approved by certain sectarians, but it must and will be approved by the Jews” (Jammer 1999b). Irrespective of his theological agreements or disagreements with traditional Jewish beliefs, Einstein felt a close sense of personal identity with the Jewish people on a cultural, ethnic, and national level. He was devastated by the news of the destruction of European Jews by the Nazis, and expressed deep hatred for the perpetrators, even though his beloved Spinoza had counseled that hatred “can never be good.” He also identified as an active and proud Zionist, although when he was offered the presidency of Israel after the death of the first Israeli president (and Einstein’s friend) Chaim Weitzman, he regretfully refused. All in all, he stands out among the great physicists of his time

as one of the very few who comfortably embraced his Judaism, even when he disagreed with its doctrinal orthodoxies or ignored its ritual requirements.

Contemporary Jewish Physicists on Judaism

Beginning early in the 1990s, there appeared a small number of books written by contemporary physicists who are themselves observant (i.e., Orthodox) Jews, addressing the relationship between physics and Jewish tradition. These works were first produced in the same cultural milieu that had produced such well-known works as physicist Fritjof Capra’s *The Tao of Physics* (1975) and Gary Zukav’s *The Dancing Wu Li Masters* (1979), which described parallels and similarities between the “new physics” and spiritual (usually mystical, eastern) traditions. Most notable among these Jewish authors is Gerald Schroeder, whose Ph.D., in Physics, was from the Massachusetts Institute of Technology. Since the publication of his first book, *Genesis and the Big Bang* (1990), he has devoted himself more to teaching and writing in the field of Jewish religious studies than in science. In that work and the several that he has written since, Schroeder argues that the creation narrative of the Torah (Pentateuch) is not only not in conflict with modern cosmological theories, but matches them, and in fact, anticipates them, quite well. Relying on traditional Jewish interpretations of the biblical text (especially those of Moses ben Nachman, or Nachmanides, thirteenth-century Spanish rabbinic authority and mystic), he argues that the order of the creation narrative in the first chapter of Genesis precisely accords with what has been learned from cosmology, geology, paleontology, archeology, and other modern scientific disciplines. He reconciles the apparent difference between the biblical report of creation taking place in 6 days with the scientific estimate of roughly 15 billion years by appealing to Einstein’s Theory of Relativity. Focusing on Einstein’s insight that time and the measurement of time are not absolute, but are critically dependent on inertial reference frames, he argues that

...the first six days of Genesis were six 24-hour days. This means that whoever was in charge recorded the passage of 24 hours per day. But who was there to measure the passage of time? Until Adam appeared on day six, God alone was watching the clock. *And that is the key.*

During the development of our universe and prior to the appearance of mankind, God had not yet established a close association with the earth. For the first one or two days... the Earth didn't even exist! ... Because there was no Earth in the early universe, and no possibility of an intimate tie or a blending of the reference frames, there was no common calendar between God and the Earth.

According to Einstein's law of relativity, we now know it is *impossible* in an expanding universe to describe the elapsed time experienced during a sequence of events occurring in one part of the universe in a way that will be equal to the elapsed time for those same events when viewed from another part of the universe. The difference in motions and gravitational forces among the various galaxies... make the absolute passage of time a very local affair. ...

The odyssey that stretched between the stuff of the Big Bang and the matter of today was too complex, too varied, to be timed by a single clock... We humans, and everything else in the solar system... are the debris of bygone stars... To which atoms of carbon, nitrogen, or oxygen would the time relate?... Until the formation of the Earth, the processing of the cosmic stuff of which we are composed occurred in a myriad of stars... Each star and each supernova had its own gravity, its own speed, and so its own space-time reference frame. ...

[A] compromise had to be made to describe the sequential development of the universe. This compromise was to choose, for the time preceding Adam, the Creator's own reference frame that viewed all the universe as a single entity. ...

...[I]t was at the moment of Adam's appearance that the part of the universe where man dwells started to operate in the same space-time reference frame as its Creator. (Schroeder 1992)

This passage is completely typical of Schroeder's method. By a clever application of modern physics, he is able to demonstrate a deep compatibility between the understanding of the universe that has been developed by modern science and what he considers the revealed truths about the universe available in the Torah. The apparent goal of such work is to prove the ultimate truth of Torah to a generally secular population that has a high regard for science and its truths. In effect, it is a sophisticated form

of Creationism in which, instead of claiming, for example, that fossils were created by God, or that each "day" of Genesis actually consisted of 3 billion years, Schroeder uses the tools of modern physics to "prove" that the biblical account is literally true, if we will only read it with a degree of sophistication due to a complex and nuanced work. In this, Schroeder's agenda is similar to that of other Orthodox Jewish writers on topics relating to physics and Judaism, such as the proponents of the Bible Codes. That agenda is to use modern science to prove the divinity, and thus the authority, of the Torah. All the authors involved in such work are personally committed to Orthodox Judaism, and their writings are designed to use rational, scientific arguments to convince readers of the ultimate truth of this form of Jewish life.

Liberal Jewish Approaches to Physics

At roughly the same time that Schroeder and others were beginning to argue that modern physics constituted a strong justification for the truth of Orthodox Judaism, liberal Jewish thinkers from outside the world of physics were beginning to turn to physics (primarily to cosmology) in a non-Orthodox move to find new meaning in Jewish life. Foremost among these thinkers is Daniel C. Matt, former professor at the Graduate Theological Union and acknowledged as one of the world's greatest authorities on *Kabbalah* or classical Jewish mysticism. In his 1996 book, *God and the Big Bang* (not to be confused with Schroeder's *Genesis and the Big Bang*), Matt proclaims that in his approach to the scientific and the spiritual he will "...experiment with seeing each in light of the other... to bring the two into dialogue" (Matt 1996a). Where Schroeder uses cosmology to demonstrate the literal truth of biblical text, Matt, the kabbalist, focuses on mystical descriptions of God such as *Ein Sof* (literally "no end" or "no boundary"), a moniker that has a startling resonance in physics (cf. the "Hartle-Hawking no-boundary condition") but that is neither mentioned nor hinted at in the Bible or the Talmud. Rather than trying to prove or convince us of anything,

he uses poetic language drawn both from the ancient terms of Kabbalah and from the fundamental concepts of cosmology to suggest how both disciplines might be understood as hinting at a meaning that transcends the ordinary and the mundane. He writes:

There are moments when the self uncovers its vast ground of being, its interface with all that exists. Mystics have no monopoly on such moments. . . . As members of the cosmos, we derive from the big bang. Each quark within each of us was present at the beginning. . . . Through science the deductive mind. . . . gropes its way back as far as possible. . . . to the beginning of time and space. Through contemplation, the meditative mind. . . . gropes its way back. The two approaches, while not the same, are complementary paths from our limited, human vantage point to the beginning. (Matt 1996b)

Employing this approach, Matt provides evocative suggestions of parallel meanings to be found in cosmology and in Jewish mysticism. For example, he presents an extended explanation of the kabbalistic doctrine of the “breaking of the vessels” (Hebrew: *shevirat ha-kelim*), a description by the sixteenth century mystics of Safed (in northern Israel) of how the perfect and undifferentiated divine light shattered early in the creation process and led to the created and flawed world that we know. He then discusses the “symmetry breaking” by which the four fundamental forces split apart in the moments after the big bang. He observes:

We exist today in our present condition, with all our flaws and imperfections, because of broken symmetry, just as Jewish tradition teaches that our jumbled, blemished reality derives from the breaking of the vessels. (Matt 1996c, p. 85)

By focusing on the philosophical implications of modern scientific cosmology, he points to similarities between some of the insights one may reach through its study and notes their similarity to insights that one may reach by studying Kabbalah.

A similar approach with a somewhat different agenda is found in the 2005 book, *Judaism, Physics and God: Searching for Sacred Metaphors in a Post-Einstein World*, by liberal rabbi and academic David W. Nelson (2005). Like Matt, he explores the conceptual landscape

of modern physics in order to find links with Jewish meaning. But where Matt is mainly interested in Kabbalah, Nelson’s main goal is to generate a set of new metaphors for God. Arguing that all we can say or know about God is metaphorical, he examines several areas of physics in an attempt to create modern God-metaphors that may be more appealing to a modern Jewish audience than the ancient metaphors of King, Father, and so on. So, for example, he suggests using the Big Bang as a metaphor for God, he uses chaos theory to suggest that God is fractal-shaped, and he describes the extra “tiny curled up spatial dimensions” posited by string theory as a way to think about God’s invisible and pervasive presence in the world. He also discusses new understandings of premodern notions of God. In his examination of Special Relativity, for example, he considers how the ancient biblical metaphor of God-as-light (see Psalm 27:1) might be understood anew by taking into account Einstein’s insights into the constant speed of light. Nelson’s use of physics is clearly designed to present a new framing of traditional Jewish concepts and beliefs that he believes will be more accessible to a modern, scientifically minded Jewish world.

The work of both Matt and Nelson is far less polemical than Schroder’s. Both are designed to be evocative rather than didactically to prove the truth of their positions. It is important to note that, whereas Schroeder is a professional physicist with extensive knowledge of Jewish tradition, Matt and Nelson are scholars of Jewish thought with amateur interest in physics, although it is clear that both received significant assistance from professional physicists.

The Future of Jews and Physics

It has been observed anecdotally that, whereas Jewish students comprised a significant portion of those entering high-level physics programs in the United States throughout much of the twentieth century, the proportion of this group has been decreasing since the 1990s. This trend is nearly impossible to demonstrate with statistical precision and confidence, yet those who believe it to be a fact conjecture that as the

American Jewish population becomes increasingly far removed from the immigrant experience, its drive to societal advancement through higher education wanes. Were this perceived trend determined to be real, one might expect, in decades to come, to find substantially reduced numbers of Jews in all areas of physics.

Cross-References

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Physics and Orthodoxy (Physics and Eastern Christian Theology)

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The Orthodox Christian Church has its roots in Christ Himself and in his Apostles. The Orthodox Church was founded in an era in which it could have had no part or influence in the broader culture around. The first century found the Church simply trying to survive and to expand spiritually as well as in numbers of people. However, the science of medicine attracted the attention in the Church. Medicine was considered to be a ministry of the Christian Church, and several important advances were made during the Byzantine era. In the mid-400s, a Christian school of medicine was flourishing in the eastern city of Edessa. This school, which was operated by Nestorian Christians from Constantinople, was closed by the emperor in 489. The teachers and students of that school moved into the Persian Empire and founded a school in the Nisibis. This medical school also moved to Jundishapur following the Nestorian Christian Hunain Ibn Ishaq, and a synthesis of medical knowledge began to form a new medical and pharmacological corpus.

Physics and the Other Natural Sciences

Interest in continuing the development of the physical sciences, which had begun in both Egypt and Greece in the centuries BCE, was pursued with great interest. Physics and mathematics were equally important in all aspects of everyday life but particularly within the realm of military engineering activities. Much of the scientific interest was devoted to military defense. The invention of “Greek fire” by the engineer Kallinikos of Heliopolis was among the advances made through research driven by

military purposes, as were advances in shipbuilding and defensive machinery. During this era, those who were occupied with scientific matters, such as Leo the Mathematician (c. 790) and John Philoponus (490–570), were laymen. Philoponus realized that there were problems with Aristotle's concept of motion. While he did not arrive at the proper conclusion (acceleration), he took understanding a step further by positing impetus. Anna Comnena (1083–1153), daughter of Emperor Alexius Comnenus (reigned 1081–1118), who wrote on medicine and astronomy, demonstrated a considerable knowledge of science. She included references to the scientific accomplishments of a number of women. There is a considerable list of scientists in the Orthodox Christian world of the Byzantine Empire, including a number of the emperors and churchmen. Their interests were wide ranging. One could find many examples which are highly relevant but now have a predominantly historical significance. However, if there is one connecting thread that could be traced from the first centuries of the Orthodox Church through the present, it would be the dynamic vision of reality, both uncreated and created, together with a subtle epistemology that goes beyond the chasm between visible and invisible. Interestingly, the special connection of the theology of the Orthodox Church with concepts of physics became far more prominent with the advent of quantum physics.

Orthodox Theology and Physics

Orthodox Christian theology is very much concerned with understandings rooted in the concepts of energy and light. Energy in particular has always been understood in the Orthodox Church to be about relationships. Both energy and light “communicate.” What we call “grace” is understood to be the uncreated energy of God. The understanding of “created energy” and “created light” has been of significant theological interest. Our relationship with God is mediated through the uncreated energy and light with which He reveals Himself to us. Created energy

and light are at the basis of the universe and of mankind. It is in this context that physics has always been of interest in the Orthodox Church. In this regard, Saint John of Damascus (c. 676–749) says that:

“energy is the natural force and activity of each essence: or again, natural energy is the activity innate in every essence: and so, clearly, things that have the same essence have also the same energy, and things that have different natures have also different energies. For no essence can be devoid of natural energy. . . . Natural energy again is the force in each essence by which its nature is made manifest. And again: natural energy is the primal, eternally-moving force of the intelligent soul: that is, the eternally-moving word of the soul, which ever springs naturally from it. And yet again: natural energy is the force and activity of each essence which only that which is not [does not exist] lacks.”

Developments in physics and other areas of science in the twentieth and twenty-first centuries have required a response from Orthodox Christian theologians, and this challenge has led a number of Orthodox hierarchs and priests into the study of science. Some of the priests are also working scientists. The development of genetic science has also raised issues which require both a moral response and a reassessment of our understandings of humanity which includes some of its fundamental moral concepts.

The appearance of quantum mechanics in particular has been of considerable interest. Many Orthodox Christian theologians have seen a kind of complementarity between the epistemological approaches of Orthodox theology and quantum physics, and this has brought the Orthodox Church into a more comprehensive involvement in modern physics. The idea of complementarity stems as much from the methods of both quantum physics and Orthodox theology as from other perspectives. It is understood that both these domains offer us models of reality but not reality itself. In the language of Orthodox theology, this is known as the “apophatic” approach which is grounded in the refusal to exhaust knowledge of the truth in its formulation. What this means is that the pursuit of truth has a fundamental experiential and existential component without which

it becomes impossible. When Niels Bohr says that “the purpose of science is not to know the essence of nature, but to discover what can be known about nature,” we are reminded of St Gregory of Nyssa’s words in his discussion of the concept of the Trinity that we are not describing the essence of God but that “we are only using the best words available to us in human language to describe a relationship.”

The essence of reality at all levels and in every dimension remains an ultimate mystery. We do not suggest that the world, which we experience with our own senses, is not reality; nevertheless, what we perceive is the surface of reality, which can be penetrated to some extent only with great effort over time. The more deeply we penetrate into this perceived reality, the greater the mystery becomes.

A factor in Orthodox Christian interest in modern physics is the fact that it deals so much with energy and light. Orthodox Christian theology and spiritual experience are very much concerned with energy and light. This concern is both concrete and metaphysical because in terms of spiritual realities, Orthodox theology divides energy and light into the created and the uncreated. Energy is understood in terms of relationships between constructs. Energy (uncreated) communicates and mediates the relationship between God and man, between human beings, and between all objects. Light also is understood as communicating energy as well as understanding. It is a medium of participation. We cannot be passive observers of these fundamental phenomena; rather, every encounter with them has a mutual effect on both that which is encountered and the one who is encountering. The Orthodox Church fathers were certainly not the first to realize that our universe is in a state of flux. Nothing is permanent and immutable, but everything in our world is in a state of change. Indeed, life and all that we see consists in processes rather than in “things.” This condition often screens our vision from reality, and when we do encounter reality beyond the surface appearance, we are reminded of the word of St Dionysius the Areopagite that “as we plunge into that darkness which is beyond intellect, we shall find ourselves not

simply running out of words, but actually speechless and unknowing.” This reminds us of the words of Werner Heisenberg that “in quantum physics we have no framework for correlating the mathematical symbols of it with the concepts of our language, nor can we satisfactorily discuss atoms in normal language.” This area of convergence between Orthodox theological experience and quantum physics is important. It arises from the clear fact that not all truth and not all reality can be discovered or defined rationally or by logical means nor can it be expressed accurately in human tongues. One must be open to paradox in both modern physics and in Orthodox apophatic theological experience. Since Orthodox theology is existential and experiential rather than based in reflective reasoning, the unfolding of the concept that existence is filled with mystery. This mystery which gives rise to a (mystical) reality that can neither be expressed in the ordinary human languages nor be successfully visualized without creating distortions is completely accessible to the Orthodox theologian. Much of the deeper interest in modern physics on the part of Orthodox theologians and in part what has led priests and hierarchs into the study of physics has been this recognition of a complementarity between their theological experience and modern physics.

So far, we have spoken about a theological-spiritual understanding of energy and light we can and have seen how Orthodox theologians are being drawn toward modern physics. Orthodox thinkers do not conceive the idea that energy and light must always be understood in some metaphysical dimension. Rather, energy and light are seen as primordial or fundamental to understanding the natural universe, while at the same time, energy and light in another (spiritual) dimension are seen as fundamental in spiritual life. No attempt is made to blend or merge science and the spiritual in these areas. However, this connection has led to a greater interest and respect for science on the part of contemporary Orthodox theologians. Another aspect of this interest lies in the problem of visualization which will be discussed briefly later.

The Nature of Theology and the Nature of Physics

“When God speaks of a place, He does not mean a space which can be quantitatively measured, but rather by using the analogy of a measurable surface, He is guiding the reader to a reality which is infinite and without limit” (St Gregory of Nyssa).

Quantum physics may no longer be an adequate term, since its newly unfolding development merges quantum and relativistic theory. The term microphysics seems to be more embracing. Microphysics is the study of the fundamental relationships of physical reality. What is interesting about it in the context of this discussion is its approach to the understanding of interaction processes rather than to the observation of entities. There is a similarity between this approach and the Orthodox approach to theology.

Medieval nominalists advanced the development of science by refocusing investigation upon particulars rather than abstractions. This idea was gradually clarified and refined, and rapid increases in the understanding of macro level reality followed. Ultimately, however, all physical reality arises from the micro level. In order to comprehend micro level reality, the method of investigation had to refocus once more. This refocusing has taken several decades as three important facts became clear. It was first necessary for physicists to realize that they could not be external observers at the quantum level. The very act of observation and quantization (which always involves a process of measurement) interjects the observer into the process of observation and interacts with that which was being observed. The second realization is that both quantum and relativity theory cannot be treated in isolation in the understanding of micro level physics. It is necessary to engage the two together for successful investigation of the microworld. If relativity does not function at some level, then an explanation for this needs to be found. The third transition, and the main aspect of the refocusing, has been to move away from the attempt to study and analyze particles as specific material objects, and away from the concept of entities as material

structures, toward the observation of interaction processes, in which the distinction between energy and matter is not so sharp or is even indefinite. It may be that being itself is a series of processes which not only shape our reality but in which we constantly participate.

What we call “theology” and what we call “Orthodox Christian spiritual life” are one and the same thing because our theology does not focus on doctrine as a legislated point, a philosophical posit, or logical “entity.” Orthodox theology is not concerned with static “facts”; rather, it is concerned with interactive processes or, rather, with processes of personal and hypostatic relationships. There can be no better declaration of this fact than the words of Gregory of Nyssa:

Seeing that you have stretched forth that which is before you with a great desire, and you never experience complete satiation in your progress, nor are you aware of any limit to the good, as your longing calls you on to ever more and more: here is a place that is so vast that he who runs in it will never be able to reach the end of his course. And yet from another point of view, this course has stability; for God said, “I will set you on the rock” (Ex.33:22). But here, we have a very great paradox: motion and stability are identical. For usually speaking, one who is rising is not standing still, and the one who is standing still is not rising. But here, one arises precisely because he is stationary.

What, precisely, is the suggested connection between the interactive processes of modern physics and the relational processes of Orthodox theology? First of all, the processes of Orthodox theology are revealed in the life of grace, the life in Christ. They lead us to truth by means of the experiencing of truth. This is accomplished not by dry legalistic “facts” but by entering into the interactive processes within the whole Body of Christ which includes the relationship with God Himself. The lives of the saints and martyrs, the holy fathers and mothers, are not remote from us but impact upon us and our struggle. The quest for an understanding of the things created by God turns out to require a similar concept, although, obviously, on a radically different level and dimension. Modern physics, at least at the quantum level, cannot be “done” except by interjecting

into the interactive processes of that which is being “studied.” In fact, this affects the general point of view and philosophy of the physicist and ultimately has an effect on the way people reason in general. It is possible to utilize this fact in a positive way in expounding the Orthodox faith to those outside the Church. Moreover, should it be thought strange that both pursuits which are helping us to approach an understanding of the “hidden qualities of the Creator” should have something in common in their approach? Orthodox theology understood and practiced this concept long before the mind of science perceived it, and that is normal also. The connection between the two, the processes of science and the processes of our theology, are not identical in essence, but in a real sense, they are related in the way they use their concepts. Could it really be otherwise when modern physics is a careful study of “the things that were created,” in view of the fact that God has promised us that such a study would reveal to us “the hidden qualities of the Creator”?

If there were no other conclusion to reach from this comparison, it would be enough simply to realize that modern physics – modern science, in general – is not a devious plot which must be feared by Orthodox Christians, by any Christian, or by anyone at all.

The Problem of Visualization in Orthodox Theology and Modern Physics

“As we plunge into that darkness which is beyond intellect, we shall find ourselves not simply running out of words, but actually speechless and unknowing” (St Dionysius the Areopagite).

In quantum physics, we have no framework for correlating the mathematical symbols of it with the concepts of our language nor can we satisfactorily discuss atoms in normal language (Werner Heisenberg).

Plato (ca. 430–348 B.C.) developed earlier ideas about the meaning of reality into a more refined and sophisticated system. What is of interest here is his concept that the material world of our senses is but an echo or imitation

of the reality of the ideal and eternal forms of the divine “jurisdiction” or, as he suggests in his parable of the cave, reflections of eternal reality moving like waves of shadow on the wall of a cave.

What concerns our subject is the implications of all this for later religious thought. Plato had a lofty conception of what all this means, and he may even have intended for it to evoke aspirations and the effort to purify the intellect. Over time, however, and particularly in the Medieval Era, these concepts were literalized in a peculiar way – perhaps the very reverse of what Plato intended. Looking briefly at the problem, the notion evolved that if the material universe is a shadow, reflection, or imitation of the ideal forms of eternal reality, the eternal reality must be a subtle form of the material world. Thus, “things yonder” were visualized and given concrete, physical, and material forms (often not at all subtle) even when the descriptions of them were metaphors for psychological states.

It is worth looking at one important result of the artificial “tandem” between religious philosophy and what we could now call “the old physics.” In classical physics, the physics which still bore the influence of Aristotle and Plato, and in the Medieval Era, every phenomenon was visualizable. The influence that this type of philosophical physics had on theology is quite interesting. It actually helped paganize the Western view of God. God was conceived of as being also visualizable, and therefore, He was anthropomorphized and, like the pagan Greek gods, had foibles and passions common to fallen humanity (vengeance, juridical justice, the need for satisfaction, etc.).

The problem in physics occurs when one attempts to visualize micro level phenomena in terms of macro level conceptualizations. The same problem occurs in the theological life when one attempts to visualize that which is unseeable and ineffable on the level of the clearly visible – not merely does one distort that which is said to be apophatic by visualizing it as kataphatic, but one seeks to seize upon what forever remains a mystery and render it common. So also, in Aristotelian science, every theory was

thought to have a one-on-one correspondence in physical reality. It was supposed, therefore, in both antique physics and Scholastic theology, that reality could be rationally determined, codified, linguistically defined, and visualized in a constant form.

In its development, physics gradually departed from this philosophical milieu and came, by stages, to the point of quantum physics, in which practically nothing is visualizable, but the clear evidence of reality can only be expressed symbolically by a mathematical formalism, rather than metaphorically or allegorically.

The idea of visualization requires some discussion. We have a certain tension between the micro and the macro levels of reality in physics and between the created and the uncreated, the noetic and the sensually visible in theological experience. The created universe we experience is reality – a macro level reality – and we see it and verbalize it in language which is a combination of symbolic, metaphorical, and concrete. Nevertheless, the macro world emerges from the micro one. If we looked at this in terms of picture rather than image, we might conceive the picture as a halftone with a very tight dot-per-inch configuration – so tight that it appears to the eye (and is expressed verbally) to be continuous tone. What we see at the macro level is visualized which means that what is seen is linguistically interpreted. The suggestion here is that seeing involves the reception of an image, while visualization involves interpretation in the realm of linguistically based assumptions. On the other hand, we also visualize what we cannot see but hear – or hear about. In this case, what we hear is also interpreted in the realm of visually based assumptions, and the two – linguistically and visually based assumptions – are not separate. It is a combination of these two that constitutes “visualization.” We always interpret within the framework of our visual experience. For example, my first concept of the wave function of a particle is that it constitutes the bow shock and wake of a dense moment of energy moving in space-time. Doubtless, this perception is induced by a visualization of the word “wave.” Whenever we visualize or visually interpret at the quantum

level, we distort and perhaps even falsify reality. Precisely the same thing occurs in Orthodox theology when we visualize the uncreated in terms of our created, macro level reality, which is the only frame in which we can visualize and linguistically interpret.

As an example, in physics, the photoelectric effect can be examined only by visualizing the waves of electromagnetic radiation as particles, which we must then name, so we call them photons. Electrons, on the other hand, must be conceptualized as waves in the context of electron diffraction. However, these necessary conventions, which while explaining a state of affairs, are not actually true. The same problem arises when one tries to visualize that which is unseen and that which does not yet exist. In each case, visualization distorts and all linguistic expressions are always metaphorical, never concrete, never complete.

The character of our visual experience dominates our descriptive apparatus; thus, the breakdown in the classical description of reality observed in relativistic and quantum phenomena occurs precisely because, in these two realms, we are moving out of the range of normal visualizable experience. It is for just this reason that linguistically based assumptions lead to errors in our understanding of the divine and the eternal, the nature of heaven, the nature of hell, and the relationship between body and soul in human beings. Linguistically based assumptions are derived from the presumption of visualizability. Language develops on the matrix of vision and is a developed system of imitation of, and metaphor for, things heard and seen. Idolatry, I surmise, can arise from the impulse to linguistically describe and define the unseen. This impulse results in metaphor or allegory. When the metaphor for the unseen is visualized, some form of idolatry results, and this is just what St Gregory the Theologian warns us against when he says, “Every concept of God is merely a simulacrum, a false likeness, an idol: it cannot reveal God Himself.”

Orthodox Christian theology stays away from kind of idolatry by the concept of apophatic or “negative” theology, according to which we can

never describe or define anything that God is but only circumscribe our understanding of Him by saying what He is not – thus, we cannot describe or visualize anything of the essence of the Deity, even though we know God in Jesus Christ and have an intimate relationship with Him by means of His energies. In this regard, the words of Abba Isaac the Syrian are extraordinarily important when he says: “Speech is the language of this world, but silence is the mystery of the age to come,” by which he also precludes the visualization of “things yonder.” One could add to this statement the words of St Dionysius the Areopagite, cited above, that “As we plunge into that darkness which is beyond intellect, we shall find ourselves not simply running out of words, but actually speechless and unknowing.”

This is interesting because it shows us that the ability to visualize in material terms and to describe in language are interrelated, and that noetic things are subject to neither. For whatever visual and concrete concepts or ideas one has about the nature of heaven, hell, the Divinity, the partial and last judgments, and all things “yonder,” they are without fail delusion and phantasy. This precludes all visualizability or language-based descriptions of noetic experience. It is worth pointing out that visualization in the realm of quantum mechanics might lead to similar distortions of the real state of affairs, and that mathematical formalisms are an expression of speechlessness but that they, too, can be turned into idolatry.

Visualization is a form of reductionism. In fact, in the process of transformation and emerging psychology of our visual conceptualization, our tendency to visualize our words has reduced our world to a picture, and already beginning with the movement from symbolic to “realistic” art during the rise of humanism, man began to conceive the passion of the moment to be reality. Ivan Ilich, in a paper not yet published, expresses the modern visual conceptualization as “show” and will suggest, as I understand it, that “show” absorbs us and makes us passive in that we are not really in the picture but are, perhaps, manipulated by it.

Paradox and Ineffability in Orthodox Theology and Quantum Physics

“So soon as I conceive the One I am illumined by the splendour of the Three: As soon as I distinguish Three, I am carried back into the One. When I consider any of the Three, I think of Him as the whole. . . I cannot grasp the greatness of the One so as to attribute a greater greatness to the rest. When I contemplate the Three together, I see but one torch, and cannot divide or measure out the undivided light” (Gregory the Theologian).

There is another area of convergence between Orthodox theology and quantum physics that has drawn Orthodox theologians into the study of physics. This convergence arises from the clear fact that not all truth, not all reality can be discovered or defined rationally or by logical means nor can it be expressed accurately in human tongues.

We touched on this elsewhere, but we must look at it again briefly. Earlier, I mentioned the fallacy, cited by Kafatos, of surmising that in physics, every point of theory must have a one-on-one correspondence with physical reality. The equivalent theological fallacy is the idea that every point of dogma and/or doctrine has a one-on-one correspondence in spiritual reality – or even farther afield, a correspondence in physical reality. The first fallacy arises in classical physics, which was based in Aristotle, while the second arises in Scholasticism, which is also based in Aristotle.

Orthodox theology is both intentionally and inevitably paradoxical. God has clearly revealed Himself to us and is intimately known, yet He is, has always been, and will always be totally unknowable. We may never know His essence, but we both receive and know His divine energies. God, Who is known to us, is unlike anything we know or could possibly know. He exists but in a manner which cannot be called existence. Perhaps, the most startling paradox of all is the Incarnation itself.

In the Orthodox context, dogma has no relationship whatsoever to the Western concept of codified and defined doctrine. Dogma is not

something learned or defined by any rational process nor is it comprehended by logical processes. It is a reflection of faith; it is not the faith itself. Dogma is that which the holy fathers have apprehended in a vital, living experience with God; it is the result of a mystical process, and in the end, it can only be expressed symbolically. We know in silence and express that which is experientially known symbolically, primarily in the Divine Liturgy. Dogma is not uncovered by rational expositions of texts of Scripture nor by any process of reason. Dogma is discerned by *theoria*, by which we do not mean simply “contemplation.” *Theoria*, in the Orthodox Christian concept, may only be defined as prayerful, experiential contemplation, and it must include the notion of “vision” and “intuition.” Dogma is the expression of interaction, participation, and relationship and presents no more than a framework – a hint and shadow of reality. Thus, there is no one-on-one correspondence between every point of theology and spiritual reality (and certainly not physical reality).

Something similar pertains to quantum physics, and though it is on a different plane and dimension, the principle is the same. In physics, the explanation of inexpressible reality is mathematics, in much the same way that liturgical worship serves as a symbolic opening up of ineffable mysteries of hidden reality.

Theory in quantum physics is also paradoxical. As an example, almost anything we say about atomic and subatomic particles – the actual “stuff” of existence – no matter how true remains untrue. We see objects as solid bodies, and we conceive them as being indivisible, material “things.” Yet, objects have mass only because they are a form of energy. The “stuff” of which all things are made is immaterial material. They are particles, but they are fields of energy. They are particles, but they are waves. Whichever paradox we choose, following the principle of complementarity, both paradoxical descriptions are partly accurate and partly inaccurate – but both are completely true. At the quantum level, which is the basis of physical reality, we must completely rethink the meaning of material, particle, and entity. When we

measure one thing about a particle, we automatically exclude knowledge of any other thing about it. Nevertheless, the field of every single particle interacts and has unity with the field of every other particle in the universe. Clearly, then, there can be no one-on-one correspondence between every point of theory and physical reality. At this level, the physicist is operating in the realm of a different form of *theoria*. More surprisingly still, all this has no real metaphysical dimension but is simply the state of affairs.

It is evident that there are aspects of reality in every dimension which can be ascertained by differing types of *theoria* but which cannot be expressed in concrete, logical, or rational terms. These aspects are expressed paradoxically and symbolically. In physics, the process is experimental, and *theoria* is informed contemplation of the results of experiments, aided in a great part by intuition. Its guidelines are quantum and relativistic theories. In Orthodoxy, the process is experiential, and this kind of *theoria* is involved in both the experience and the contemplation of the experience. Its guidelines are Scripture and the sacred tradition of the faith.

In both modern microphysics and in Orthodox theology, there is no separation of the observer and the observed. The observer in both instances is not extraneous to that which is being observed; rather, he is a participant in it at different levels of experience. He is part of the process and state of affairs he has interjected himself into by becoming an observer, by seeking to understand and quantify it. In the case of Orthodox theology, the “observer” has intentionally involved himself in the hope of becoming a part of it, a part of the vital stream of the living theology of Orthodoxy, and being changed by it. In the case of modern microphysics, the observer impacts directly on the object of his observation and actually becomes part of the process being observed – and this is inevitable.

These aspects of complementarity have opened Orthodox theologians to modern physics in many ways. Among those Orthodox theologians convinced of this complementarity and pursuing these paths are professional scientists who are also clergymen, Metropolitan Nikolaos of

Mesogaia, Greece, and Archbishop Lazar Puhalo, and several Romanian Orthodox priests including Razvan Ionescu, Cristian Badilita, Teodor Baconschi, Bogdan Tataru-Cazaban, and Mihai Valentin Vladimirescu. Orthodox laymen who are both physicists and theologians include Dr. Alexei Nesteruk, Dr. Stoyan Tanev, Dr. David Bradshaw, and many others. It has also been the basis of a series of conferences in Romania over the past 5 years on Orthodoxy and Modern Physics, A Necessary Dialogue. These conferences have involved the Romanian Academy of Sciences, the Romanian Orthodox Patriarchate, and theologians and scientists from around the world.

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Physics in Protestantism

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Related Terms

[Body of knowledge; Reformation](#)

The development of Protestant thought in Europe from the early sixteenth century onward had perhaps much to do with the rise of modern empirical science, especially modern physics. While in this secular and pluralistic age one tends to assume that the emergence of science followed its own trajectory independent of late Medieval theology, intellectual historians for some time have noted how the two approaches were joined at the hip from the start. It was really only in the eighteenth century that science and theology went their own separate ways for the first time. But even so the visible Protestant footprint within the genealogy of modern physics remains unmistakable.

In order to espy the historical, if not the present day, affiliation between physics and Protestantism, it is crucial to see the larger impact of Protestantism on the birth of modern science as a whole, which has been closely examined by researchers in recent years. At the same time, we must caution that Protestantism had its own distinctive trajectory that did not always intersect with the history of science, and the maturation of what we name today the "scientific method" was shaped by many different sets of circumstances, only a few of which were clearly distinctly

“religious.” Sudden progress in mathematics during the seventeenth century had as much to do as anything with the transformation of what had long been considered “science,” since the age of Aristotle (384–322 BC). The revival of an interest in mathematics arose for the most part from the Italian Renaissance and its flirtation with the ancient Greek conviction, represented in Pythagoras and Plato, that ultimate reality is based as much on the numerical as on the divine will. The new astronomy pioneered by Copernicus and Galileo were largely the result of efforts to test out certain speculations about how the universe was made up that had been inspired earlier by pagan thinkers, heretics, and mystics. René Descartes (1596–1660), the great European philosopher celebrity, and Blaise Pascal (1623–1662), who invented probability theory, maintained their own style of Catholic orthodoxy throughout their lives.

In fact, the many, though not necessarily the majority, among the Medieval intelligentsia had always venerated the sciences, with keen curiosity concerning a diversity of concrete phenomena around them. The English Franciscan friar Roger Bacon (1214–1294), for example, pioneered a style of inquiry he termed *scientia experimentalis*, urging less reliance on classical philosophical texts and more attention to simple observation of what can be found in the everyday world which we experience everywhere around us. Bacon’s version of *scientia*, a term ancient Greek times implying “wisdom,” was not in any way a prelude to the *philosophia prima* of Francis Bacon (1561–1626) four centuries later.

Francis Bacon is generally credited with having devised the theoretical framework and justification for modern empirical science. The latter Bacon, who became one of the most influential English statesmen under King James I, sought a “reform of the sciences” founded on the method of induction in contrast with the traditional manner of resolving disputes through *deductive* reasoning, as embodied in Aristotelian logic and the formal syllogism. The notion that science proceeds by offering tentative hypotheses that can be later revised through investigation and

observation was the backbone of the inductive approach. During his political career, Francis Bacon was a key player in the establishment of the Royal Society, which sponsored collaboration and discussions among eminent scientists and which historians generally consider the motivating force behind England’s rapid ascent as the leader of the new sciences during the seventeenth and eighteenth centuries.

While Catholic Europe produced theoretical geniuses, it was thus Protestant England that gave birth to modern empirical science and eventually enabled the technological inventions that fueled the industrial revolution of the nineteenth century. If it had not been for so-called British empiricism, founded by Francis Bacon during the Elizabethan era, modern science would have remained largely a speculative branch of “natural philosophy.” What were some of the key factors that contributed to the alliance of Protestantism with empirical science – or what is popularly known as the “scientific method” of experimentation and the gathering of factual evidence?

Historian Kenneth J. Howell has argued that the deciding factor in the migration from Medieval metaphysics to modern science was Protestant “hermeneutics,” the theory of how properly to interpret texts. One of the main battle cries of the Reformation, first enunciated by Martin Luther (1483–1546), was *sola scriptura*, “by Scripture alone.” Luther maintained that ultimately all truths of God, including the secrets of the universe itself, were to be found in the Bible, and the Bible only. Whereas previous European thought had been built around a complex hierarchy of suppositions and propositions centering on the pronouncements of ancient authorities and the traditions of the Catholic Church, Protestantism demanded that any knowledge out of step with what could be discovered in Scripture was invalid. Although Luther and the other major Reformers had been preoccupied less with what the Bible said, or did not say, about “nature” and more with questions of the soul’s salvation, the principle of *sola scriptura* inevitably resulted in the later insistence that even questions of

“science” be Biblically authorized. Modern fundamentalism and creationism are the logical outgrowth of this tendency.

However, the Reformers’ “return to the text” – the pure, original text stripped of all previous glossary or commentary – had further implications than merely laying the groundwork for the twentieth century Protestant doctrine of “Biblical inerrancy.” The shibboleth of *sola scriptura* also fostered a preference for literal interpretation of the written word, enshrined in the modern rule of uncovering the genuine “authorial intention” in the texts themselves. Medieval hermeneutics had been multilayered and complex, even though it also provided a coherent and unified methodological structure that allowed for the interpreter to ferret out mystical and allegorical meanings that often proved paradoxical. Moreover, the Medievals had regarded the natural order itself as a genuine “book” authored by God, open for adventures in understanding like the Bible and the preserved classics. They relied on earlier “natural philosophers” such as Ptolemy, Archimedes, and Aristotle as a means of guidance for their own interpretations, in much the same way as contemporary students of literature regularly fall back on published secondary sources, including outlines, summaries, and so-called Cliffs notes both to secure and to enhance their understanding of major books assigned.

For the Scholastics, according to Howell, nature like all knowledge was contained in books. But the preoccupation with Scripture among Protestants, who subordinated all knowledge to matters of salvation, contributed to what scholars have termed the “disenchantment” of nature, which was part of the historical process of secularization. In its reverence for the “Book of Nature,” Medieval thinkers had been more concerned with tracing the symbolical, allegorical, and “anagogical” (i.e., the connection of the visible to the invisible) relationships among all phenomena. They considered these phenomena in many ways as high-level “textual” problems. The Reformers also rejected the reliance on allegorical interpretations. Scripture “meant” what it said, and did not need to be compared with other

texts or systems of ideas in order to ascertain its fundamental implications.

In addition, the Book of Nature was no longer viewed as a book, let alone a text. It consisted mainly in a realm that had been darkened and toward which our minds had become confused, according to the Reformers, as evidenced in the doctrine of the Fall as well as in the apostle Paul’s declaration that because of original sin human beings’ “thinking became futile and their foolish hearts were darkened.” (Romans 1:21, NIV). Finally, as Peter Harrison has remarked, the Protestant disdain for allegorical readings and their suspicion of the capacities of the light of “natural reason” gave rise to a skepticism about any genuine interdependence of “words and things.” The “things” of nature no longer function as signs of a comprehensive, epistemological order embedded in what Thomas Aquinas had dubbed “sacred doctrine.” Words no longer functioned as signs of things, but stood on their own and could be considered more significant and dependable when they were expressed in terms of the Word of God.

While major Protestant theologians such as John Calvin (1509–1564) held that the natural world was a suitable arena in which to learn about God’s beneficent and providential workings, they did not regard it as the supreme object of inquiry or intellectual pursuits. Calvin believed such pursuits should be directed toward a “revealed knowledge” that can be acquired solely in the study of Scripture. In his *Institutes of the Christian Religion*, first published in Latin in 1559 and in French a year later, Calvin asserted that through the study of science, we only attain “knowledge of God the Creator” (Calvin 2007). Through the theological study of Scripture, we arrive, nevertheless, at “knowledge of God the Redeemer.” Following Saint Augustine in his *Confessions*, Calvin also gave priority to self-knowledge, a constant spiritual and moral inventory that discloses our own finitude and sinfulness. In the *Institutes* Calvin developed what came to be known as the *duplex cognitio Dei*, the “double knowledge of God.” We can only grasp that the redemptive knowledge that Jesus Christ is our savior once we have

thoroughly scrutinized our failings and our essential need for salvation. “In order to apprehend God,” Calvin wrote, “it is unnecessary to go farther than ourselves.” (John Calvin, *Institutes of the Christian Religion*, I.V.3). Therefore, natural knowledge is irrelevant to our ultimate concern, which should be about our relationship with God and our heavenly salvation.

The emphasis on personal salvation through introspection and the illumination of the mind by the study of Scripture, however, did not necessarily encourage Protestants to ignore science. Instead it persuades them to segregate science from the study of texts and to do so for purely practical and utilitarian, not theoretical, reasons. The German sociologist Max Weber (1864–1920) in his magisterial treatise *The Protestant Ethic and the Spirit of Capitalism* (Weber 2010) demonstrated how the Calvinist obsession with personal salvation led them to adopt an attitude of “worldly asceticism” as a sign of God’s favor, which in turn promoted hard work and the discipline of financial accumulation. Likewise, his twentieth century heir Robert K. Merton (1910–2003) maintained that Weber’s analysis applied as well to the emergence of empirical science in England, not just to the emergence of the market economy itself.

As already indicated, it was in light of these broader historical eventualities that physics, especially in Protestant lands, replaced theology as the “queen of the sciences.” From the seventeenth up until the close of the nineteenth centuries, the overwhelmingly dominant branch of the sciences was physics. Since Aristotle’s day, physics had been considered the “science of motion.” Theories about the motions of the celestial spheres went hand in hand with the development of the science of physics. The Aristotelian legacy, at the same time, was used to support an *organismic* paradigm of the universe apparent in the Medieval conviction that all reality was held together in one gigantic “book” of creation.

Aristotle, who coined the word “physics,” maintained that motion could be explained by a four-fold schema of “causal” connections. The Latin word *causa*, a translation of the Greek *aitia*, refers simply to any component in

a system of reasoning whereby two or more phenomena can be linked with each other and hence accounted for. Aristotle named these cause “material,” “formal,” “efficient,” and “final.” Material and formal causation had to do with the substance and structure of things known or experienced. For example, the “formal” cause of a specific human being was its genetic archetype. The “material” cause was the stuff – the blood, flesh, and bones – out of which it was composed. Final causation was related to the ultimate purpose toward which a thing grew and unfolded. Thus, in Aristotle’s world picture, the “final cause” of an acorn would be an oak tree. The “efficient” cause was that thing, or set of conditions, that prompted such change. Therefore, sunlight and rain would be the efficient cause of the acorn turning into an oak tree.

In his observations of how bodies fell, Galileo Galilei (1564–1642) was the first to suggest that causation had nothing to do with any “teleology” or purposiveness – for instance, the “desire” of the object to return to earth. When Isaac Newton (1642–1727) revolutionized physics, improving significantly on the work of Robert Boyle (1627–1691) as well as Galileo, with the publication of his *Principia* (Newton 1999) in the late 1600s, he eliminated all rules of explanation other than efficient causes. The general Newtonian picture of the cosmos as “bodies in motion,” which reigned until Einstein overthrew it three centuries later, was the broad consequence of this move on Newton’s part.

The actual “causal” connection between Newton’s Puritanism and his breakthroughs in physics has been a topic for conjecture and debate. Like Catholic thinkers, Newton as a religious man insisted that God was the supreme, “metaphysical” mainstay of any scientific account of how the cosmos functions.

But in eliminating final causes, Newton may have been influenced in a broad way by the Calvinist image of the omnipotent, perhaps even arbitrary Deity, whose will more than anything else determines the destiny of human beings. In contrast, Catholic thinkers following Aristotle were more interested in the “end” or “aim” – i.e., the final purpose – for which God created the

world. Aristotle's God, whom he named the "Unmoved Mover," was the source of attraction for all things in motion. But Newton's Deity simply put the whole cosmic apparatus together in accordance with certain immutable laws of motion. God was, as the eighteenth century described him, the cosmic "watchmaker" who conceived and designed the watch we know as the natural world. The intricacies of the watch itself could be discovered through scientific inquiry, but God did not necessarily have to exert a hand in its operation, only adjust or repair it from time to time.

Protestant literalism, as the backdrop to the Newtonian science of motion, henceforth fomented over the years a new kind of "mechanico-materialism," in which all mystical, arcane, or even "humanistic" considerations were purged from the outlook of modern science. A century later the French physicist Pierre-Simon Marquis de Laplace (1749–1827) in his *Celestial Mechanics* decided that the elegance of Newtonian science did not require at all what he termed the God "hypothesis." The laws of nature were sufficient in themselves to explain what happens. With the coming of the industrial revolution and the invention of the steam engine, the universe itself gradually came to be seen throughout the 1900s as one, enormous, self-regulating, and self-propelling "machine" in light of which even human behavior became intelligible.

It was because of the ubiquity of the Newtonian, mechanistic model that Protestantism eventually became an enemy of modern science rather than its incubator, as it was presumably during the early seventeenth century. The watershed moment for this shift was the publication by Charles Darwin (1809–1882) of his *Origin of Species* in 1859. Darwin advanced the thesis for the first time from a "scientific" (Darwin 2011) standpoint that human beings were direct, lineal descendants of primates and that appearance and disappearance of different species over time was due to a long process of random selection, leading to the "survival of the fittest." Darwin's evolutionism, particularly the concept of "natural selection," was an extension of Newtonian mechanism to biology. Because it contradicted so dramatically the Biblical account

of the creation, Darwin's theories quickly met with ecclesiastical scorn and attacks by many prominent figures and intellectuals. In the first major, modern example of science becoming the center of a political storm, Darwinism was attacked by prelates of the Church of England, whose aristocratic ties lent it more influence than in other Protestant nations on the scientific establishment.

Slowly at first, nevertheless, the Protestant mind of the late nineteenth century tended to accommodate, rather than recoiling against, Darwin's theories. By the early twentieth century, Christian thinking had slowly acquiesced to, to "evolutionary" principles, mainly as they applied to social theory. The Progressive Era just before the Great War had nurtured the so-called social gospel, stressing the role of the churches in combating human suffering and exploitation. The earlier types of predatory capitalism exemplified in the economic dislocations and excesses of the Gilded Age had used Darwin's idea of the "survival of the fittest" – a mechanistic explanation in itself – to excuse the practices of the notorious Robber Barons. This view was called "social Darwinism." It was morally acceptable, so far as the social Darwinists were concerned, to exploit the weaker sectors of society because such policies encouraged a "natural" selectivity among who would be economically fit and who would fall by the historical wayside. Their demise was preordained and unavoidable. The Progressives, on the other hand, turned this notion on its head. They cited evolutionary thinking and the belief in "progress," fashionable since the eighteenth century, to justify humanitarian intervention, mass education, and conscious efforts of governments and social institutions to mitigate the effects of ruthless economic competition in the industrial era.

Darwinism strongly influenced what came to be known alternately as religious modernism, or liberalism. Modernism took all forms of science, especially physics, as compatible with the Christian understanding of nature. On the eve of World War I, however, the special theory of relativity, advanced by Albert Einstein (1879–1955), brought to an abrupt end to the monopoly of Newtonian physics and introduced

a new dimension to the ongoing interplay between physics and theology. In one blow, the mechanico-materialist description of the universe lost its allure and the heavens and the earth seemed less tight-knit and less deterministically ordered, and even somewhat more mysterious. One philosopher familiar with Einstein, while sympathetic to Christianity, was the British thinker Alfred North Whitehead (1861–1947). A mathematician by profession with a strong interest in both physics and metaphysics, Whitehead combined many of the ideas surrounding relativity with evolutionary theories, to create what came to be termed “process philosophy (Whitehead 1979).”

The central thrust of process thought was against the Aristotelian concept that everything, including God, must be ultimately defined as a timeless substance. Ancient Greek metaphysics identified the real with the perduring, relegating change and temporality to an inferior level of existence. In process thought, the ancient Greek prioritization of being over becoming is turned on its head. Being must be equally understood as a “process” whereby “things” are primarily intelligible as temporal sequences, which have both a synchronous and diachronous structure that entails other entities. Whitehead gained something of a following among liberal Protestants in the second half of the twentieth century, whereby his views served as the general framework for what came to be dubbed “process theology.” Process theologians tend to stay closely attuned to the latest innovations in theoretical physics, and have been instrumental in the sustained conversation at an academic level between Christian thought and physics.

Cross-References

- [Christianity](#)
- [Epistemology](#)
- [Mathematics and Religion](#)
- [Mathematics, Modern](#)
- [Natural Theology](#)
- [Physics in Christianity](#)
- [Revelation](#)

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Physics, Science in Islam

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Related Terms

[Islam and science](#); [Islamic science](#)

Description

Physics is taught as part of the curriculum in schools, colleges, and universities in all 48 Muslim-majority countries. The content is, for the most part, fairly standard. In some countries, there is often an extended attempt to show the consistency of science with Islamic principles and to stress the achievements of ancient Muslim scientists. Specific Muslim responses to major scientific developments such as Einstein’s theory

of relativity, quantum mechanics, big bang cosmology, or chaos are hard to find. Only a few little-known Muslim writers have argued that these major ideas of science are in conflict with Quranic teachings. They have essentially echoed criticisms common in the last century in the West wherein, for example, Einsteinian relativity was taken to imply moral relativism and quantum mechanical uncertainty was criticized for limiting God's power to know. However, these are isolated examples, and the majority attitude has been to essentially ignore such philosophical issues and to passively accept the results of physics research without critical examination of its theological implications.

The research productivity of Muslim physicists residing in their own countries is low. This will be evident from statistics quoted later in this essay. Muslims living abroad in scientifically advanced countries are relatively much more productive. Several have been credited with important scientific discoveries. Mohammed Abdus Salam is by far the most significant. Together with Steven Weinberg and Sheldon Glashow, he received the Nobel Prize for physics in 1979 for work that unified the weak and electromagnetic interactions. Salam was also the most articulate and effective proponent of Muslim scientific development. As founder-director of the International Centre for Theoretical Physics, he created an organization that played an important role in stimulating scientific research in developing countries by inviting thousands of researchers to participate in research conferences and workshops in Trieste, Italy. The Third World Academy of Sciences, an offshoot of the ICTP, was also headed by Salam and received some financial support by Muslim countries. It should be noted, however, that Salam's Ahmaddiya sect, while it continues to claim adherence to Islam, was officially declared non-Muslim by an act of the Pakistani parliament in 1974.

Academic research in physics appears to be strongest in Turkey and Iran, both of which are considered the most secular among Muslim countries. In applied nuclear physics, also considered as the domain of medium-high technology, Pakistan has relatively the most advanced

program among Muslim countries. It has one Canadian-supplied power reactor as well as two Chinese-supplied ones and a third one currently (2010) in the process of installation. It also has an extensive uranium enrichment program using centrifuge technology derived from Holland and Belgium. It is the only Muslim country which currently has nuclear weapons capability with an estimated 80–100 nuclear warheads. Iran is investing heavily in nuclear technology and has developed advanced centrifuges that, when cascaded together, can provide enriched uranium for a number of nuclear power plants or for warheads.

Physics Within the Context of the Other Sciences

Physics is firmly based upon the scientific method and its development goes hand-in-hand with other branches of science: mathematics, chemistry, biology, and various engineering disciplines. In effect, science goes as a package – it is rare for one branch to progress by itself. In a nutshell, the Muslim experience of science consists of a golden age extending from the ninth through thirteenth centuries, subsequent collapse and modest rebirth in the nineteenth century, and a marked reversal away from science and modernity beginning in the last decades of the twentieth century.

There was no science in Arab culture in the initial period of Islam, around 610 AD. (A detailed account of Muslim scientific achievements can be found in George Sarton's monumental 5-volume work, *Introduction To the History Of Science*, Vol. I & II, New York, 1975.) But as Islam established itself politically and militarily, its territory expanded. In the mid-eighth century, Muslim conquerors came upon the ancient treasures of Greek learning. Translations from Greek into Arabic were ordered by liberal and enlightened caliphs, who filled their courts in Baghdad with visiting scholars from near and far. Politics was dominated by the rationalist *Mutazilites*, who sought to combine faith and reason in opposition to their rivals, the

dogmatic anti-reason Asharites. A generally tolerant and pluralistic Islamic culture allowed Muslims, Christians, and Jews to create new works of art and science together. The Arabic language held sway in an age that created algebra, elucidated principles of optics, established the body's circulation of blood, named stars, and created universities. In addition, Greek learning was transmitted to Europe through a major translation effort by Muslim rulers.

Over time, the theological tensions between liberal and fundamentalist interpretations of Islam – such as on the issue of free will versus predestination – became intense and turned bloody. A resurgent religious orthodoxy eventually inflicted a crushing defeat on the *Mutazilites*. Thereafter, the open-minded pursuits of philosophy, mathematics, and science were increasingly relegated to the margins of Islam. (*Islam And Science – Religious Orthodoxy And The Battle For Rationality*, by Pervez Hoodbhoy, London, ZED Books 1991. A critical account of the relationship between the scientific spirit and Muslim orthodoxy, covering both present and medieval times.)

Centuries later, the introduction into Islamic societies of European post-Renaissance science, technology, and thought was pioneered by several outstanding Muslim leaders. In nineteenth-century Egypt, following the Napoleonic occupation, Muhammad Ali seized state power and ruled from 1805 to 1848. During this period, he made bold attempts to transfer French and British technology into the country, relying principally on European expatriates. (*Science And Science Policy In The Arab World*, by A.B. Zahlan, London, 1980. A valuable, if somewhat dated, work on science and technological levels in Arab countries.) He introduced the first printing press – a device initially condemned by some of the *ulema* as having a belt of pig's skin. But this resistance was overcome, and the Bulaq press in Cairo published 81 Arabic books on science between 1821 and 1850. Technology for irrigation, textile manufacturing, surveying, prospecting and mining for coal and iron, and military hardware received high priority. Major earthmoving and civil engineering projects were embarked upon.

Even more significantly, technical schools with foreign teachers were established with the aim of generating manpower. More than 400 students were sent to Europe to study various branches of science, including military tactics.

However, the success of Muhammad Ali's industrialization policies was mixed. (*The Muslim Discovery Of Europe*, Bernard Lewis, New York, 1982. Details the encounter of Muslims with the modern civilization of the West.) The quality of domestically produced products, such as textiles, was poor. Technical schools provided insufficient exposure to theoretical science and did not succeed in creating a base of technicians or engineers of sufficiently high caliber. The reasons for this have been debated. (See, for example, A.B. Zahlan in "A History Of Technology In The Arab World, 1800–1977.") After Mohammed Ali's death in 1849, these schools were closed down under the rule of Khedive Abbas and Khedive Sa'id, and the scientific momentum ground to a halt. Among other Arab rulers, Sultan Sa'id bin, Sultan of Oman (1806–1856), is notable for his interest in acquiring European technology. He made numerous attempts to have sugar refineries installed in Zanzibar, an Omani possession. He also made unsuccessful attempts at ship building. Emir Abdel Kader of Algeria, whose rule extended from 1832 to 1847, engaged various experts to build small ordnance factories and appears to have understood the importance of technology for progress.

The Turkish Ottomans had established an extensive and magnificent empire in the sixteenth century and had recognized the utility of military technology, particularly cannons, which they readily borrowed from the West. But there were strong religious taboos which, for example, prevented the use of the printing press or of public clocks. Travelers to Turkey in this period remarked on the lack of interest in matters of science and learning. Sweeping changes in civil administration and education came with Sultan Selim III (1761–1808), who was the last and the most radical of the Ottoman reformers. Selim established a new military corps armed and organized in the most modern techniques of warfare

in Europe. Gun founding was introduced, printing presses were set up, and the works of Western authors were translated into Turkish. To sustain the modern army the subjects of algebra, trigonometry, mechanics, ballistics, and metallurgy were introduced into the teaching curriculum.

Like Muhammad Ali, Selim III had no choice but to import teachers from Europe for these subjects. The importance of theoretical science as a basis for continued development appears not to have been recognized. The major impetus to scientific and industrial development came after the revolution brought about by Mustafa Kemal Atatürk (1881–1938) in 1924. Prior to this, education had been limited to the cities and controlled by religious authorities. (*The Economic History of The Middle East, 1800–1914*, Issawi, Charles (Ed.), Chicago, 1966.) But after the secularization of Turkey, the control was taken over by the state and the curricula revised to include modern science, mathematics, world history, etc. Among Muslim countries, Turkey is today among the most advanced in scientific research and in terms of the quality of its universities.

On the Indian subcontinent, modern scientific ideas and techniques came in the wake of the English conquest. In the decades preceding this, the rule of the Moghuls had produced a civilization known for impressive architecture, literature, and poetry but with few achievements in the realm of knowledge. The Moghuls did not set up any universities or centers of learning. Some transmission of Western technology had taken place in the reign of Emperor Akbar (1542–1605), when Europeans had come as traders. (*Science And Empire – Essays In The Indian Context*, Delhi, 1991. Kumar, Deepak (Ed.) A useful collection of essays detailing the introduction of science in British India.) Notably, ships of large tonnage and shapes similar to English ones were built. But these lacked compasses, gimbals, navigational charts, etc. Reading glasses were greatly admired by Akbar, but they appear to have been imported from France. After the banishment of the last Moghul emperor Bahadur Shah Zafar in 1857, the English consolidated their rule and later introduced modern

education. A combination of hurt, pride, defiance, and conservatism led Muslims to resist Western learning. Consequently, Muslims were at a substantial disadvantage relative to Hindus; it is recorded, for example, that between 1876–1877 and 1885–1886, 51 Muslims and 1,338 Hindus took the B.A. degree at Calcutta. In 1870, only two Muslims, both of whom failed, sat for the B.A. while, in the same year, 151 Hindus took the examination of whom 56 received the degree.

The resistance of Muslims of the subcontinent to modern ideas motivated Syed Ahmad Khan (1817–1898) into becoming a forceful proponent of modern science and thought. (*Sayyid Ahmad Khan – A Reinterpretation Of Muslim Theology*, by C.W. Troll, Karachi, 1978. This book traces the evolution of Sayyid Ahmad Khan from a staunch Muslim conservative into the most outstanding exponent of modernism in British India.) He was convinced that the subjugation of Muslims to the West was a result of their scientific backwardness and that this in turn was a consequence of the dominance of superstitious beliefs and rejection of *maaqulat* (reason) in favor of blind obedience to *manqulat* (tradition). He therefore set about the monumental task of reinterpreting Muslim theology, making it compatible with post-Renaissance Western humanistic and scientific ideas. Syed Ahmad Khan founded the Aligarh Muslim University, which provided Muslims of the subcontinent a unique opportunity for higher education. His articles in the periodical *Tahzib-ul-Akhlaq*, which included translations and explanations of scientific tracts as well as his interpretations of religious issues, were highly influential among upper class Muslims. To maintain consistency with science, he argued that miracles – such as Noah's Flood – must be understood in allegorical rather than literal terms. This innovative position brought Syed Ahmad Khan widespread condemnation and numerous *fatwas* against his life.

Syed Jamaluddin Afghani (1838–1897), also a supporter of Western science and modern ideas, but an implacable opponent of Syed Ahmad Khan, was a determined anti-imperialist who

inspired Muslims in Turkey, Egypt, Iran, and India. (*An Islamic Response To Imperialism*, Nikkie Keddi, University of California Press, 1983. An authoritative account of Jamaluddin Afghani's life and thought, and his encounter with the anti-science orthodoxy of his times.) Like his mentor Mohammad Abduh (1849–1905), Afghani held that there was no contradiction between Islam and science and that Islam encouraged rational thought and discouraged blind imitation. In 1870, because of pressure from the clergy, Afghani was expelled from Istanbul for advocating the setting up of *Darul-Funun*, a new university devoted to the teaching of modern science. He is known for his vitriolic criticism of those *ulema* who opposed modern ideas and science.

Modernization and the introduction of science have inevitably brought about the issue of having to choose between traditional and modern education for Muslims or perhaps devising an acceptable synthesis. Traditional Islamic education, with its emphasis on teaching of the *Quran* and *Sunnah* and on perfect memorization, had remained essentially unchanged since the Nizammiyah curriculum was devised under the rule of Sultan Nizam-ul-Mulk in the eleventh century. (*Islamic Education*, A.L.Tibawi, London 1972.) Ibn Khaldun, in a comparative study of education in Muslim lands of the fourteenth century, pointed out that only in Muslim Spain and Persia were subjects such as poetry, grammar, and arithmetic included in the syllabi.

Elsewhere, subjects unrelated to the Quran were regarded as too secular to teach to children. The Nizammiyah curriculum was faithfully passed on to subsequent generations and also adopted in unchanged form in Mughal India, until somewhat modified by Shah Waliullah (1762) to include arithmetic and logic. However, Al-Azhar University in Cairo did have some scientific subjects in its teaching syllabus, including mathematics and astronomy, even prior to the Napoleonic invasion. These largely reflected knowledge which had long since been superseded. The astronomy taught, for example, was based on a Ptolemaic model requiring the sun to go around the earth.

Thus, it was a prime goal of Muslim modernists to effect the transfer of Western models of universities and schools into their societies. The spread of science teaching in several Arab countries, such as Egypt, Syria, Iraq, and Lebanon, and on the Indian subcontinent, was greatly aided by Christian missionary efforts. Although their purpose was primarily evangelical, they brought considerable intellectual stimulus coming from new developments in the West. The first Western scientific institutions in the Arab world were the Syrian Protestant College and the Jesuit St. Joseph's College, both in Beirut.

Current Muslim Scientific Achievements

The metrics of scientific progress are neither precise nor unique. Science permeates our lives in myriad ways, means different things to different people, and has changed its content and scope drastically over the course of history. In addition, the paucity of reliable and current data makes the task of assessing scientific progress in Muslim countries still harder.

The following four metrics appear to be reasonable:

1. The quantity of scientific output, weighted by some reasonable measure of relevance and importance
2. The role played by science and technology in the national economies, the funding for S&T, and the size of the national scientific enterprises
3. The extent and quality of higher education
4. The degree to which science is present or absent in popular culture

Only the first two shall be commented upon here. The reader may find additional details in reference. (*Science and the Islamic world – The quest for rapprochement*, Pervez Hoodbhoy, *Physics Today*, August 2007, pp. 49–55.)

Scientific Output. A useful, if imperfect, indicator of scientific output is the number of published scientific research papers, together with the citations to them. [Table 1](#) shows the output of the seven most scientifically productive

Physics, Science in Islam, Table 1 The seven most scientifically productive Islamic countries in 2007 compared against a selection of other countries. This data is from the Philadelphia-based science information specialist, Thomson ISI

	Physics papers	Physics citations	All papers	All citations
Malaysia	656	1,650	10,930	40,007
Pakistan	809	2,862	7,662	25,867
Saudi Arabia	866	2,390	15,700	56,416
Morocco	1,584	5,720	10,344	38,579
Iran	2,165	8,628	22,635	67,605
Egypt	3,099	10,743	26,829	90,597
Turkey	4,827	20,562	83,961	280,622
Brazil	18,467	102,605	125,132	627,441
India	26,627	139,841	203,989	788,852
China	71,782	275,963	400,917	1,480,743
USA	208,695	2,483,089	2,831,004	37,822,213

Muslim countries for physics papers, over the period from 1 January 1997 to 28 February 2007, together with the total number of publications in all scientific fields. A comparison with Brazil, India, China, and the USA reveals significantly smaller numbers. A study by academics at the International Islamic University of Malaysia (*Scientometrics*, M. A. Anwar, A. B. Abu Bakar, **40**, 23 (1997)) showed that OIC countries have 8.5 scientists, engineers, and technicians per 1,000 population, compared with a world average of 40.7, and 139.3 for countries of the Organisation for Economic Co-operation and Development. (For more on the OECD, see <http://www.oecd.org>.) Forty-six Muslim countries contributed 1.17% of the world's science literature, whereas 1.66% came from India alone and 1.48 % from Spain. Twenty Arab countries contributed 0.55%, compared with 0.89% by Israel alone. The US NSF records that of the 28 lowest producers of scientific articles in 2003, half belong to the OIC. (For additional statistics, see the special issue "Islam and Science," *Nature* **444**, 19 (2006)).

The situation may be even less favorable than the publication numbers or perhaps even the citation counts suggest. Assessing the scientific worth of publications – never an easy task – is complicated further by the rapid appearance of new international scientific journals that publish low-quality work. Many have poor editorial

policies and refereeing procedures. Scientists in many developing countries, who are under pressure to publish or who are attracted by strong government incentives, choose to follow the path of least resistance paved for them by the increasingly commercialized policies of journals. Prospective authors know that editors need to produce a journal of a certain thickness every month. In addition to considerable anecdotal evidence for these practices, there have been a few systematic studies. For example, (*Chem. Biodivers*, M. Yalpani and A. Heydari, **2**, 730 (2005)) chemistry publications by Iranian scientists tripled in 5 years, from 1,040 in 1998 to 3,277 in 2003. Many scientific papers that were claimed as original by their Iranian chemist authors, and that had been published in internationally peer-reviewed journals, had actually been published twice and sometimes thrice with identical or nearly identical contents by the same authors. Others were plagiarized papers that could have been easily detected by any reasonably careful referee.

Islamic countries show a great diversity of cultures and levels of modernization (*Islamic Cultural Identity And Scientific-Technological Development*, Klaus Gottstein. This collection of papers deals with questions of cultural diversity and identity, and science and development in Muslim countries) and a correspondingly large spread in scientific productivity. Among the

larger countries – in both population and political importance – Turkey, Iran, Egypt, and Pakistan are the most scientifically developed. Among the smaller countries, such as the central Asian republics, Uzbekistan and Kazakhstan rank considerably above Turkmenistan, Tajikistan, and Kyrgyzstan. Malaysia – a rather atypical Muslim country with a 40% non-Muslim minority – is much smaller than neighboring Indonesia but is nevertheless more productive. Kuwait, Saudi Arabia, Qatar, the UAE, and other states that have many foreign scientists are scientifically far ahead of other Arab states.

National Scientific Enterprises. Conventional wisdom suggests that bigger science budgets indicate, or will induce, greater scientific activity. On average, the 57 OIC states spend an estimated 0.3% of their gross national product on research and development, which is far below the global average of 2.4%. But the trend toward higher spending is unambiguous. Rulers in the UAE and Qatar are building several new universities with manpower imported from the West for both construction and staffing. In June 2006, Nigeria’s president Olusegun Obasanjo announced he will plow \$5 billion of oil money into R&D. Iran increased its R&D spending dramatically, from a pittance in 1988 at the end of the Iraq–Iran war to a current level of 0.4% of its gross domestic product. Saudi Arabia announced that it spent 26% of its development budget on science and education in 2006 and sent 5,000 students to US universities on full scholarships. Pakistan set a world record by increasing funding for higher education and science by an immense 800% over the past 5 years.

But bigger budgets by themselves are not a panacea. The capacity to put those funds to good use is crucial. One determining factor is the number of available scientists, engineers, and technicians. Those numbers are low for OIC countries, averaging around 400–500 per million people, while developed countries typically lie in the range of 3,500–5,000 per million. Even more important are the quality and level of professionalism, which are less easily quantifiable. But increasing funding without adequately addressing such crucial concerns can lead to

Physics, Science in Islam, Table 2 High-technology exports as a percentage of total manufactured exports (World Bank Development Report 2006)

Malaysia	58%
Pakistan	1%
Saudi Arabia	0%
Morocco	11%
Iran	2%
Egypt	0%
Turkey	2%

a null correlation between scientific funding and performance.

The role played by science in creating high technology is an important science indicator. Comparing Table 1 with Table 2 shows there is little correlation between academic research papers and the role of S&T in the national economies of the seven listed countries. The anomalous position of Malaysia in Table 2 has its explanation in the large direct investment made by multinational companies and in having trading partners that are overwhelmingly non-OIC countries.

Although not apparent in Table 2, there are scientific areas in which research has paid off in the Islamic world. Agricultural research – which is relatively simple science – provides one case in point. Pakistan has good results, for example, with new varieties of cotton, wheat, rice, and tea. Defense technology is another area in which many developing countries have invested, as they aim to both lessen their dependence on international arms suppliers and promote domestic capabilities. Pakistan manufactures nuclear weapons and intermediate-range missiles. There is now also a burgeoning, increasingly export-oriented Pakistani arms industry that turns out a large range of weapons from grenades to tanks, night-vision devices to laser-guided weapons, and small submarines to training aircraft. Export earnings exceeded \$300 million in 2009. Although much of the production is a triumph of reverse engineering rather than original research and development, there is clearly sufficient understanding of the requisite scientific principles and a capacity to exercise technical

and managerial judgment as well. Iran has followed Pakistan's example.

The global diffusion of modern technology has profoundly altered lifestyles in Muslim countries and has become an inseparable part of modern existence. It is not, however, easy to decide on the status of a country in the field of science and technology in a simple quantitative manner. But one important indicator of the level of scientific-technological development of a country is the extent to which industry and manufacturing are part of its economy. This, in turn, is estimated by the "value added" in manufacturing, which includes machinery and transport equipment, chemicals, textiles, etc. Data on "value added" is published yearly in the Development Report of the World Bank, which the reader may consult for estimating the relative levels of progress of individual countries. Indonesia and Malaysia are among the fastest growing economies of the world, partly because of their success in attracting foreign investment and partly because of high investments in human resource development. There has been a steady rise in "value added" for most Muslim countries, but absolute levels are still low: In 1983, of 46 Muslim states, only 24 produced cement, 11 produced sugar, 5 had heavy engineering industries, 6 produced textiles, and 5 produced light armaments. By and large, Muslim states are consumers of technology and producers of raw materials, oil being the most important one of these.

Muslim Reactions to Modern Science

In defending the compatibility of science and Islam, Muslims argue that Islam had sustained a vibrant intellectual culture throughout the European Dark Ages and thus, by extension, is also capable of a modern scientific culture. The Pakistani physics Nobel Prize winner, Abdus Salam, would stress to audiences that one-eighth of the Quran is a call for Muslims to seek Allah's signs in the universe and, hence, that science is a spiritual as well as a temporal duty for Muslims. Perhaps the most widely used argument one hears is that the Prophet Muhammad had

exhorted his followers to "seek knowledge even if it is in China," which implies that a Muslim is duty bound to search for secular knowledge.

Generally, attitudes of Muslims toward technology are far friendlier than toward science. In earlier times, the orthodoxy had resisted new inventions such as the printing press, loud-speaker, and penicillin, but such rejection has all but vanished. The ubiquitous cell phone, that ultimate space-age device, epitomizes the surprisingly quick absorption of black-box technology into Islamic culture. Popular new Islamic cell-phone models now provide the exact GPS-based direction for Muslims to face while praying, certified translations of the Quran, and step-by-step instructions for performing the pilgrimages of Hajj and Umrah. Digital Qurans are already popular, and prayer rugs with microchips (for counting bend-downs during prayers) have made their debut.

As an epistemological enterprise, science has elicited three principal types of response from Muslims.

The first response could be characterized as a pragmatic one – let science and religion go their own separate ways. Vagueness suffices. It is, from this point of view, inessential to look too closely at what Islam says about science. Most Muslims would probably be content to simply live with the thought that the two are not in conflict.

A second, diametrically opposed, reaction is articulated by Sayyid Qutb of Egypt and Syed Abul Ala Maududi of Pakistan. (*Modern Technology And The Dehumanization Of Man*, Maryam Jameelah, Lahore, 1983. A scathing criticism of science and modernism from the Muslim orthodox perspective; *Taalimat* (Urdu) by Abul Ala Maudoodi, Lahore, Islamic Publishers, n.d. A critique of modern education and sketch of the Islamic alternative by one of the leading conservatives of the century.) They are overtly hostile to science and do not see lack of Muslim scientific progress as particularly regrettable because, in their opinion, modern science is guided by no moral values but only naked materialism and arrogance. Science and modernity emphasize ceaseless change and are seen as working against the immutable and constant values of Islam.

Claims to high achievement arising from the exercise of human reason are decried as amounting to man worship. Therefore, according to this view, scientific development is not desirable in an Islamic society.

A third reaction, largely syncretic, was prominent among nineteenth-century Muslim modernists. They worked to reinterpret the faith in order to reconcile the demands of modern science and civilization with the teachings and traditions of Islam. This school of thought has a historical tradition with roots going back to the rationalist Mutazilla movement of the ninth century and the work of Ibn Rushd, particularly his book *Tahafut-al-Tahafut* in which he refuted the antirationalism of Imam al-Ghazali. In this “reconstructionist” tradition, it is argued that the word of God cannot be wrong but also that the truths of science are manifest and real. Therefore, the only issue is to arrive at suitable interpretations of the Quran, through careful etymological examination, wherever there is an apparent conflict between the revealed truth and physical reality. It was held that Islam in the days of the Prophet and the *Khilafat-e-Rashida* was revolutionary, progressive, and rational and that the subsequent slide into stultifying rigidity was due to the triumph of *taqlid* (tradition) over *ijtihad* (innovation). Mohammed Abduh, Rashid Rida, and Syed Ahmad Khan were the leading proponents of this point of view.

It is interesting to examine Muslim attitudes toward major developments in science, of which Darwin’s theory of evolution provides the most contentious example. The first major debate, which pitted traditionalist Muslim and Christian Arabs on the one side against rationalists and radicals on the other, was initiated in 1884 following the publication of a work in Arabic by Shibli Shumayyil (1853–1917) favoring Darwinism. Expectedly, religious conservatives denounced Darwin’s theory as amounting to the denial of God and a refutation of the Quranic and biblical theories of creation. Even Jamaluddin Afghani, otherwise a powerful proponent of science, derided Darwinism – although it appears that he had not understood, or even read, any of Darwin’s work. A few Muslims, such as the writer Ismail Mazhar (1891–1962), did make

serious efforts to understand Darwinian evolution and asserted the need to reinterpret Islamic theology in the light of established facts. Others, such as the theologian Hussein al-Jisr (1845–1909), sought to reconcile elements of Darwin’s work with Islam. (A comprehensive account of this historical debate may be found in *Western Science In The Arab World – The Impact Of Darwinism, 1860–1930* by Adel A. Ziadat, London, 1986. The author concludes that an author’s religion – whether Muslim or Christian – was of secondary importance in this debate. Rather, it was largely a debate between religious men on the one hand and secularists on the other.) In the contemporary Muslim world, attitudes toward Darwinism are mixed. Teaching of the theory of evolution is allowed in Turkey, Egypt, Iraq, Iran, Indonesia, and several other countries. However, it was removed from the syllabus in Pakistan in the regime of General Zia-ul-Haq and is expressly forbidden in Saudi Arabia and Sudan.

Unlike the vigorous science versus religion debates in post-scientific revolution in Europe, there seems to be little discussion on the philosophical implications of modern scientific issues in Muslim countries, with Turkey and Iran being partial exceptions. The reason for this relatively low-level interest may be the increasing specialization of science and the difficulty of translating its ideas into ordinary language, as well as the reluctance of the ulema to be drawn into new fields. However, some time-honored issues continue to be routinely debated and commented upon. One such issue is whether the new moon must be visually sighted or whether its position can be predicted in advance with modern astronomical techniques. This becomes important and contentious especially around the time of *Eid-ul-Fitr*. In Pakistan, a *Ruet-i-Hilal* (moon-sighting) committee has been formed by the government to make final decisions on this matter. Weather prediction is an issue on which there has been a considerable softening of the traditionally hard position – that Allah alone knows and decides if and when it will rain and that He has prescribed the *namaz-i-istisqa* (prayer for rain) so that believers may supplicate him. Presently, all

Muslim countries maintain some form of meteorological department and provide weather information. Whereas orthodox *ulema* continue to maintain their position against the dissection of cadavers for medical training, blood transfusions, and organ transplants, this is essentially disregarded almost everywhere in Muslim countries now.

In recent years, the applications, methodology, and epistemology of modern science have been severely criticized by growing numbers of Muslim conservatives. (*Knowledge For What? Proceedings of the Seminar on the Islamization of Knowledge*, Islamic University, Islamabad, 1982. A useful compendium of papers setting out the orthodox Islamic perspective on the nature and purpose of knowledge.) At one level, in close similarity with the radical critiques of science by the German “Greens” as well as European Marxists and anarchists, it is argued that the development and application of a supposedly value-free science is the prime cause of the myriad problems faced by the world today – weapons of mass destruction, environmental degradation, global inequities in the distribution of wealth and power, alienation of the individual, etc. Others go a step beyond this and reject the validity of the scientific method as well as the notion of science as knowledge, believing that the goals and techniques of modern science – which are considered distinct from those of medieval age science – will inevitably damage the fabric of Islam. Knowledge for the sake of knowledge is declared to be a dangerous and illegitimate goal, and the only form of legitimate knowledge is that which leads to a greater understanding of the Divine. The most articulate representation of this point of view is by the Iranian born scholar Seyyed Hossein Nasr who also argues that the word *ilm*, whose pursuit is a religious duty, has been willfully distorted into meaning science and secular learning by Muslim modernists in an effort to make science more acceptable in Islamic societies. (*Islam And Contemporary Society*, S.H. Nasr, London, 1982. An attack on the foundations of modern science and an appeal for a science based on Islam by one of the best known opponents of Western science.)

The reaction of Muslim orthodoxy to the teaching of modern science in schools has been to demand basic changes. These include some or all of the following: introduction to all scientific facts by reference to Allah, dilution of the cause-and-effect relation to accommodate the Divine Will, rewriting of all science books by people of sound Islamic beliefs, highlighting of the former Muslim supremacy in science, and removal of names associated with specific physical laws (e.g., Boyle’s law and Einstein’s theory). It should be noted, however, that the Iranian clergy has allowed science taught in Iranian schools to maintain its secular character.

Islamic Science

Exponents of the so-called Islamic science argue that it offers an Islamic alternative to the challenge of modern Western science, which they consider as reductionist and incapable of accommodating Islamic beliefs. Individual proposals for creating this alternative science have emerged in large numbers since the 1970s. However, given the absence of a centralized religious authority – an “Islamic church” – the validity of these proposals cannot be clearly certified from the religious point of view. One fairly common definition of “Islamic science” is that every scientific fact and phenomena known today was anticipated 1,400 years ago and that all scientific predictions can and must be based upon study of the Quran. This has been the concern of dozens of conferences in numerous Muslim countries, including Egypt, Pakistan, Malaysia, and Saudi Arabia. Maurice Bucaille, a French surgeon who turned into a spiritualist, enjoys enormous popularity across the Muslim world. Bucaille’s major book is “The Bible, The Qur’an, And Science.” This book, which seeks to establish that the Quran correctly anticipated all major discoveries of science while the Bible was flawed in places, has been translated into several languages and read widely in Muslim countries.

Another opinion is that Islamic science is that which is based on Islamic values and beliefs such as *tawheed* (unity of God), *ibadah* (worship), and

khilafah (trusteeship) and which stands for the rejection of *zalim* (tyrannical) science as well as science for the sake of curiosity. Revelation rather than reason ought to be ultimate guide to valid knowledge. Seyyed Hossein Nasr demands that “a truly Islamic science cannot but derive ultimately from the intellect which is Divine and not human reason ... the seat of the intellect is the heart rather than the head, and reason is no more than its reflection upon the mental plane.” He provides no further clues of how the new science should be organized. Other Muslim authors insist that the study of natural disasters, which constitutes Islamic environmental science, must begin with trying to understand God’s will because earthquakes, volcanic eruptions, floods, etc., are events under His direct control and part of a grand systems scheme. One of the most articulate advocates of the Islamization of knowledge, including science, was the late Isma’il Al Faruqi.

One should distinguish science practiced by Muslims – whether in the present epoch or in the “Golden Age” of Islamic civilization – from “Islamic science,” which is supposed to reflect specifically Islamic characteristics. Whether an Islamic science of the physical world is a meaningful notion or concept can be challenged on at least three grounds. First, decades of efforts to create a specifically Islamic science have failed. The fact is that Islamic science has not led to the building of even a single new machine or instrument, the design of a new experiment, or the discovery of a new and testable fact. Only post facto explanations have been provided, never a prediction. Second, specifying a set of moral and theological principles – no matter how elevated – does not permit one to build a new science from scratch. There are numerous examples of scientists subscribing to very different philosophical assumptions and having very different emotional and psychological dispositions, who have arrived at very similar results in their scientific investigations. Although a scientist may be inspired toward making a particular discovery as a consequence of his belief, his claims of discovery must be validated by a system of science which relies on experimentation and testing as its basis. Third, there has never existed, and

still does not exist, a definition of Islamic science which is acceptable to Muslims universally. Many of the great Muslim scholars of medieval times, including Al-Kindi, Al-Razi, Ibn-Sina, and Ibn-Rushd, suffered persecution at the hands of the orthodoxy on account of their nontraditional religious and spiritual beliefs. The sectarian divisions within Muslims today would be reflected in any endeavor to establish a common set of rules. It is also worthy of note that all suggestions of creating a new epistemology of science based on ideological or moral principles have failed to be of little value because they are far too vague and ill-defined.

Current Trends in Science Development

Muslim leaders today, realizing that military power and economic growth flow from technology, frequently call for speedy scientific development and a knowledge-based society. Often that call is rhetorical, but in some Muslim countries – Qatar, the United Arab Emirates (UAE), Pakistan, Malaysia, Saudi Arabia, Iran, and Nigeria, among others – official patronage and funding for science and education have grown sharply in recent years. Enlightened individual rulers, including Sultan bin Muhammad Al-Qasimi of Sharjah, Hamad bin Khalifa Al Thani of Qatar, and others have put aside some of their vast personal wealth for such causes. No Muslim leader has publicly called for separating science from religion.

A pragmatic approach, which seeks promotion of regular science rather than Islamic science, is pursued by institutional bodies such as COMSTECH (Committee on Scientific and Technological Cooperation), which was established by the OIC’s Islamic Summit in 1981. It joined the IAS (Islamic Academy of Sciences) and ISESCO (Islamic Educational, Scientific, and Cultural Organization) in serving the *ummah* (the global Muslim community). But a visit to the websites of those organizations reveals that over two decades, the combined sum of their activities amounts to sporadically held conferences on disparate subjects, a handful

of research and travel grants, and small sums for repair of equipment and spare parts.

Cross-References

- [Mathematics in Islam general](#)
- [Philosophy in Islam](#)
- [Philosophy of Science](#)
- [Physics, Science in Islam](#)
- [Pragmatism on Religion and Science](#)
- [Rationality \(Philosophical\)](#)
- [Religion and Pseudoscience](#)
- [Science in Islam, Classification](#)
- [Science in Islam, Transmission](#)

Physiological Psychology

- [Biological Psychology](#)

Physiology and Psychology of Visual Perception

- [Optics in Islam](#)

Physiotherapy

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Description

Physiotherapy (physio- [prefix] from ancient Greek physis = nature) relates to treatment of diseases, bodily defects, or bodily weaknesses by physical remedies, such as massage, special exercises, etc., rather than by drugs.

In 1999, the World Confederation for Physical Therapy proclaimed the following definition of physiotherapy:

Physiotherapy is providing services to people and populations to develop, maintain and restore maximum movement and functional ability throughout the lifespan.

Physiotherapy is a profession. Physiotherapists frequently receive prescriptions from physicians indicating type and frequency of treatment as indicated for individual patients. While treating patients, physiotherapists make their own clinical judgments and specific treatment choices and practice reflections, i.e., reviewing their own behavior and success in their work and taking action as appropriate to solve problems they identify in themselves.

Physiotherapists work with a broad variety of physical problems, especially those associated with the neuromuscular, musculoskeletal, cardiovascular, and respiratory systems. They may work alone, with physiotherapy colleagues or teams, and with other health-care professionals in multi-professional teams and in a wide variety of health settings such as intensive care, mental illness, stroke recovery, occupational health, and care of the elderly.

In the last decades, physiotherapists' activities were characterized by professional diversity and involvement in patient care in many areas such as:

- Outpatients – treating spinal and joint problems, accidents, and sports injuries.
- Intensive Care Units – keeping limbs mobile and chests clear.
- Women's Health – ante- and postnatal care advice, exercise and posture, managing continence, and post-gynecological operations.
- Care of elderly – maintaining mobility and independence, rehabilitation after falls, treatment of arthritis, Parkinson's disease, and chest conditions.
- Neurology – helping people restore normal movement and function in stroke, multiple sclerosis, and other conditions.
- Orthopedics and trauma – restoring mobility after hip and knee replacements and

spinal operations and treating patients after accidents.

- Mental illness – taking classes in relaxation and body awareness and improving confidence and self-esteem through exercise.
- People with learning difficulties – using sport and recreation to develop people and assessing and providing specialist footwear, seating, and equipment.
- Occupational health – treating employees in small to large organizations and companies and looking at work habits to prevent physical problems such as repetitive strain injury.
- Terminally ill (palliative care) – working in the community or in hospices and treating patients with cancer and AIDS (acquired immune deficiency syndrome).
- Pediatrics – treating sick and injured children, those with severe mental and physical handicaps, and conditions like cerebral palsy (weakness due to brain damage during pregnancy or near birth) and spina bifida (developmental spine closure deficits).
- Community – treating a wide variety of patients at home and giving advice to carers.
- Private sector – working independently in private practice, clinics, hospitals, and GP surgeries and treating a wide range of conditions.
- Education and health promotion – teaching people about many conditions and lifestyle choices. This may include back care, ergonomics, and taking exercise classes and cardiac rehabilitation groups.
- Sports clinics – treating injuries in sportsmen and women and advising on recovering fitness and avoiding repeated injury.
- Voluntary organizations – advising and consulting for organizations supporting and caring for people with multiple sclerosis and Parkinson's disease.

Self-identification

Science might be viewed as knowledge attained through study or practice, or knowledge covering

general truths of the operation of general laws, especially those obtained and tested through scientific method [and] concerned with the physical world.

Academic physiotherapy is a science since its methods are subject to both research evidence addressing issues of relevance for its theoretical concepts (e.g., basic science) and to clinical research, e.g., clinical trials assessing treatment effects of physiotherapeutic approaches.

Characteristics

Physiotherapists try and bring the patients into an active role to help make the best of independence and function. Core skills used by physiotherapists include manual therapy, therapeutic exercise, and the application of electrophysical modalities.

Relevance to Science and Religion

Physiotherapy is relevant to science in that its specific methods, e.g., manual therapy, therapeutic exercise, and the application of electrophysical modalities, add to the medical therapeutic knowledge in the above mentioned areas of health care to the extent that its remedies are supported by scientific evidence.

Physiotherapy is interested in science in that it – as an academic discipline – thrives to expand its knowledge base for its clinical applications.

Evidence-based physiotherapy can be described as a commitment to use the best available evidence to inform decision-making about the care of individuals that involves:

- Integrating physiotherapist practitioners
- Individual professional judgment with evidence gained through systematic research

The World Confederation for Physical Therapy (WCPT) believes that physical therapists have a duty and responsibility to use evidence to inform practice and to ensure that the management of patients/clients, their carers, and communities is based on the best available evidence. Evidence should be integrated with

clinical experience, taking into consideration beliefs and values and the cultural context of the local environment. In addition, physical therapists have a duty and responsibility not to use techniques and technologies that have been shown to be ineffective or unsafe.

Sources of Authority

At least as early as the days of Hippocrates, massage was used and the history of physiotherapy was begun. The practice of physiotherapy has evolved through the centuries from the earliest forms to the complex system of treatment it is now.

In 460 B.C., Hector was using a type of physiotherapy called hydrotherapy, or water therapy. Professionals use this type of therapy today, although it is more specialized for each type of condition that the patients have.

The year 1894 saw the first evidence of a group of nurses in the history of physiotherapy with a Chartered Society. Within 20 years, physiotherapy programs were set up in other countries. New Zealand's started in 1913 and America's in 1914.

The first American professionals in the history of physiotherapy were from the Walter Reed College and Hospital in Portland Oregon. Rather than being called physiotherapists, they were called reconstruction aides. These aides were nurses and they had a physical education background. They were important in the recovery of many World War I veterans.

In 1921, the Physical Therapy Association was formed by Mary McMillan. This group later became the APTA, arguably the most influential organization in the American history of physiotherapy.

The Georgia Warm Springs Foundation was started in 1924 to deal with the ever-growing epidemic of polio. The foundation offered physiotherapy for these patients. Sister Kinney was known nationally for her work with polio victims. She practiced at the Mayo Clinic. The polio epidemic was a turning point in the history of physiotherapy.

PNF (proprioceptive neuromuscular facilitation) stretching is a physical therapy procedure designed in the 1940s and 1950s to rehabilitate patients with paralysis (weakness due to nervous damage). Herman Kabat, a neurophysiologist, began in 1946 to look for natural patterns of movement for rehabilitating the muscles of polio patients. He knew of the myotatic stretch reflex (muscle reflex), which causes a muscle to contract when lengthened too quickly, and of the inverse stretch reflex, which causes a muscle to relax when its tendon is pulled with too much force. He believed combinations of movement would be better than the traditional moving of one joint at a time. To find specific techniques, he started an institute in Washington, DC and, by 1951, had two offices in California as well. His assistants Margaret Knott and Dorothy Voss in California applied PNF to all types of therapeutic exercise and began presenting the techniques in workshops in 1952. During the 1960s, the physical therapy departments of several universities began offering courses in PNF.

In about 1950, chiropractic manipulations came on the scene in the history of physiotherapy. This was most common in Great Britain.

After that time, the history of physiotherapy moved from hospitals into other arenas of service. There were, and are, physiotherapists working in clinics, private practices, nursing homes, and schools.

Dr. Karel Bobath, a physician, and Berta Bobath, a physiotherapist, were born in Berlin and moved to England during World War II. There they developed their approach to the evaluation and treatment of children and adults with lesions of the central nervous system, nowadays called the Bobath concept. The first center opened in 1951 and there the first course was conducted. Since then, many thousands of therapists and doctors have been trained worldwide.

The World Confederation for Physical Therapy, which was founded in 1951 to represent physical therapists internationally, champions the principle that every individual is entitled to the highest possible standard of culturally appropriate health care provided in an atmosphere of trust and respect for human dignity and

underpinned by sound clinical reasoning and scientific evidence. The World Confederation for Physical Therapy was founded in Copenhagen, Denmark, with 11 founding member organizations from Australia, Canada, Denmark, Finland, Great Britain, New Zealand, Norway, South Africa, France, Sweden, and the United States of America. The confederation is a nonprofit organization comprising 106 member organizations which, together, represent more than 350,000 physical therapists worldwide.

During the history of physiotherapy, training and practice have changed and improved. Many brilliant pioneers have left their marks in the literature and organizations of the field. Physiotherapy is a well-respected profession as a result.

Ethical Principles

As for every medical subdiscipline and allied health services, physiotherapy is guided by the oath and law of the ancient Greek physician Hippocrates (born 460 B.C.) who is considered the so-called father of medicine. This “Hippocratic Oath” has been supplemented by the rules of the Declaration of Helsinki of 1971.

The World Confederation for Physical Therapy (WCPT) expects physical therapists to:

- Respect the rights and dignity of all individuals
- Comply with the laws and regulations governing the practice of physical therapy in the country in which they practice
- Accept responsibility for the exercise of sound judgment
- Provide honest, competent, and accountable professional services
- Provide quality services
- Be entitled to a just and fair level of remuneration for their services
- Provide accurate information to patients/clients, other agencies, and the community about physical therapy and the services physical therapists provide
- Contribute to the planning and development of services which address the health needs of the community

Key Values

Physiotherapy is a science-based health-care profession which views movement as central to health and well-being. Physiotherapists aim to identify and make the most of movement ability by health promotion, preventive advice, treatment, and rehabilitation. Physiotherapists believe it is of vital importance to take note of psychological, cultural, and social factors which influence their clients.

Cross-References

- [Body](#)
- [Neurology in Europe](#)
- [Occupational Therapy](#)

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Pietism

- [Mysticism](#)

Pilgrimage

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Related Terms

[Journey](#); [Landscape](#); [Place](#); [Ritual](#)

Pilgrimage is a ritual journey undertaken by a person or a group to a specific, religiously defined location in landscape in order to reach

an objective not achieved at home or in ordinary religious practices (Morinis 1992; Turner and Turner 1978).

Through the three elements of pilgrimage, location, journey, and person, the physical movements in geographical space are connected to a religious journey in mythological space. Pilgrimage sites are often said to be the location of mythological events, the journey or a reenactment of earlier journeys taken by religious figures in past mythological times or an anticipation of future journeys after death, or the pilgrim may be considered different from the ordinary social person.

Pilgrimage is a common practice in many religious traditions and is known from all over the world and from ancient times, when people visited sacred places in the landscape, through the Middle Ages, when Europe was crisscrossed by pilgrimage routes, and up to today. Due to increasing possibilities of long distance travel, globalization in general, and the revitalization of embodied religious rituals in Lutheran countries, pilgrimage is more popular and widespread than ever (Morinis 1992; Reader and Walter 1993). As a ritual, pilgrimage is a sequence of practices that separates the pilgrim from home and everyday life and relates the pilgrim with religiously defined values (Morinis 1992; Turner and Turner 1978). Pilgrimage situates this separation and relation in the landscape as distance and location. The journey along the pilgrimage route thereby separates the pilgrim from home and leads the pilgrim toward a valued location both in geographical and religious terms. The pilgrimage site is a location in the landscape that is believed to stand, somehow, in a special and close relation to cosmology, mythological events, historical periods or persons, or other types of religiously defined values and powers of change. In order to be in contact with those values or powers, the pilgrims approach and interact with the location and the pilgrimage site, in certain, often well-defined mode of movements. The pilgrims embody this movement in order to relate themselves to the pilgrimage route and site and the associated religious meaning.

Pilgrimage is constituted by three elements: the place, the person, and the journey that

connects place and person. The different pilgrimages and religious traditions differ in emphasis on these three elements (Morinis 1992).

The pilgrimage site is traditionally defined as the center of the cultural world and pilgrimage as a journey to the center of cultural values. But pilgrimage sites are more often located in cultural border regions, and pilgrimage sites were often established in order to mark the foreign or untouched landscape in new religious terms. The same site can therefore be disputed and contested, when more than one religious traditions or more than one group within the same tradition argue or fight over the symbolic and/or territorial control over the pilgrimage site (Coleman and Eade 2004; Eade and Sallnow 1991).

Pilgrimage sites are the alleged locations for cosmological figures and mythological and historical events and are often placed at special landscape features, like mountains, rivers, springs, caves, etc. These places function as commemoration of these figures and events but are also a source for their continuing relevance for the believing pilgrim.

The pilgrim commences on a pilgrimage for a series of reasons. Penance, blessings, good deeds, religious obligations, healing, etc., are religious motivations often combined with adventure, tourism, or commerce, sometimes making pilgrimage difficult to separate from other practices. In general, pilgrimage is a voluntary journey available for all independent of religious position, earlier initiating ritual, or social status. This equalitarian character makes pilgrimage a predominantly lay practice with less restriction on interpretation. Even when a pilgrimage site is well established as unique for one religious tradition, the lay pilgrims may bring their own interpretations of the site and the connected practices. The institutional establishment and the visiting pilgrims may therefore be in some conflict about interpretation and practice, the clergy often emphasizing soteriological goals and institutionalized interpretation, whereas pilgrims prefer worldly and practical gains, such as fertility, wealth, and good health and interpretations informed by popular, folk religion.

Completing a pilgrimage increases the religious and social status of the pilgrim on her or his return home. Occasionally, a new name or a specific title is given to the successful pilgrim. A pilgrim may have undertaken the journey on behalf of another person or as representative of the whole family, and on the return, the acquired benefits must then be passed on. Soil, plants, relics, or other material substances collected or bought at the pilgrimage site may embody such transfer or can be broken up or collected water dissolved into a bigger solution to be distributed to close ones. The pilgrim leaves as an individual, even when in a group, and returns with new religious status to a social context (Turner and Turner 1978).

The journey is central to pilgrimage. A pilgrimage requires some distance between home and the pilgrimage site and a journey to the site (Morinis 1992). The actual distance is not important, but often the journey will bring the pilgrim in contact with unknown areas. The journey may be done in specific modes of movements. Pilgrims sometimes crawl on their knees or make full body-length prostrations to or at the pilgrimage site. Minor altered mode of movements, such as a slower pace, or changing the appearance of the walk, like wearing specific clothes or using a walking stick, all indicate to others and to the pilgrims themselves that it is no ordinary journey. Instead, pilgrimage is a journey that relates the pilgrim to the located value and potential change. Sometimes the journey itself is the goal of pilgrimage; the pilgrimage site merely being a location in landscape that indicates the end of the pilgrimage, not the actual goal. As such, the journey and the pilgrimage route are important, where the movement from A to B along the route is a geographical metaphor for a change that occurs in time, before and after the pilgrimage.

At the core of pilgrimage lies this assumption that the changes wished for in the religious, social, material, or other realms can be mapped onto the landscape. The movements in space and approaching a location in landscape can be transferred back onto these domains. To journey along a route in a specific mode to a defined

location in landscape is newer only spatial transport but also a temporal transference from one situation to another. The pilgrims move through landscape and reach some defined goals in their own life.

Cross-References

- [Body](#)
- [Cosmology](#)
- [Experience](#)
- [Landscape](#)
- [Myth](#)
- [Religion, history of](#)
- [Ritual](#)
- [Space](#)
- [Space and Time](#)
- [Worldview](#)

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Pilgrims

- [Latino Studies](#)

Place

- [Ecological Psychology](#)
- [Pilgrimage](#)

Planck Length

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It is conjectured that there might be a smallest unit of length – one that is incapable of being subdivided. Max Planck argued that, were there to be such a minimum length, there must be a formula for it – one that depended on the fundamental constants: the gravitational constant, G , the speed of light, c , and Planck's constant, h , governing quantum effects. The simplest formula yields a value for the length of approximately 1.6×10^{-35} m. This is 20 orders of magnitude smaller than the size of a proton and means that it is very unlikely we shall ever be able to check whether there is a smallest unit of distance.

Cross-References

► [Space](#)

Planck Time

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It is conjectured that there might be a smallest unit of time - one that is incapable of being subdivided. Max Planck argued that were there to be such a minimum interval of time, there must be a formula for it - one that depended on the fundamental constants: the gravitational constant, G , the speed of light, c , and Planck's constant, h , governing quantum effects. The simplest formula yielding a quantity with the dimensions of time gives a value of approximately 5.3×10^{-44} seconds. This is 27 orders of magnitude smaller than the smallest time

interval measured so far, and means that it is very unlikely we shall ever be able to check whether there is a smallest unit of time.

Cross-References

► [Time](#)

Plasma

► [Transfusion Medicine](#)

Plasticity

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Related Terms

[Neural plasticity](#); [Neuroplasticity](#)

Description

Plasticity is the capability of the brain to alter its functional organization as a result of experience. As such, plasticity refers to the phenomenon of change, not to the specific underlying mechanisms. The word itself originates from the Latin word *plasticus*, literally meaning that which can be molded. No single morphological or physiological change comprises the phenomenon of plasticity, as it applies to the nervous system. Instead, many different processes from genetic to subcellular to cellular to systems level contribute to plasticity. Similarly, brain plasticity involves several cell types, including neurons, glia, and endothelial (or vascular) cells. One of the important morphological structures that is known to undergo plasticity is the chemical

synapse. Hence, synaptic plasticity is a term that describes long-lasting changes in the efficacy of chemical transmission across the synapse resulting from certain patterned activities of the presynaptic nerve. Further, behavioral experience can induce changes in cortical maps, so that those body parts engaged in the behavioral task come to be represented over larger cortical territories. Such *cortical plasticity* is also known as *cortical remapping*. Cortical plasticity has now been demonstrated in widespread regions of the cerebral cortex, including the somatosensory, auditory, visual, and motor cortex, and thus, is considered to be a basic property of cortical circuits. While *developmental plasticity* had been accepted for decades, most neuroscientists thought that the nervous system was relatively fixed after certain critical periods of development. The importance of this subdiscipline is that it suggests that the brain is mutable throughout life.

An important demonstration in 1973 of a specific form of synaptic plasticity showed that a test electrical pulse could activate a greater number of synapses if preceded by brief trains of pulses (Bliss and Lomo 1973). This phenomenon came to be known as *long-term potentiation*, and is thought to be the synaptic basis for learning and memory. These studies set the stage for brain plasticity studies to follow in the later part of the twentieth century. Throughout the 1980s and 1990s, a large number of studies demonstrating the phenomenon of *cortical plasticity* were conducted (Buonomano and Merzenich 1998). The cerebral cortex contains a representation, or map, of the sensory receptors in the skin, and this representation is laid out in an orderly arrangement. As the result of specific types of sensory experience, details in the map can be altered. For example, a peripheral nerve injury might disrupt the map representing the injured nerve, and subsequently, neurons in this region will become responsive to other nerves. Some of the most compelling data came from nerve transection experiments demonstrating that a decade after the transection of a peripheral nerve innervating the hand, the representation of the face in the cerebral cortex expanded into the former

hand territory (Merzenich et al. 1983). Such examples of cortical plasticity were found in every cortical area studied, including somatosensory, auditory, visual, and motor cortex. In the 1990s, and continuing to the present, an increasing number of neuroimaging studies in brain-injured and intact humans have demonstrated brain plasticity at the tissue and network level of analysis. In parallel with the development of human neuroimaging studies, laboratory experiments in animal models have revealed details of the cellular and molecular basis for brain plasticity. These studies have included demonstrations that neurons are altered anatomically. Changes include axonal sprouting or neuroregeneration, increases in synapse number (synaptogenesis), dendritic spine length, and branching of dendrites.

Self-identification

Science

Plasticity is self-identified as a science to the extent that the phenomenon has been demonstrated through empirical studies. In its early beginnings, plasticity emerged as a hypothesis, but significant skepticism prevailed in the scientific community for several years. While most neuroscientists were willing to accept the concept of plasticity during the early development of an organism, the notion that the adult brain was modifiable in structure and function was not universally accepted. As the phenomenon was demonstrated in increasingly varied circumstances at several levels of analysis, skepticism gave way to acceptance that brain structure and function was mutable throughout life. The body of evidence demonstrating brain plasticity, and its underlying rules and assumptions, now amounts to a well-established theory.

Characteristics

As a subdiscipline of neuroscience, plasticity is distinct in its emphasis on change. Other subdisciplines such as neuroanatomy and neurophysiology examine the structural or functional

state of the nervous system at a given point in time. Plasticity phenomena can be described based on neuroanatomical or neurophysiological end points, but emphasizes the change in those end points that result from a modulating influence, such as behavioral experience. A unique subfield of plasticity that has garnered attention recently focuses on the degree to which current state of the nervous system influences the magnitude or direction of plasticity. This form of plasticity was termed *metaplasticity* by Abraham and Baer (1996).

Relevance to Science and Religion

While plasticity focuses on natural events, there has rarely been any specific discourse regarding its relationship to “Science and Religion.” However, the notion that the nervous system is alterable throughout life is a major paradigm shift that departs radically from the previous concept of the nervous system as being fixed in adulthood. As such, brain plasticity has clear philosophical, if not religious, implications related to the concept of “free will.” An alterable brain, modifiable as a direct result of experience, implies that our core being is not entirely preordained, but rather, can be consciously shaped. A provocative example of communication between scientists and religious leaders on the issue of plasticity occurred in the 1990s when the Dalai Lama became interested in this subdiscipline and encouraged monks to participate in neuroimaging studies. The results suggested that the physiology of the brain could be altered by meditation training (Brefczynski-Lewis et al. 2007).

Sources of Authority

While the term “neural plasticity” was reportedly coined by Polish neuroscientist Jerzy Konorski, a student of Pavlov, in the 1940s, the concept of brain plasticity has its origins in the writings of neurologists and psychologists at least as early as the mid-nineteenth century (Finger 1994). However, firm empirical evidence has only been available in abundance since the 1980s. Focused

studies on the alterability of the nervous system began in earnest in the laboratory of Sir Charles Sherrington at the beginning of the twentieth century. Sherrington, widely regarded as the father of modern neurophysiology, stated in his Silliman Lectures that “Mere experience can...mold nervous reactions, insofar as they are plastic.” His students, especially Sir John Eccles and Graham Brown, carried on with this work and established some of its early principles. Eccles began studying plasticity at the level of the neuromuscular junction and then moved into the spinal cord, where he established some of the early principles of activity-dependent synaptic plasticity. In the 1930s and 1940s, the work of American psychologist Karl Lashley and his student, the Canadian physiologist Donald Hebb, was very influential in establishing testable hypotheses regarding neural plasticity. Hebb’s book “The Organization of Behavior” is still one of the most influential books in the field of neuroscience (Hebb 1949). In this book, Hebb outlined his hypothesis for synaptic plasticity, based on the temporal contiguity of pre- and postsynaptic activity. This hypothesis was given firm credence with the work of Bliss and Lomo and their landmark studies in 1973 on long-term potentiation of synapses in the hippocampus. Long-term potentiation is a phenomenon of synaptic communication in which a test electrical pulse can activate a greater number of synapses if preceded by brief trains of pulses. Under different stimulating conditions, the test pulse can activate a fewer number of synapses. This phenomenon is known as longterm depression. These early studies set the stage for influential experiments demonstrating *cortical plasticity* in adult nonhuman primates in the 1980s by Michael Merzenich, Jon Kaas, and others. Within a decade, modern neuroimaging studies confirmed the phenomenon in humans, and the theory developed wide acceptance in the field of neuroscience. In each instance, these scientists became advocates for the existence of the phenomenon of plasticity based on their own empirical work. Their authoritative influence on the field was grounded in thorough, careful experimentation.

Ethical Principles

Ethical principles guiding practitioners in plasticity are based on the foundations of ethics common to all human subjects and nonhuman animal research. With respect to human subjects research, principles dictate (a) respect for the dignity of all subjects in research, (b) the need for free and informed consent to participate in research studies, (c) the importance of protecting subject confidentiality, (d) equity in the selection of subjects and distribution of risk, and (e) the right of subjects to withdraw participation at any time without penalty. These ethical codes were summarized in the oft-cited Declaration of Helsinki in 1964, but have been refined throughout the ensuing decades, most notably in The Belmont Report. Practitioners in the field of plasticity research conducting nonhuman animal research also adhere to a strict code of ethics. This is especially important since many plasticity experiments are necessarily invasive. Specific guidelines vary from country to country, but generally follow similar principles, such as those outlined in the Guidelines for Ethical Conduct in the Care and Use of Nonhuman Animals in Research developed by the American Psychological Association. In both human subjects and nonhuman animal research, oversight boards to monitor conduct of studies and adherence to ethical guidelines play an essential role in this process.

Key Values

The key values of plasticity as a phenomenon of brain function are both theoretical and practical. From a theoretical perspective, plasticity suggests that the state of the nervous system at any point in time is the product of the organism's life experiences, but especially recent experiences. The alterability of the brain at the synaptic, cellular, and network level provides an entirely new perspective on understanding of neural function. From a practical standpoint, brain plasticity implies that both acute and chronic neurological disorders may be treatable. While some

self-repair in the brain after injury has now been established, further understanding of the alterability of neural tissue may lead to major new treatments for neurological disorders.

Conceptualization

Nature/World

Nature refers to the physical world. With respect to the brain, it refers to the neuroanatomical constituents, as well as biochemical and physiological reactions. It encompasses observable, material events.

Human Being

The human being is any member of the species *Homo sapiens*, possessing a uniquely complex brain and accompanying unique behavioral attributes, such as fine dexterity of the hand, language, ethics, and culture.

Life and Death

Life is the state of an organism in which basic biological processes continue to function. These include metabolism, reaction to stimuli, growth, and adaptation. Death is the cessation of these processes.

Reality

Reality is the perceived physical world. As such, reality is not identical in all organisms, since considerable variability exists among species regarding the precise physical information that can be perceived. For example, humans perceive a limited range of wavelengths of light that we refer to as the visible spectrum. Extreme ultraviolet and infrared wavelengths are not perceived, and thus, are not part of our reality unless manufactured devices are used to transduce them.

Knowledge

Knowledge is the sum total of factual information about a given topic.

Truth

Truth is an irrefutable fact or principle. Based on the scientific method, absolute truth is never

attained, only approximated. Thus, a preponderance of evidence results in a probabilistic likelihood of truth.

Perception

Perception is the interpretation by the brain of sensory signals. Thus, the brains of different individuals can perceive the same sensory experience as quite different.

Time

Time is a fundamental structure by which humans measure the intervals between sequences of events.

Consciousness

Consciousness is used variably to refer to a state of alertness and arousal, or to a state of self-awareness. With regard to the former, consciousness can be altered by various pharmacological agents or, pathologically, by brain injuries. The latter is used in the context of psychology and is alterable in certain psychological disorders.

Rationality/Reason

Rationality is the process of sound inference, based on existing knowledge. It often obeys traditional rules of logic.

Mystery

Mystery is anything that is unexplained in science. An inference common among scientists is that the mystery will ultimately be explained pending further scientific query. Mystery is often a powerful motivating factor in science, encouraging its practitioners to discover information about the natural world that was formerly unrealized and unappreciated.

Relevant Themes

The notion that the brain is alterable throughout life implies that each brain is highly idiosyncratic. This realization has important implications for our understanding of individuality. While all brains are organized based on similar fundamental

principles, details of experience-driven network properties differ substantially, contributing to the uniqueness of human individuals.

A recent issue that is drawing increasing attention by individuals interested in ethics of modern technology surrounds the topic of brain-machine interfaces. Increasingly sophisticated microelectronic devices are becoming available to assist neurologically injured persons. For example, in a paralyzed individual, neuronal signals can be derived from the individual's brain and used as command signals to drive external devices, such as a cursor on a computer screen, or even the contraction of the patient's own muscles (Hochberg et al. 2012). These devices rely on *neural plasticity* to allow the nervous system to adapt to the presence of the artificial microelectronics and the new control algorithms that are required. As so-called smart prostheses become more sophisticated and available clinically, an ethical dilemma may be raised. As human brains are interfaced with microelectronic devices, at what point does the organism cease to be human? As cybernetic organisms move from science fiction to reality, our sense of humanity may be challenged.

Cross-References

- ▶ [Biological Psychology](#)
- ▶ [Cognitive Neuroscience](#)
- ▶ [Experience](#)
- ▶ [Neuroethics](#)
- ▶ [Neuroimaging](#)
- ▶ [Neurophysiology](#)
- ▶ [Philosophy of Mind](#)
- ▶ [Recovery](#)
- ▶ [Science in Buddhism](#)
- ▶ [Transcranial Magnetic Stimulation](#)

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of the heterogeneous” in several ways. First, the operation of the plot organizes what would otherwise be purely an enumeration of incidents into an intelligible whole, having at least a basic beginning-middle-end structure. Second, the plot integrates different components such as different protagonists, their activities and their feelings, and knowledge and intentions into the dynamic identity of a particular story located in space and time. Third, the plot distills a meaningful temporal unity from an otherwise chronological sequence of unrelated episodes.

Pluralism (Religious)

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Related Terms

[Diversity](#); [Ecumenism](#); [Interreligious dialogue](#); [Plurality](#)

Description

The term “pluralism” appears within a number of different disciplines, such as Science, Philosophy, Economy, Law, Art, and Religion. From a general point of view, it is used in two different senses. In the first sense, it is used simply to refer to the fact of plurality when it comes to, for example, methods, systems, religions, or values. In the second sense, it stands for the view that this plurality is something to be acknowledged, promoted, or reconciled. Scientific pluralism denotes the view that there is no unified scientific method but that multiple explanations are required to account for the nature of certain observed phenomena.

The focus here is on religious pluralism and the use of the term within the subdisciplines of Philosophy of Religion and Theology of Religion(s). In this context, the term is used to indicate openness

Platelets

► [Transfusion Medicine](#)

Pleasure

► [Happiness](#)

Plot

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The organizing theme or structure of a narrative, the sense of a narrative or story. Following Paul Ricoeur, the plot is understood as the “synthesis

and tolerance from within one religion toward other religions. In this sense, some religious traditions are more prone to pluralism than others. In recent decades, the term has in the academic world come to appear within a certain typology used to classify possible theological positions toward alien religions. This is the threefold typology of exclusivism, inclusivism, and pluralism. Generally speaking, exclusivism is the view that it is only the home religion that is true and salvific. Other religions are simply false. Inclusivism stands for the view that the home religion is the only universally true religion. Other religions can be partly true and adherents to them can attain salvation, but this is done surreptitiously through the power of the home religion, which alone is truly salvific. Pluralism is then the view that the home religion is not the only true and salvific religion.

These different standpoints become paradigmatic for how one understands the interreligious situation and for one's attitude toward interreligious dialogue. Pluralism is generally considered the most conducive for a creative engagement with the religious other. There are, however, different variants of religious pluralism.

One variant is the view that there is a common ultimate reality as the ground for the plurality of religions. The different religions are equally valid expressions of this universal ground. This does not mean that the particularity of each religion should be dismissed but, rather, that no one religion can be considered superior to the others (Schuon 1959).

Related to this variant of pluralism is the view that all the great world religions are salvific, which means that they lead to a common goal, that of transformation from self-centeredness to Reality-centeredness, even if this is differently conceived of as salvation, liberation, or enlightenment. The doctrines and stories of the various religions are not literally true, but they facilitate this transformation (Hick 1989).

In opposition to these is the view that the various religious traditions are radically different, that there is no common ground or even conceptual contact between the religions. Even the concept of religion is problematic since it is difficult to

determine how what we call religions really are examples of a single category. In this view, interreligious dialogue is not an exploration of commonalities but rather an encounter with otherness and an openness to mutual transformation (Cobb 1982).

Still, another form of pluralism is the one that focuses on tolerance between religions. It emphasizes the fact that our world is religiously plural and that this is the reality, not that there is an ultimate reality behind the religions. The religions are complementary expressions that together comprise the universal whole. They are not competing expressions of a common ground (Dalai Lama 2010).

A further variant of pluralism focuses on the religions as dynamic processes rather than essentialist belief systems. Through phenomenological studies and dialogical engagement, this variant attempts to discern parallel processes, moods, and insights from the various traditions and creates new concepts and categories to further the understanding of religious phenomena. Here, the promotion of understanding is the central incentive. Feminist approaches to religious diversity are generally in line with this variant of pluralism (Pfändtner 2010).

Cross-References

- [Feminist Philosophy of Religion](#)
- [Interreligious Studies](#)
- [Philosophy of Religion](#)
- [Typologies in Science and Religion](#)

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Plurality

► Pluralism (Religious)

Poesy (Archaic)

► Poetry

Poetry

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Related Terms

[Poesy \(archaic\)](#); [Verse](#)

Description

Poetry is a language art characterized by composition in lines, dense use of figurative language, and repetitions of sound and meter. The primary unit of meaning in a poem is generally considered

the line and the secondary unit of meaning to be the stanza or strophe; poetry is thus distinguished from *prose*, in which the primary unit of meaning is the sentence, and the secondary unit, the paragraph (although the nineteenth and twentieth century has seen many examples of hybrid work, particularly the prose-poem, in which the primary unit of meaning is, in fact, the sentence).

The English word “poetry” derives etymologically from the Greek *poiesis*, which means “to make.” Aristotle used the term to refer to anything that is made, including practical tools as well as epics, calling that which is made “a productive science.” French Romantic poet Alphonse de Lamartine gives an exultant definition of poetry when he writes, “Like all that is divine in us, it can be defined neither by one word nor a thousand. . . . It is, at the same time, sentiment and sensation, spirit and matter; and that is why it is the complete language, the language *par excellence* that seizes man by his entire humanity; ideas for the mind, sentiments for the soul, images for the imagination, and music for the ear.” British Romantic Poet William Wordsworth calls poetry the “breath and finer spirit of all knowledge; it is the impassioned expression which is the countenance of all science.” Most definitions give some combination of either the imaginative, technical, spiritual, philosophical, or emotional aspects of the art.

Poetry originated from an oral tradition, in which stories, genealogy, and spiritual/religious rituals were passed from person to person, generation to generation, via speech that was organized through patterns of sound (repetition, alliteration, rhyme, and meter). These patterning devices of sound may have been employed for mnemonic reasons; that is, people were more likely to remember stories, rituals, hymns, etc. if they were told with a repetition of sound or meaning, or in the form of a song. In this way, poetry is a distinct part of the evolution of civilization – it was one way that humans cultivated to retain its collection of knowledge over time.

These patterning devices are often arranged structurally, creating what is called poetic form. Form may be as simple as the repetition of a particular metrical and/or rhyming pattern, or

may denote stanza length, repetition of lines or phrases, or even content of the poem (the elegy, for example, is reserved for mourning, the epithalamium for marriage). Other popular forms are the pantoum (Malay), haiku (Japanese), canzone (Italian), ghazal (Persian), sestina (Italian), ode (Greek, English), and elegy (Greek, English).

Until the twentieth century, poetry was usually written either in a codified, recognizable form (such as the sonnet or elegy), or else employed regular stanza divisions with lines of equal metrical length (12 quatrains written in iambic pentameter, for example). Jules Laforgue and Walt Whitman were famous in the nineteenth century for practicing what is now known as “free verse,” in which line and stanza length are variable, and the poet does not follow rules for the composition of the poem. At the turn of the twentieth century, and particularly following WWI and WWII, free verse became, in Western poetry, the rule rather than the exception.

Taxonomy of Poetry: One of the earliest attempts to taxonomize poetry can be found in Aristotle’s *Poetics* in which he delineated three “species” of poetry: tragedy, comedy, and epic. Both tragedy and comedy, however, would be classified, according to contemporary standards, as “dramatic.” Current generic classifications of poetry tend to focus on three primary types:

Epic – a long narrative poem that recounts the long and arduous journey of a hero. The earliest extant epic is the Sumerian epic of Gilgamesh. In the Western tradition, Homer’s *Illiad* and *Odyssey* and Virgil’s *Aeneid* are considered quintessential examples of the epic (between 12,000 and 15,000 lines each). Few modern examples of the epic exist; Derek Walcott’s *Omeros* and Alice Notley’s *Descent of Alette* are two of the few epics written in the twentieth century.

Lyric – a short, typically non-narrative, poem characterized by first person expression, apostrophe, and density of figurative language. There have been lyric poems as short as two lines and those that extend past 800. Common themes include death, desire, love, mysteries of nature, and spirituality. The ancient Greek poetess Sappho is typically considered to be

among the first lyric poets, but we can trace early examples of lyric compositions as far back as the tenth century B.C.E.

Dramatic – a long narrative poem written for multiple voices in dialog with one another. A dramatic poem is, essentially, a drama (tragic or comic) written in verse lines. Euripedes and Sophocles are among the oldest recorded writers of dramatic verse, although the genre remained popular through the Renaissance, practiced by writers such as Shakespeare and Marlow.

Our oldest records, those of the Old Kingdom of Ancient Egypt, indicate that poetry was composed with musical accompaniment, though details about these performances are sparse. Repetitions of rhythm and syllabic sound in ancient Egypt suggest that poetry could have been sung or chanted. At least a millennium later, around 2100 B.C.E., ancient Sumerian poetry, probably influenced by the Egyptian tradition, was composed in verse lines and recited orally as songs, sometimes sung with lyre or harp; Sumerian praise poetry in particular was sung by one or more voices, and was often accompanied by drums.

Ancient Greek choral poetry was accompanied by an aulos, a precursor to the flute. Epic poems were accompanied by a lute (a precursor of the guitar), and lyric poems by the kithara or lyre (a precursor of the harp), from which it derives its name. This close performative relationship between poetry and music remains throughout the Middle Ages (in the troubadour tradition), though during the Renaissance, poetry began to grow away from accompaniment, which is a relic of its oral roots, and began to be written for the page, to be read silently. As this happens, lyric poetry takes on greater metaphorical complexity, and becomes a site for deep internal reflection, rather than outward performance, though the practice of composing lyrics for instruments is still practiced widely today. Most scholars would distinguish, however, lyrics (written for music) from poetry (written for the page), despite the fact that in their geneses, they were one-and-the-same.

The histories and expressions of poetry and spirituality are deeply entwined; according to

Egyptologist John Lawrence Foster, ancient Egyptian poems were “almost exclusively religious. Ancient peoples seemed not to have atheism, agnosticism, or skepticism as options in the constellation of their beliefs.” Hymns to a creator God, to Aton and other gods, as well as poems that speak of the soul in relationship to the divine, can be found among the ancient relics of this time. In the twenty-first century B.C.E., for example we find:

The generations come and go among mankind, and
God, who knows all natures, still lies hidden.

....

The gone soul journeys on to whence it came.
(1–2, 8)

Ancient Sumerian poetry evidences similar spiritual themes, and expresses a power of the divine over the natural world, as in this fragment to the moon god Suen:

The Glory of Heaven has undone the halters of
those grazing cows, of that grazing herd.
(7,8)

In the Western tradition, poetry continued to explore the relationship between man and the divine, whether through Sappho’s fragments, Dante’s *Divine Comedy*, the sonnets of Petrarch, John Donne’s Holy Sonnets, or Hopkins “The Wreck of the Deutschland.” There are far too many examples to give anything near a comprehensive list; sufficed to say poets over many millennia have used poetry as a vehicle of exploration and communion with the divine.

Poetry is not at all, however, exclusively bound to spiritual themes. In ancient Greek verse, one site of contention for Aristotle was the idea that anything written in verse (or metered lines) was a poem: Indeed, medical, philosophical, “natural science,” or other didactic texts were often written in rhyme and meter. The Roman poet Catullus made himself very famous by writing bawdy, political poems. In the twentieth century, in particular, we find a shift from the regular consideration of spiritual themes to more secular content in poems. In the scope of the history of poetry, however, these poems constitute a mere fraction of a percent of what has been written. By and large, the history of poetry is bound very

closely with the history of humanity’s spiritual expressions, as well as its pre-Enlightenment scientific expressions. But poetry has always been one of humanity’s most cherished records of itself; it is, to quote Lamartine, “man himself, it is the instinct of all his ages, it is the internal echo of all his human impressions.”

Cross-References

- [Creative Writing](#)
- [Imagination](#)
- [Language and Literature, French](#)
- [Philosophy of Language](#)

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Policy

- [Ecological Psychology](#)

Political Ideology

- [Political Theory](#)

Political Philosophy

- [Political Theory](#)

Political Principles

► Political Theory

Political Science

► Ecclesiology

Political Theology, Theological Politics

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The concepts “political theology” and “theological politics” are controversial since they cannot be understood as value-neutral ways of forming ideal types of different ways of conceiving the relation between theology, faith, and politics. This chapter will concentrate on how these concepts can be understood in a Christian theological context.

There is of course a long tradition of thinking about the relation between Christian faith, theology, and politics within the Christian traditions. Theologians such as Augustine, Aquinas, John Calvin, or Martin Luther all formulated important contributions to Christian political thinking. In the twentieth century, the *Barmen Declaration* (1934) in Nazi Germany, opposing the Nazi influence in the church, can be seen as an important example of a political theological statement. Not least did Karl Barth contribute to the interpretation of the political consequences of Christian faith in Europe during the 1930s and 1940s (Rasmusson 1994).

The thoughts of Augustine, Luther, and Aquinas, the theologians of the radical reformation, or for that matter, eighteenth- and nineteenth-century liberal theology, all contain theological reflections on politics and the relation

between church and state. However, it is during the latter part of the twentieth century that “political theology” became a distinct concept (for an interesting analysis, see De Vries & Sullivan 2006).

Political Theology in the Twentieth and Twenty-First Centuries

According to the Swedish theologian Arne Rasmusson (1994), political theology can be understood as a way of theological thinking that developed among Protestant as well as Roman Catholic theologians from the 1960s onward in response to the challenges of modernity. Political theology in this sense might then be described as a Christian theological response to radical political movements that grew up in the 1960s and 1970s. The reforms of the Second Vatican council created a more open theological climate in the Roman Catholic Church, which also contributed to the growth of various versions of political theology. The meeting of the World Council of Churches in Uppsala in 1968 also contributed to the growing interest in political theology (Rasmusson 1994).

Political theologies hold in common that Christian faith in God cannot be politically neutral. God is radically taking sides with those who are oppressed. The methodology of political theology could therefore be described as a method of correlation. The political and social problems at hand are identified and analyzed and then put in relation to God’s liberating will. Political theology, thus understood, can be divided into several subgroups, among whom, Latin American liberation theologies; feminist theologies in the Northern and Southern hemispheres, respectively; gay and lesbian liberation theologies; ecotheologies; and various culturally (or ethnically) oriented liberation theologies (black theology, mujerista theology, Asian theology, etc.) are the most important. Some versions of queer theology might be labeled “political theology” while other forms of queer theology might better belong to what will be discussed as “theological politics” below. In a broad sense, much of modern political

theology is inspired by the methods and perspectives of Marxist critique of the modern capitalist society even if the Marxist or Socialist traits must not be exaggerated (Rasmusson 1994).

According to Rasmusson (1994), the theology of the German theologian Jürgen Moltmann (born 1926) naturally belongs to the type of theology that can be labeled “political theology,” as does the theology of the Roman Catholic theologian Johann Baptist Metz (born 1928). Both Metz’s and Moltmann’s theologies are written against the background of the terrible history of Europe during the twentieth century. Not least are the atrocities of the Second World War and the decisive role that Germany played in that history an important background to their theological thinking. At the same time, theology should be a theology of hope (Rasmusson 1994).

The “classical” text of Latin American liberation theology is Gustavo Gutiérrez’ book *Teología de la liberación* (A Theology of Liberation), published in Spanish in 1971. Gutiérrez argues that theology must take its starting point in the situation of the poor, since “poverty is an evil and therefore incompatible with the Kingdom of God” (Gutiérrez 1974). This does not mean that Gutiérrez questions the universality of God’s love. But he does not perceive God as a politically neutral God. Not least has theology to be seen as praxis – growing from the communities of the poor – rather as mainly an academic discipline.

Latin American liberation theology has had a vast influence on theological thinking and practice through theologians such as Gutiérrez, Leonardo Boff, Ivone Gebara, Juan Luis Segundo, or Jon Sobrino. It has also inspired other forms of liberation theology such as Asian theology and black theology.

Feminist theologies can be understood as an especially influential form of liberation theology. In her classical work *Sexism and God-talk* (1983), Rosemary Radford Ruether states that “the critical principle of feminist theology is the promotion of the full humanity of women. Whatever denies, diminishes, or distorts the full humanity of women is, therefore, appraised as not redemptive.” (Ruether 1983) Feminist theologies

criticize the apparent sexism and male bias in theology and society and want to formulate theological visions that are liberating for both men and women. This has been – and is – done along many different lines. Some feminist theologians/theologians such as Daphne Hampson or Mary Daly have concluded that Christian faith is beyond redemption and argued that it is impossible to be both a Christian and a feminist. Other feminist theologians have remained within a Christian context. Elisabeth Schüssler Fiorenza’s extremely influential book *In Memory of Her* (1983) argued that women had a much more central role in early Christianity than in the later church. Schüssler Fiorenza and Radford Ruether’s pioneering work in feminist theology has led to a rich theological tradition within Christian theology.

At present, the future development of Christian feminist theology seems to be at a crossroad. On one hand, feminist theologies’ critical perspectives on androcentric theological and ecclesiastical traditions are of continuing relevance. The need for the development of constructive alternatives to patriarchal theological thinking is still very much present in the theological debate. On the other hand, earlier versions of Christian feminist theology have been criticized for not paying enough attention to contextual differences. Feminist theologians of the South often point out that Northern feminist theology is embedded in a Western liberal discourse which cannot easily be applied to the situation of women and men in the South (Althaus-Reid 2004). Important feminist theologians in this tradition are, for example, Chung Hyun Kyung, Kwok Pui-Lan, and Rita Nakashima Brock. Jacquelyn Grant’s book *White Women’s Christ and Black Women’s Jesus: Feminist Christology and Womanist Response* (1989) is an influential example of black women’s theology, which, as is evident from the title, is often labeled *womanist* in a certain distinction from the concept “feminist.”

A relatively new theological stream is the various forms of ► [queer theology](#). Queer theology should not too easily be associated with gay and lesbian theologies, being forms of liberation

theology aiming at the liberation of gay and lesbian people. Queer theology can, of course, in many ways be seen as a liberationist theological project, striving toward a way of doing theology that does not reproduce heteronormative patterns in Christian theology. But queer theology shares the critique of queer theory in general in the understanding of *sexual identity* in both feminist theology and gay and lesbian theologies. An important contribution to this field is Gerard Loughlin's (ed) *Queer Theology. Rethinking the Western Body* (2007).

Theological Politics

Theological politics can, methodologically, be understood as something of an opposite to political theology. This observation should not, however, be interpreted as saying that *theological politics* in its actual way of doing *politics* is less radical. But it starts from another angle and often out of a critical stance toward political theology.

Political theology can – even if this is a simplification – be understood as a theology of correlation. It tries to relate the Christian traditions to a contemporary political situation, which is analyzed not least through various social scientific or philosophical perspectives. One example could be early liberation theology's use of concepts and theories borrowed from Marxist social science (Rasmussen 1994).

Advocates of *theological politics* often criticize political theology for accepting the conditions of a secular or even secularist culture and argue that Christian faith in itself contains a different social theory and political practice. There is, to borrow an expression coined by the Swedish theologian Arne Rasmussen in his book *The Church as Polis* (1994), an “ecclesial theological politics” that has its distinct traits.

One of the most influential theoretical works in this tradition is John Milbank's *Theology and Social Theory – Beyond Secular Reason* (1990) where it is argued that modern social theory, whether in Weberian, Marxist, or any other “► [secular](#)” tradition, is inherently secularist. Theology, therefore, should not try to make

use of secular social theory. Instead, Christian faith has a comprehensive view of society stemming from its own sources. There is no good reason, so it is argued, for Christian thinking to capitulate to secular reason (Milbank 1990). Milbank's book has become one of the important pillars for the theological movement named *radical orthodoxy*.

As with political theology, *theological politics* cannot be pinned down to just one way of doing theology. It is rather an umbrella concept which can be used for such different theological perspectives as those of Stanley Hauerwas, John Milbank, Graham Ward, and Catherine Pickstock. Its common core is the critique of Western liberal and secular thought and of those theologies which are perceived as accepting or even embracing secular theory as an important instrument for theology.

Christian Realism

Another perspective on the relation between Christianity, theology, and politics can be said to be offered by what is sometimes called *Christian realism*. This view would argue that although Christian faith and the Christian church cannot be politically neutral, it is nevertheless not the task of the church to be active in day-to-day political struggles and activities. *Christian realism* has been closely connected with what has been called the “method of middle axioms,” the principles of which was laid out by e.g., Josef H. Oldham in his and Visser't Hooft's book *The Church and Its Function in Society* (1937). Other advocates of Christian realism are theologians such as Reinhold Niebuhr, William Temple, and Ronald Preston. According to Christian realism, Christian faith contains some basic ethical values and beliefs of quite a general kind, as, for example, the command to love one's neighbor. Ethical ideas of such a general nature are not, however, possible to use as practical guidelines for politics. The task of theology in relation to politics is to reflect on these core values of Christian faith and to formulate “middle axioms” – i.e., standpoints based in central Christian values that can be used

as moral guides in political action. Most advocates of Christian realism, however, make a distinction between middle axioms and standpoints in day-to-day politics (Kamergrauzis 2001).

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- government, individuals, and/or groups. Where political science predominately studies the political processes, structures, and institutions, political theory studies the normative principles that define, inform, guide, and establish the relationships between persons and society, and the government. Political theory explores and advances what political relationships ought, and ought not, be.

Understanding political theory begins with defining “government.” Fundamentally, government is the systematic use of force within a defined geographic area to control (to varying degrees) human behavior. The government is essentially power, coercive power. Political science explores and describes the government’s use of that coercive power. Political theory, however, seeks to understand the purposes, reasons, and justifications that explain and perhaps legitimize, the government’s use of that power. Political theory seeks to elucidate and illuminate the moral or normative underpinnings of the government’s exercise of coercive power (Weber 1918; See also Janda et al. 2009).

To what end should this coercive power be used? Political theory sets out three general purposes for the government’s use of power. First, government should protect life and property. This is the oldest purpose of government. The military, and police and fire departments are examples of how government protects life and property. Second, government can also use its power to provide for the public good and general welfare. This can be seen in the government’s establishment of schools, parks, and health clinics to name a few. Finally, government may be used to promote and advance equality. This is a more modern conception of governmental purpose. This purpose can be seen in laws and constitutional interpretations that end discriminatory practices, laws that enable minority programs, and laws that provide equal opportunity of advancement and/or equal social and economic outcomes. These three purposes can stand alone or be combined in various measures depending on how society chooses to prioritize and advance underlying fundamental and core values (Janda et al. 2009).

Political Theory

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Related Terms

[Justice theory](#); [Political ideology](#); [Political philosophy](#); [Political principles](#); [Political values](#); [Theories of governing](#); [Theories of government](#)

Description

Political theory is political philosophy. Political theory is about defining the fundamental bases of political relationships between the

Political theory mobilizes five essential concepts in describing the political “ought to be.” The first three essential concepts are freedom, order, and equality. Defining and prioritizing these core concepts make up the fundamental debates of political theory. ► [Freedom](#) can have many definitions. The more common understanding of freedom is the absence of governmental restraints or interference. This type of freedom is commonly seen in the American Bill of Rights and similar type Constitutions and governing documents elsewhere. These are, for example, the freedom of speech and freedom of religion concepts. Freedom can also be defined as the ability to do, or means to actually accomplish, something. This definition of freedom looks at, for example, whether one is really free to go to college or to the beach when the means are not available to actually get there. This type of freedom (effective freedom), however, is perhaps better viewed as an equality issue, which is discussed below.

The second core concept that political theory seeks to define is order. Order typically has two definitions: First, order is defined as the government’s police powers. The police power is the government’s ability to use force or coercive power. This is the idea that government should protect life and protect property. For example, the government arresting, prosecuting, and imprisoning persons for breaches of criminal codes is the type of order associated with police powers. Second, order can be seen in a society’s historical associations and traditions. Long-standing social norms and traditions also contribute to order. Such traditions may be, for instance, how marriage is defined.

The third core concept that political theory engages is equality. ► [Equality](#) is defined essentially in four ways: equality of opportunity, equality of outcome, social equality, and political equality. Equality of opportunity is defined as everyone having the same chance at a desired outcome, not that such desired outcome will occur in reality. Equality of outcome, however, ensures that a desired result or outcome actually occurs. For example, determining school admission on random selection of a limited number of

students from an eligible group is a type of equality of opportunity. Predetermining and guaranteeing that a particular student body will have certain demographics is equality of outcome. Social equality seeks to provide consistency and sameness in the distribution of wealth, property, education, and other resources. Political equality is typically understood as no one individual having greater influence or control over the government and its ultimate use of power. Allowing one person to have and exercise one vote is a form of political equality (For a good discussion of freedom, order and equality, see Janda et al. [2009](#)).

Political theory further includes explanations of how persons, either individually or as groups, interact with the government. The interaction between government and persons or society may be described in three basic forms. First, interaction and participation may be based upon an individual’s sole efforts. Second, participation and decision-making on a simple majority basis is defined as majoritarianism. That is, fifty percent plus one of eligible participants (usually voters) decides how the government ultimately defines and prioritizes the core concepts of freedom, order, and equality. Finally, interaction with the government may be based on interest group or small group participation. This model of interaction, as described by Robert Dahl, is called pluralism (Dahl [1967](#)).

While political theory was historically seen as a linear (left/right) progression across the political spectrum, contemporary political thought views political theory as a multidimensional amalgam of core values and concepts. Deciding which values are fundamental and core, however, is the work of political theorists proposing, discerning, and defining the fundamental values. Political theorists provide the formulations of how such defined values ought to be combined together, in what amounts and importance, and for what end purposes. Political theorist, both historical and contemporary, struggle with whether there is a fundamental and core value upon which all theories can be built. Political theory continually searches for a universally agreed upon axiom which can forever serve as

the starting point for creating a political philosophy, expounding a theory of justice, and building a political system. To date, such political axiom remains elusive.

Contemporary debates in political theory begin with John Rawls and his 1971 publication *A Theory of Justice* and his 2001 book *Justice as Fairness: A Restatement*. Rawls ushered in the contemporary political theory debate with this book *A Theory of Justice*. In that work, and the later restatement, Rawls sought to create a defense for a political theory that hinges on a unique combination of freedom and equality. The conceptualization of freedom and equality, for Rawls, is derived from the social contract theory of John Locke. Rawls's social contract, however, is developed out of a hypothetical discussion among society's members who have been deprived of knowing who they are, what attributes (physical and mental) they possess, their ultimate social status, and the like. The members creating the social contract, those in the "original position," would develop and agree upon a political system while under this "veil of ignorance."

For Rawls, crafting a political theory and system while secluded behind a "veil of ignorance" would result in a just society and social contract, with justice defined as both freedom and equality. The freedom (or liberty) and equality that arise from Rawls's hypothetical original position means that each person has "an equal right to the most extensive total system of equal basic liberties..." and any social and economic inequalities are to be arranged for the greatest benefit of the least advantaged allowing for fair and equal opportunity for all (Rawls 2001; see also Wolff 2006). The resulting society would be a just society, according to Rawls, if freedom were equally held and any other inequalities (economic for example) would only be accepted if such inequalities make everyone better off. Under Rawls's political theory, inequalities in economic opportunities would be tolerated only if society's worst off were improved, and not further disadvantaged, as a result of any occurring inequality (Rawls 2001; see also Wolff 2006). Rawls's political theory envisions

a prioritization and blend of freedom and equality. In the end, Rawls's society developed from the "original position" and behind a "veil of ignorance" could only rationally result in a political and government structure, in which the members opt for maximum freedom bounded by equality.

Robert Nozick continued the contemporary discussion, and replied to Rawls, with his 1974 work *Anarchy, State, and Utopia*. Unlike the Rawls's conception of justice wherein society's members agree to what is fair ahead of knowing crucial circumstances, Nozick advances a political theory that holds proper political associations and government arise only by respecting the right to own one's self. Owning one's self includes owning, utilizing, and disposing of all physical and mental attributes and talents associated with each individual self. In addition to owning one's self, Nozick argues that individuals own legitimately held and acquired property (Nozick 1974). Moreover, and in contrast to Rawls, Nozick argues that one should be free (uninterfered with) to dispose of said talents, attributes, and property as one chooses. The government that evolves under these conditions is concerned with protecting the individual's right to property and right to dispose of said property as one chooses. Unlike government established through Rawls's original position, Nozick's government evolves from the overriding desire to protect individual talents and attributes and to preserve private property rights that arise there from. Where Rawls's theory of justice results in redistributive government activity, Nozick's theory of justice confines the government to protect persons and property from unwanted intrusion and redistributions.

Rawls and Nozick rekindled contemporary debates in political theory. Since that time political theory has been reconceptualized in a multitude of contemporary offerings. Four contemporary areas generating discussion in political theory are multiculturalism, communitarianism, feminism, and ecologism. These are by no means the only areas generating contemporary discussions. They are areas, however, that garner a good deal of attention.

► **Multiculturalism** defines political relationships through group and community identity. Multicultural theory expresses itself in terms of equality of social differences and freedom within social traditions, orders, and contexts (Hoffman and Graham 2009:365). The earlier course of multiculturalism centered on whether justice was served by providing color (or gender or disability)-blind rules. It was thought that minority groups could attain equality by creating a political process that ignores differences of the diverse minorities. That understanding of multiculturalism was criticized because it maintained the status quo. While multiculturalism as “difference-blind” may not increase inequality or injustice, it perpetuates pre-existing political disabilities historically imposed on minorities. The use of difference-blind rules failed to correct the already existing forms of injustice and discrimination; difference-blind rules in the end maintained the pre-existing political inequalities in the form of facial neutral decisions, policies, and laws (Kymlicka 2002:365).

Multiculturalism now understands that strictly adhering to “difference-blind” rules perpetuates systemic disadvantages and inequalities for the minority groups (Kymlicka 2002). Contemporary multiculturalism seeks to correct inequalities on a more case-by-case basis. In some instances it may benefit a minority group by having “difference-blind” rules. However, historical and modern day inequalities may be better remedied by a system in which differences are acknowledged and inequities are directly addressed by rules specifically crafted with the differences in mind (Kymlicka 2002:366). Contemporary multiculturalism avoids institutionalizing political inequality by crafting political systems, rules, and laws that openly acknowledge and consider minority differences, rather than ignoring them.

Communitarianism is a theory in which society’s conception of what is “good” or what “ought to be” takes priority over individual desires to the contrary. Traditional western political theory orders society and political relationships around the concept of self-determination and individual autonomy. Communitarianism, however, offers an alternative to that traditional

view. Communitarianism asserts that an individual’s political rights should be abandoned (or at least subjugated) in favor of communal politics. That is, the community’s conception of the “common good” should be advanced and applied over individual conceptions of the “good” to the contrary (Kymlicka 2002:212).

Communitarians doubt the quality and usefulness of individualism (or using individual decision-making as the basis for political thought and action) because individuals, acting as such, often fail to make good choices. In fact, many choices made or allowed on the basis of self-determination are actually harmful to the person making the choice. For example, individuals engage in many forms of risky behavior that negatively impact the individual and the community. Such risky behavior can include such things as using illicit drugs or even opting to buy things other than basic health insurance. In order to prevent the harmful effects of bad individual decisions and to enable beneficial decision-making, communitarians place community standards of the common good over individual desires and bad choices (Kymlicka 2002:212).

Feminism generally encompasses efforts to eliminate the factors that assign lesser social and political roles to women and/or make women conform to subordinate roles within society (Kymlicka 2002:377). Beyond the basic definition, however, feminist theory is abundantly diverse. There are two schools of thought that freedom and equality are conceptualization in feminist political theory.

Feminism as equality focuses on women obtaining equal status as men in society, particularly in the work place. Equal access is a traditional argument of feminism. It is an argument based on the principle of equal opportunity. That is, women should be able to enter into the roles and fields historically dominated by man. Gender, it is argued, should not be used to discriminate against women who wish to pursue traditionally male-defined roles (Kymlicka 2002:382–383).

Feminism as freedom focuses on empowering women to create female-defined, or gender-neutral, roles in society. This form of feminism

seeks freedom or autonomy for women. Being allowed to enter male-dominated roles as equals with men is different from the autonomy (or freedom) to reject the society's norms and standards that place women in subordinate roles (Kymlicka 2002:384). Moreover, women should not only be free to reject historical standards and norms but also be empowered to create, define, and establish norms and standards for themselves.

Ecologism defines itself as a political theory in which nature and all things within the natural world are inseparably interconnected and equally worthy as human beings in all moral and political considerations. Ecologism as a political theory is distinguishable from environmentalism. Environmentalism, as a political concern, typically finds itself attached to other ideologies. Environmentalism sees nature's value tied to human needs and concerns. For environmentalism, how the environment is subordinated to human concerns is largely dependent on the position of other ideologies (Hoffman and Graham 2009:364). Ecologism, however, is not human-centered.

Ecologism asserts that nature holds value independent of human beings. The focus of ecologism is nature itself. Human beings are one part, but not the superior part, of a wholly interconnected natural world. Ecologism reverses the traditional view of human dominance over nature by asserting that human life only has value within the natural world's interconnected web of all things, animate and inanimate alike (Hoffman and Graham 2009:364). Sometimes this is referred to as "deep ecology" to distinguish the political from the scientific field of ecology (Dobson 2007).

Both ecologism and environmentalism significantly contribute to the political debate about man-made global climate change and global warming. They differ, however, in the approach society should take to combat the effects of man-made global warming, pollution, and/or global climate change. Where environmentalism seeks to incorporate itself into other existing political ideologies, ecologism stands alone in its belief that nature requires equal moral consideration to humans.

These four particular theories represent contemporary examples of the various conceptualizations occurring in the field of political theory. Many others exist. While these contemporary theories tend to focus on group identities or community classifications, there remains a branch of theory devoted to maintaining, explaining, and developing the theories of individualism, autonomy, and self-determination. Such theories can be read and explored through the works of notable authors as John Stuart Mill, Friederich Hayek, Ayn Rand, and Robert Nozick, to name a few.

Self-identification

Science

Political theory is political philosophy. Political theory is about defining the fundamental bases of political relationships between the government and individuals and/or groups. Where political science predominately studies the political processes, structures, and institutions, political theory studies the underlying and normative principles that define, inform, guide, and even establish the relationships between persons and society, and the government. Political theory does not seek to empirically describe or test (in a social science if manner) political relationships; political theory explores and advances what such relationships ought, and ought not, be. Political theory is about philosophical discourse and not about scientific methodology. However, advancements in science and technology can inform political discussions. For example, privacy rights are redefined in the digital age, and abortion/right to life claims are challenged as technology and medical advancements now allow for nearly indeterminate storage of fertilized human embryos.

Religion

A religious doctrine can form a basis on which a political theory is built. Political theory (and the political systems that flow there from) can be directly influenced by theological premises. Political theory can be expressed in terms of, and justified by, the same sources as theological

positions. That is, religion and political theory can be based upon both Holy Scripture and divine revelation.

There are many ways in which the major religions of Judaism, Christianity, and Islam (and perhaps minority religions as well), inform political theory (Strauss and Cropsey 1987:318–319). Political theory is informed and impacted by religion through divine revelations and scriptures. Political theory and religion wrestle with the relationship between natural, positive, and divine law, church and state relations, and the duties and obligations of citizens, subjects and rulers, just to name a few areas (Strauss and Cropsey 1987:319).

For Judaism, political philosophy is derived from the interpretation of the Torah and the Talmudic writings. The political outgrowth of Judaic Biblical interpretation assumed a legalistic form. Interpretation of divine revelation provided direction, order, and regulation for government and society.

Judaic thought is not the only place where religion directly informs political theories and systems. A venerated Islamic political and religious philosopher, Alfarabi (870–950), worked to harmonize the political thought with Islam. The Quran contains divine law as revealed through the prophet Muhammad. The Quran, in combination with other religious writings, provides the bases for Islamic law or Shari'a. The Shari'a serves as a means of applying divine law to followers in many areas of daily life including politics.

Judaism and Islamism incorporated divine revelation into nearly all inclusive laws and political order that dominate and regulate all aspects of life, public and private (Strauss and Cropsey 1987c). Christianity, on the other hand, did not. While Judaism and Islam applied and adapted divinely revealed laws into social and political order, Christianity sought to separate and distinguish the earthly from the divine. Christianity did not come as a divine source of comprehensive set of laws and societal regulations. Rather, Christianity came as a fundamental belief system that left believers largely at liberty to organize their political and social lives around principles

that are not necessarily religious (Strauss and Cropsey 1987c). Christianity, however, has been used through history to justify various political ends. Christianity has been used to establish political authority, question authority, engage in war, justify slavery, and advance freedom and civil rights. The Church's canonical laws also provided a fundamental framework for western law (See generally: Berman 1983, 2006).

Political theory can be informed by religion, but political theory usually is not identical to religion. In some instances, political theory and religion are inextricably linked. While political theory typically does not self-identify as religion, political theory can be directly and indirectly influenced, informed, and even justified by religion.

Characteristics

Political theory is distinctive from other philosophical studies in that political theory focuses on relationships between the government, individuals, communities, and/or groups. Moreover, political theory, unlike general philosophical studies, explores and advances what political relationships and political systems ought to be.

Relevance to Science and Religion

Political theory is interested in the scholarly area called "Science and Religion" to the extent that political theories intersect and frequently collide with religion. There are essentially three models by which political theory and the law address religion's role in society. First, religion and political theory can be one and the same. Second, the political theory can allow religious participation, and governments can make a variety of accommodations for religion in the public sphere. Finally, the political theory can be used to exclude religion entirely from the public and political sphere.

The first example of the political theory and religion combining to be essentially the same is found in countries such as Iran and Afghanistan

(before 2001). In Iran, following the 1979 Islamic Revolution, the Ayatollah Khomeini ushered in an Islamic state that replaced the ruling monarch with a theocracy. This Iranian theocracy based its laws, and in particular its criminal codes, on Islamic religious law. In Afghanistan prior to 2001 the Taliban did much the same. The Taliban established an Islamic state based upon the strict use and interpretation of Islamic religious laws. These countries (and 10 others) demonstrate the merger of and fusion between political theory and religion.

The second example of political theory and religion interacting are countries that enforce purely secular laws, but nonetheless establish a state religion. Here there is an incomplete fusion of religion and political theory. England is one such example. In 1689, the Church of England was firmly established and granted a variety of legal and political privileges. The head of this State established religion is the ruling monarch (currently Queen Elizabeth II) who holds the title of Supreme Governor of the Church of England. There are 60 such states in the world where a church is officially sanctioned by the government (Kuru 2009). While England and other numerous other countries maintain a governmentally sanctioned church, there is an incomplete fusion between church doctrine and political theory.

An additional example of political theory and religion interacting is in the United States. The United States, like England, enforces purely secular law. Unlike England, however, the U.S. does not maintain a state-sanctioned or official church. In the United States, political theory and law allow various amounts of religion in the public realm. The amount of influence and participation religion has in the public sphere in the United States is often in flux. Typically the debate centers on three political theories of what religion's role ought to be.

To begin with, religion is addressed in the Bill of Rights (the first 10 Amendments) of United States Constitution. The First Amendment was ratified in 1791 and addresses religion in two ways: It allows for the free exercise of religion and prohibits the governmental establishment of

religion. The Amendment specifically states in pertinent part "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances." (U.S. Constitution, First Amendment, ratified December 15, 1791). That Clause meant different things to the American founding fathers. While the separation between government and the religion was thought to be advantageous to both, there was no single compelling and unifying purpose found among the founding fathers (Chemerinsky 2006:318–319). Justice Brennan once stated that "The historical record is at best ambiguous, and statements can readily be found to support either side of the proposition" (*Abington School District v. Schempp*, 374 U.S. 203, 237 (1963); Brennan, J., concurring; Chemerinsky 2006:318–319). History shows that at least three main views were held by the American Founding Fathers at the time the First Amendment was written. Professor Laurence Tribe summarized them as follows:

At least three distinct schools of thought... influenced the drafters of the Bill of Rights: first, the evangelical view (associated with Roger Williams) that "worldly corruptions... might consume the churches if sturdy fences against the wilderness were not maintain"; second, the Jeffersonian view that the church should be walled off from the state in order to safeguard secular interest (public and private) "against ecclesiastical depredations and incursions"; and, third, the Madisonian view that religious and secular interests alike would be advanced best by diffusing the decentralizing power so as to assure competition among sects rather than dominance by any one (Laurance 1988; Chemerinsky 2006:1184).

Without a clear, unified history as to what the Establishment means, the courts are left to fashion an analysis often as cases arise. The Establishment Clause's meaning in the twenty-first century, and more importantly how to determine violations, depends on how the Supreme Court approaches the issue presented.

U.S. Supreme Court decisions suggest three competing approaches in analyzing

Establishment Clause issues. The approaches are a strict separation analysis, an accommodation approach, and a neutrality theory. Adherents to a strict separation approach assert government and religion should disassociate from each other to the greatest extent possible. That is, government should be exclusively secular and that religion should be relegated and confined to private society (Chemerinsky 2006:1193). The strict separation approach adopts the Jeffersonian view that there should be a “wall of separation between Church & State” (Thomas Jefferson 2010, Letter to Messrs. Nehemiah Dodge, January 1, 1802; Chemerinsky 2006:1193). However, that has not always nor completely happened.

The accommodation approach to church/state relations maintains that “Government should accommodate religion by treating it the same as nonreligious beliefs... the government violates the establishment clause only if it establishes a church, coerces religious participation, or favors some religions over others” (Chemerinsky 2006:1197). The accommodation approach essentially advocates that religion should not suffer any disability in the public realm. Rather, religion should play a role equal to any other belief. Anything short of the government formally declaring a state religion, according to those advocating the accommodation approach, is acceptable (Chemerinsky 2006:1198; see also McConnell 1985).

The last approach within the Establishment Clause rubric is the neutrality approach. The neutrality approach essentially requires governmental action be neutral toward religion. Government cannot favor religion over the secular and cannot favor one religion over another (Chemerinsky 2006:1198). In analyzing whether government action is religiously “neutral,” the Court adopts a two-step analysis. First, determining whether government action is neutral toward and among religions, the Court looks first to whether the law facially differentiates among religions. If there is a facially apparent differentiation, then an Establishment Clause violation is found and the Court does not need to move to the second test (*Hernandez v. Commissioner* 490 U.S. 680 1989). If there is no facially apparent

differentiation, then the Court, when useful, turns to a traditional balancing test (*Lemon v. Kurtzman* 403 U.S. 602 1971).

The balancing test looks to whether the law at issue has a secular purpose, whether religion is advanced or inhibited, and whether the government and religion will become excessively entangled (*Lemon*, 403, at 612). This balancing test, however, is not the exclusive means by which the U.S. Supreme Court analyzes Establishment Clause issues. There have been a number of instances where Establishment Clause claims have been decided without this balancing test (Chemerinsky 2006:1202. Chemerinsky cites *Board of Education of Kiryas Joel Village School District v. Grumet*, 512 U.S. 687 (1994); *Lynch v. Donnelly*, 465 U.S. 668 (1984), and *Marsh v. Chambers*, 463 U.S. 783 1983).

There is no governmentally established church within United States. However, political theory, law, and religion play a dynamic role within the country. Generally, religion plays a part (and sometimes a large part) in the political discussions. How the government, and more specifically the Court, handles religion’s entrance into the public sphere varies from mandating a strict separation, to being neutral, to allowing full acknowledgement of religion short of formal establishment. Interestingly, religion in the United States plays an active role in molding contemporary political debates, but unlike England there is no officially sanctioned church.

The third example of political theory and religion encountering one another is where the government specifically excludes religion from the public and governmental realm. France is a contemporary example. France is a purposeful secular state. In fact, its Constitution declares France to be a “secular republic.” (Kuru 2009:4) Unlike the United States, France does not allow religious symbols in schools and has even banned the wearing of Muslim head scarves in school. Moreover, excluded from French political spheres are ceremonial acknowledgments of religion such as “In God We Trust” as found on U.S. currency as well as oaths of office which end with “So help me God” (Kuru 2009:8–9). France is an aggressively secular nation wherein

religion and political theory remain purposefully apart (Kuru 2009:8–9).

These are three examples by which religion and political theory interact. The first is a nearly complete fusion between the two. These are countries such as Iran and also Afghanistan while under the Taliban. The second is where religion plays a role in the public sphere, but that role is limited to varying degrees. The Church of England and the First Amendment to the U.S. Constitution provide the spectrum of how religion's role is incorporated into the governing political theory. The final example, as seen in France, excludes religion from the public and governmental realm. While these three examples show the basic combinations of political theory and religion, other variations exist.

Sources of Authority

The writings of political philosophers comprise the authoritative sources of political theory. The political philosophers noted below were leaders in the field and contributed in ways that not only changed the way people and government thought about political philosophy but changed the entire discipline in ways still felt today. Such philosophers and political theorists include the ancient Greeks with the unmatched writings of Plato (427–347 B.C.) and Aristotle (384–322 B.C.). The subsequent Islamic political writings of Alfarabi (870–950), which leaned heavily on Plato, and the work of St. Thomas Aquinas (1225–1274), who incorporated Aristotle into western Christian thought, contributed mightily to the area of religion and political philosophy. Later writings of the sixteenth and seventeenth centuries include many noted philosophers such as Niccolo Machiavelli (1469–1527), Martin Luther (1483–1546), Thomas Hobbs (1588–1679), Rene Descartes (1596–165), John Locke (1632–1704), and Benedict Spinoza (1632–1677). The prominent eighteenth-century political philosophers include Jean-Jacques Rousseau (1712–1778), David Hume (1711–1776), Edmund Burke (1729–1797), and Immanuel Kant (1724–1804). The nineteenth

century produced the works of Alexis Tocqueville (1805–1859), John Stuart Mill (1806–1873), Karl Marx (1818–1883), Friedrich Nietzsche (1844–1900), Max Weber (1864–1920), and Edmund Husserl (1859–1938). The twentieth century brought us the notable works of Friederich Hayek (1899–1992), John Rawls (1921–2002), Robert Nozick (1938–2002), and Michel Foucault (1926–1984). The political theorists in the twenty-first century will be equally prolific and will no doubt address the challenges in political theory and philosophy that await them.

Ethical Principles

The ethical principles within political theory center on what the government or State ought to do (or not do). There are three basic principles that guide government action or are considered (but not without controversy) proper government functions. The first, and the oldest, is that the government should protect life and property. Second, the government should provide for the public good and general welfare. Finally, the government should promote equality.

Key Values

A key value in political theory is “Justice.” The expectation is that the State should act “justly” or “do the right thing.” Defining expectations about how government should act depends on how one defines “justice.” For the government to use its coercive power, it must be somehow be “justified” in doing so. Defining what counts as justification is the primary role of political theory.

Political theory looks to conceptions of “justice” in terms of what people (individuals, groups, or society as a whole) expect from each other and from the government. Such expectations lead to identifying the duties individuals or people have in relation to one another and with the government. And, perhaps more important for political theory, is defining when the government should use its coercive powers to enforce the accepted form of “justice.” The conception of

justice depends on how one, from a political theory perspective, defines and prioritizes the core concepts discussed above.

Another key value is "Fairness." One expects the political systems that arise out of the debates and struggles with the core political concepts to render a system that people believe to be acceptable and one that acts in a fair manner. How one defines fairness comes from how one defines and prioritizes the core concepts of freedom, order, and equality. Of course, fairness may be defined differently in a democracy, a theocracy, or under an authoritarian regime.

Conceptualization

Nature/World

"State of nature" as defined by Hobbes is a position of fear, danger, and war where life would be "solitary, poor, nasty, brutish, and short." Nature, for Locke, is state of perfect freedom and equality tempered only by natural, physical laws.

Human beings

Persons, people.

Life

Life's meaning differs depending on what, when, or at what stage something living is given rights or is otherwise protected.

Reality

Objective natural existence or the total aggregate of phenomena.

Knowledge

Information or awareness acquired, discovered, or held either through the use of reason and through experience or received by revelation.

Truth

Comporting to reality.

Perception

To gain knowledge or become aware through use of the senses.

Time

(Normal dictionary definitions apply)

Consciousness

(Normal dictionary definitions apply)

Rationality/Reason

The way the brain/mind identifies and utilizes experiences to acquire knowledge. Means by which choices are made. Balancing of possible outcomes.

Mystery

(Normal dictionary definitions apply)

Relevant Themes

There are two issues especially relevant to contemporary discussions in political theory and religion. Those issues are religious fundamentalism and the emergence of new minority religions (NMRs). Recall that political theory explores and advances what society's political relationships ought to be. Political theory is distinct from religion, but religion does inform and may guide political relationships.

Religious fundamentalism is defined as an effort by some religious believers to return to and preserve their distinct religious identity, which is threatened by a contemporary and more secularized era (Hoffman and Graham 2009:389). The attempt to return to a philosophical time before modernity may significantly impact political theory when fundamentalists become social and political activists. Moreover, religious fundamentalism is often advanced by a small group of believers. The political model based upon majoritarian participation and democracy is typically eschewed by fundamentalist. The political model based on pluralistic participation is also avoided in that competing interest groups are disallowed. The reason for rejecting the typical models of political participation is that fundamentalist reject the idea of debate and political discussion. Fundamentalists, having already decided what ought to be, reject out of hand different points of view.

In rejecting such dialogue, fundamentalists champion their cause in a more aggressive, dogmatic, and all too frequent violent manner (Hoffman and Graham 2009:390, 392). In avoiding accepted models of political participation, rejecting debate and dialogue, and often resorting to violence, fundamentalists challenge contemporary notions of political theory. That is, fundamentalists reprioritize the modern rankings of freedom, order, and equality and reject contemporary political discussions of what “ought to be.”

New minority religions (NMRs) challenge traditional order, norms, and political relationships within a society. NMRs challenge traditional values and separate themselves from dominant religions in society. In doing so, NMRs also challenge the historical hegemony of the dominant church(s) and strain relations with secular governmental entities. While NMRs find it difficult to develop followings in culturally homogenous countries, they do exist. For example, China has been challenged by the presence of the Falun Gong and Japan endured the deadly attacks by Aum Shinrikyo. Some former Communist block countries such as Uzbekistan and Turkmenistan are challenged by various Muslim groups. In China, and other places, the NMRs are not tolerated and are even declared terrorist organizations. Whether any particular NMR is or is not a terrorist organization is beyond the scope here. However, connecting NMRs with terrorism allows for greater control over emerging and minority religious groups. Such characterization of the minority religion also places greater traditional political order over religious freedom generally (See generally: Richardson 1999, 2007). While not all NMRs are labeled terrorist organization, NMRs are routinely referred to as “cults” or “sects,” which carry a rather negative, if not scary, connotation. New minority religions, whether violent or just different, stand in opposition to the traditional political order. In doing so, new minority religions find themselves often struggling for political freedoms and asking for social tolerance. Whether NMRs obtain political freedoms or are accepted within a society

depends on how each particular society realizes its underlying political theory (see generally: Richardson 2006).

Cross-References

- [Biblical Studies](#)
- [Christianity](#)
- [Islam: An Overview](#)
- [Judaic Studies](#)
- [Justice \(Philosophically\)](#)
- [Political Theology, Theological Politics](#)

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Political Values

► Political Theory

Politics of Sexuality

► Sex and Gender

Polytheism

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The notion *polytheia* was first used by Philo with regard to ancient non-Jewish religions (De mut. nom. 205). *Polytheos* meant in Aeschylus that one altar is consecrated to many gods. Polytheism more generally means agency of many personal gods (Detienne, Gladigow), and it is conventional to speak about representations of those gods within the framework of polytheistic systems, god being the autonomic nonhuman subject (Gladigow 1998). The ensemble of those deities makes up *pantheon* (“all gods” in translation from Greek, *pantheia* in the plural). It is only theologically that one can speak of the idea or notion of god, but only a few polytheistic religions have elaborated theologies using those terms.

Egyptian (with the exception of Akhenaton’s theology), Sumerian, Babylonian, Canaanite, Greek, Roman, Hinduism, Minoan, Eblaite, Etruscan, Iranian, Celtic, Baltic and Slavic, German, Mesoamerican, and Shinto religion might be referred to as polytheistic theologies. Many religions combine monotheistic (see ► [Monotheism](#)) and polytheistic traits and can be discussed in either context. What is most actively debated is the dynamics of these two orientations which is made difficult by insufficient theologization of polytheistic systems. The use of the notion polytheism is heavily affected by the way polytheism and idolatry, paganism, and superstition are seen in Protestantism. Even the ongoing debate on the legitimacy of scholarship on polytheism bears traces of a revived ancient battle between Greek polytheists and Jewish Christian monotheists (for example, Detienne) (Detienne 1986). According to the thesis of original monotheism (Ur-Monotheismus thesis, W. Schmidt, see ► [Monotheism](#)), polytheism is a phenomenon of decline or at least of deviation from monotheism, which is close to the understanding of sin in monotheistic religions. According to the thesis of religious evolution, polytheism is a case of deficient development (it is located between fetishism and monotheism in Comte, between animism and monotheism in Taylor and Spencer, and between the communal stage of religious development and monotheism in Wallace). In both theories, polytheism means something deficient or transitory. On the other hand, Geo Widengren maintained a reversed evolutionary theory, according to which polytheism emerges as a differentiation of the high god (Hochgott). This theory is not far from the theory of *Ur-monotheismus*. Similar views were held by Pettazzoni as well. From this point of view, polytheism is a phenomenon to be explicated. Debates about polytheism involve hermeneutical problems of understanding. Scholars in early postwar years confessed their incapability to understand polytheistic religions (Brelich). Some scholars like Topitsch and Gladigow chose to use “understanding Sociology” by Max Weber which endowed deities with some “sense” proceeding from their acting modes, and this “sense” had to be

understood hermeneutically. This view is to some extent compatible with the way Wittgenstein reflected on knowing what foreign religions “mean.” Wittgenstein, however, held that understanding requires a stronger engagement with the religious person’s way of life where the religious concepts (of deities) are embedded to come to a full and authentic expression. This “sense” is explicated through the divine order and design revealing divine intentions (Dumezil). Polytheism proves to be a kind of action theory, where the deities intervene (Vernant 1991), have functions, represent antagonisms and alternatives, and take over roles (“mother,” “ruler,” “healer,” “fighter,” and others). “Deity” and “agent of action” are used in this regard as complementary notions. It may even be said that the notion or definition of action was performed first in religion as the shaping of the world and reality, the consequence of which is all other shapings of the world and reality.

The greatest contributions to scholarship of polytheistic systems were made by structuralism. Marcel Detienne understood under polytheism a classification system of different active powers and their mutual delimitations. The definition of modes of action has to specify the principal deities of the pantheon (Detienne) (Detienne 1986). Georges Dumezil stressed the role played by three partitions in polytheistic pantheons: there are three “functions,” magic and juridical sovereignty, military action, and the function of fertility which are distributed between the personages of the pantheon (Dumezil 1952). The definition of a deity is necessarily a differentiation and classification that cannot be performed by means of static notions, but only by considering the whole entity of all the positions this deity holds. Immediate data of polytheism are the structures themselves, first of all elementary agencies, then couples of powers or triads of powers. Each aspect of one deity (say Mitra) necessarily implies one contrasted aspect of another one (say Varuna), the way the right implies the left. Should Poseidon and Athena receive cultic worship on neighboring altars as patrons of horses, two different complementary deities and ways of patronage are nevertheless involved: while Athena intervenes with

technical tools, Poseidon does it with violence (see ► [Violence](#)) and uncontrollable animal power. What is characteristic of polytheism is that altars are devoted to the plurality of gods, sanctuaries are consecrated to several gods all at once, and festivals and rituals associated with different deities are brought together for a particular occasion, becoming now two different aspects of a single power, contrasted by their respective modes of sacrifice. There are exemplary collections of deities, in circumstantial or recurrent groupings and in monumental or ephemeral configurations (Detienne 1986).

The main structural problem is inner relations within the Panthea. A special problem is restricting the number of acting deities. The unifying of Sumerian city-states with subsequent restructuring of a pantheon is one good historical model how the building of a polytheistic pantheon works. The action of deity is characterized through the difference between divine possibilities and intentions, capabilities and actually performed acts. Pantheon’s inner structure manifests through dramatization patterns, represented in myths. The main tool of dramatization is the mutual battles of deities, although not all gods do engage in fight (Zeus, Apollo), with some just supervising these battles. God’s battles renew the divine order and – representing conflicting images and symbols – give structure to culture and resist irrationality. There are different types of divine battles. Kippenberg stresses that the inner structure of a pantheon combines elements of cooperation (alliance) and battle (Kippenberg) (Kippenberg 1984). Battle is not a universal trait of polytheistic *panthea*. In polytheistic constructions of the African world, figures of a pantheon are seldom linked with each other according to dramatic or narrative patterns.

Struggle between deities may be permanent (German myths), related to the current moment, or may have taken place at the beginning of the world (Mesopotamian and old-Iranian mythology, where the fight is actually over). Wakemann calls the latter “space model,” because the monster is the world itself. He calls the battle for kingship in Heaven the “time model.” It may be demonstrated with a succession of ruling gods

or, in Hurrite-Hethite and Greek system, with a new system of divine coalitions as a result of infringement and revenge, which rules out any further struggle and leads to stability. In this way, a new, just world order is established in Hesiod; there being no evil (see ► [Evil](#)) deities, only victorious and subordinate gods. Gods are often ambivalent and complex (Odin, Mithra, Ahura, Mazda, Varuna). Their antagonism requires systematizing in the cognitive, emotional, or social sense. Univocity can be won through complex precision and differentiation (Luhmann) as a removal of “classificatory equivocality” (Douglas). Polytheism attracted the attention of psychoanalysts who no longer saw in deities of polytheistic religions heuristic models, but rather exemplary phantasms (G. Devereux). The research on group dynamic with psychoanalytic touch tries to shed light on the relationship between ambivalent gods and human beings (Ph. E. Slater). These antagonisms are less frequently explicated through conflicts of social (Honko) or ethnical groups. The antagonism of gods is directly related to the pluralism model which dominates current discussions on pluralism. Polytheism entails epistemological problems like the monistic (see ► [Monism](#)) or pluralistic anthropology (Landmann) or leads to a pluralistic end of day’s vision, for example, in Frank, Bohrer, and de Vries.

Names and attributes of gods are construction elements as well; they embed deities into social schemes (Brellich, Gladigow). On the other hand, to give a name to god means to give a singular form or a shape to him, that is, to individualize him. The images of gods confer the evocation power of a visible presence of deity (Detienne) (Detienne 1986). Satisfactorily, individualized gods are able to differentiate themselves in different figures during ritual (see ► [Ritual](#)) practices. The latter accommodate to these successive positions cohabiting on the same altar. Polytheism uses those action models which are closely related to the functioning of society and forms of political organization. Altars, statues, and sanctuaries are inseparable from the invention of political space. Gods are mobilized in every practice of social life here. This type of society

defines itself in conjunction with “affairs of gods” and “affairs of humans.” The famous “spatial turn” in humanities runs as parallel development to this structural research on polytheistic systems. Social relations are inseparable from the symbolic dimension represented in the polytheistic system. Polytheistic systems are systems of representations marked with multiplicity and diversity of divine powers, and they constitute the whole armature of the symbolic function in a large number of ancient and traditional societies (Detienne).

Because polytheistic religions are orally transmitted, polytheistic theologians are frequently called “administrators of memory.” They transmit not only the most conscious beliefs but also all that was abandoned to the historical subconscious of the language and the civilization that language conveyed. Detienne is going to propose experimenting in the field of polytheism that requires a resolute pragmatism, if not “positivism.” This is the knowledge of the ethnographic context that helps an analyst of polytheistic complexes to learn everything possible about the fauna, the flora, and the customary practices of games, hunting, and warfare, in fact all the material and concrete aspects of a particular culture. The analysts of polytheistic complexes have to investigate the way in which the divine powers are linked in dozens of aspects with the objects and phenomena of social life and the natural world (Detienne 1986).

The number of gods in a pantheon is limited and does not exceed 10–20 (Brellich). In this regard, one can speak of coherence and unity of the worldview (Gladigow) and propose the economy of symbols as an explanatory model (Luhmann). This fact is probably rooted in ethological background (Tiger, Fox) and explains the understanding of polytheism as a model for sociality: necessary and possible relations between gods become more differentiated, relations between gods and humans getting stronger in the general context of social processes. There should be some economical limits to this number of gods (the number of priests is limited as well). Some paradigmatic groupings of gods are those in Egypt containing

2, 3, 4, 8, and 9 members (Hornung), or in Greece where an “undifferentiated triad” and number 12 were preferred.

In each city, the regnant deity reorganizes the pantheon anew according to the local hierarchy of gods and rivalries between many powers pretending for sovereignty on the same territory (Detienne 1986). Universal (and present in almost all panthea) is genealogy as a principle of divine organization. Significant is displacement or flight of some deities to another region (or underworld) that corresponds to labor distribution and political order.

Difficulties in the scholarship of polytheism can be explicated with the dominant position of evolutionism (see ► [Evolution](#)) in religious studies beginning with the nineteenth century, which contributed little to this field. But neither have reaction to it – antievolutionism and phenomenology of religion – done much (Brelich 1960). Another problem is that there is no polytheism – there are many polytheistic religions lacking its dogmatic conceptualization that would have been able to determinate its essence. Angelo Brelich pointed out correlation between developed agriculture and polytheism (Brelich 1960). Guy Swanson and C. Lemert sought correlation between complexity of society and presence of polytheism (Swanson 1960; Lemert 1974). This line of research was outrivaled by exploration of this same correlation in monotheism, a much more complex stage of religious development (see ► [Monotheism](#)).

Topitsch pointed out the link between the hierarchization of pantheon (king, other gods as vassals) and centralization of power in society. When there is a tension between creation of pantheon and regionalization, where not all gods are available, the cult objects in the latter case are either mobile, or one has to set out on a pilgrimage to the places they are located. Another development is the concentration of several qualities in one or several deities (polytheism’s retreat tendency). One can interpret Henotheism as a reduction of regionalization (Gladigow). Elativistic/laudatory and superrelativistic/extreme laudatory predications were introduced and taken back again (in the case when a regional or

temporal connection was given up. The history of religion emancipated from Christian theology tends to postulate that polytheism is a normal case, but monotheism – an exception and discusses the question of how monotheisms (henotheisms) – might be integrated into polytheisms (Gladigow). It is not polytheisms that have to be explicated but rather monotheisms according to this line of reasoning. There emerges a paradox that singularity and elevation above others in a row of deities are at the same time manifested in prayer as equal predicates, whereas theologies ask how polytheistic impulses can be integrated in monotheistic systems (Lohfink).

Two attempts have been made to establish polytheism in early modern times. Gemistos Plethon undertook the first one in the fifteenth century on the basis of ancient polytheism with a neoplatonistic touch in the tradition of Zarathustra. The aim of this reform was to establish both a rational state and a rational religion. The German idealists (Schelling, Hölderlin, Hegel, Schiller: “Greek gods,” 1788) formulated in the eighteenth century the so-called Earliest System Program of German Idealism that invited to build polytheism of imagination and arts, which was understood as a full-blown religion as well (a “new religion”) directed against monotheistic theology, on the one hand, and the rationalism of Enlightenment, on the other hand. (It was characterized as “monotheism of heart, polytheism of imagination and arts”). The myth is taken here “seriously” and seen as something more original and universal than religion. Christian desacralization of ancient culture was partially reversed here. Mythology and polytheism no longer overlapped each partly going its own way so that there could have been polytheism without mythology and mythology outside of polytheism. Early romanticism made this “discovery of polytheism” that merged with individualization of religious feeling. To this tradition belongs Schleiermacher who wanted to see all religions in one infinite religion and moved toward Pantheism.

Polytheism within the framework of romanticism and neo-romanticism emphasized their proximity to nature and promoted the emergence

of neo-paganisms in late modernity. It was presumed that the hidden gods of polytheism manifest themselves in nature and myths, rites and images being the appropriate forms of this manifestation. The main conflict of the eighteenth century was the one between nature and scripture. Within this framework developed a vision on the Greek god Pan as a possible bearer of environment ethics (See ► [Ethics](#); ► [Environmental Theology](#)). Reproaching monotheism with insufficient attention to the problems of environment belongs to the permanent arsenal of arguments produced by people with polytheistic preferences. An attempt was made to emphasize the philosophical value of ancient paganism (Auge: "Le genie du paganisme") against philosophical monotheism. Recent scholarship on philosophical monotheism in late antiquity makes this line of argumentation substantially weaker. The notion of paganism as a substitution for polytheism still remains ambivalent, because it constitutes and affirms itself in opposition against monotheism. Polytheism of proximity to nature is no alternative to that conflict (Gladigow); it rather defines itself as an alternative to monotheism and therefore maintains its claims for exclusive truth. Nietzsche saw the "greatest utility of polytheism" in human ability to create gods and even proceeded from the structure of polytheism in substantiating the individual. He held both God and gods as human projections, the former of the individual self and the latter of the collective self of mass morality. So monotheism was for him mass-consciousness, whereas polytheism implied creation of individual norms and experimenting with them (Gay Science, II, 134–135).

William James expressed similar ideas moving in the direction of polytheistic anthropology. He interpreted gods as constructive and useful projections of the extended self. Although he defended the polytheistic creed, it was in fact pluralism of myths and no real polytheism. These gods might be like Epicurean gods who were imagined as human shaped, appearing in human dreams and visions, but existing in inter-spaces between universes and not intruding in human matters. So there was no danger that any

other activity than emulating those gods would lead to practical worshipping or to "real polytheism." Secular anthropologies are challenged through this defense of polytheism directed against the monotheization and de-anthropomorphization of religious imagery (Funkenstein 1994). What Xenophanes used to deconstruct as mythological anthropomorphizations of gods, James perceived as a realm of meeting with the divine, a kind of projections of the divine in the subconscious parts of our consciousness so that these projections form an extended self. This divine domain (power) need not be necessarily one in number. James speaks of "many finite gods." Polytheism means that universe is a collection of selves as mutilated expression of these powers, with no absolute unity realized at all. James speaks here in terms of possibility of polytheism ("polytheism's hypothesis"), for there are many selves, there are many deities adjusted to their tempers. The experience itself acquiesces to a plurality of perspectives which are neither complete nor inclusive. Polytheism is the religion of common people exposed to such experience. Funkenstein presumes that James' polytheism does not follow from his pluralistic dispositions in other realms.

It is in recent time that the thesis on modernity of polytheism has come to the fore again on the continental scene. Odo Marquard formulated "praise of polytheism" as a kind of "polymythia" implying "mythological freedom" and "distribution of power within the Absolute ... through a plurality of gods." He postulated that "the great human principle of polytheism" is compatible with Enlightenment and stated that an "enlightened or secularized polytheism follows after the end of monotheism." Both monotheism and natural science were made responsible for the "dedivinized nature," in which we are to live today. Egyptologist Assmann translated this polytheism into cosmotheism. Having discovered this trend in both Egyptian religion and European Enlightenment, he borrowed the term itself from German idealist thinker Jacobi, thus drawing closer to Panentheism (see ► [Panentheism](#)). Further attempts were made to formulate on this basis the "political theology" as an alternative to

Christian theology (for example, Peterson). Jacob Taubes, however, diagnosed “conjuncture of polytheism” in late modernity, an Apology of paganism in the scholarship of history of religions and even philosophical praise of polytheism, which is nothing but production of the mythical state of spirit going back to “repetition of Julian’s apostasy” (Taubes 1996).

David Hume not only postulated the original character of polytheism as a form of religion (this thesis was discarded by scholarship) but also its advantages. Nevertheless, this originality in his view was without any positive cognitive sense, – polytheism was simply superstitious. By no means did he think that polytheism could be free from idolatry. Being a spokesman for pure theism, he saw Protestantism as more progressive than Catholicism with its worship of icons and theism the most perfect religion. The enthusiastic revival of polytheism today often quotes some passages from Hume without giving attention to his contempt for cognitive incapability’s of this kind of religious belief.

It was Max Weber who by referring to John Stuart Mill linked together two different phenomena – the pluralism of values (with the implied notion of freedom that supports this pluralism) and “gods’ battles,” rooted in modernity: “Many old gods, disenchanted,... strive for power over our life and begin their eternal battle with each other” (Weber 1991). Polytheism is one of the main categories in his sociology of religion and stands for a form of religious experience, where sublimation of fight of different principles in human life is represented through gods of polytheistic religions. The paradigmatic meaning of polytheism marks the current state of civilization torn between antagonistic values. Sometimes, the term “polydemonism” was used – as in de Van der Leuw – to give expression to the state of antagonism of values ending in the insurmountable battle between god and devil, or as it was expressed in a more sophisticated way, the god of the one becoming the devil of the other. Polytheism assumes internal divisions in society. Polytheism reigns within groups, between members of one caste, and not between

castes. Polytheism is a religious configuration that immediately corresponds to human experience.” (Brelich argues against this view: Polytheism is historical, not a universal human experience. It is hardly understandable to modern man (Brelich 1960)). Weber ruled orgiastic and Dionysian experience out of his picture of polytheism, attributing the latter to animism indifferent to the mythic dimension of polytheism. “Gods of polytheism” are bearers of values like justice, prudence, and interests as well. What polytheism ignores are characteristics like universalism or heresy, and it manifests high tolerance. So Weber returns to this classical theme of modern theism. Nevertheless, real polytheism can be reconstructed out of impure monotheism as in the case of Catholicism or even Islam. Weber held only Judaism to be pure monotheism. According to him, polytheism is a heuristic concept in sociology that replaces ancient gods by viewpoints or values which are no longer personified entities, but philosophical or ideological abstractions. Legitimacy of each of them can only be based on subjective convictions. Ancient *pantheia* of gods offers no image of peace, only that of permanent conflict between envious deities. Modern times give us a similar picture where conflicts between values are unsolvable. While ancient mythology cannot reconcile Themis and Dike, modern justice itself is an object of irresolvable controversies, despite all appeals to ethics. Minerva was a goddess of wisdom and war at the same time. Battle is the immanent law of polytheism, while monotheism, by allowing for antagonisms, strives to transcend them through its universalism. There is a difference between ancient and modern polytheism as well: polytheism of values responds to decline of religious spirit and to mass mentality dominated through disenchantment. The mythos assumes another meaning; its goals lack eschatological (see ► [Eschatology](#)) prestige, because they ought to be achieved in this world, not beyond it. They may be chiliastic and even lead to revolution. But what is especially important is that Weber never held that polytheism of values could become pagan because it is not able to depart from mainstream monotheism.

Nevertheless, it is quite possible that ancient polytheism becomes a component of intellectuals' religiosity today by their illusionary ability to reconcile all viewpoints. By using the term polytheism metaphorically, Weber rules out any possibility that his use can be interpreted as a call to return to polytheism in the proper sense of the term.

Value pluralism appears to be an unavoidable consequence of historical processes, full of tensions, and conflicts, and we only have to accommodate ourselves to that without any hope of overcoming it in the foreseeable future. Rationalization of modern life does not mean disenchantment: polytheism rationalizes animism and monotheism rationalizes polytheism. Disenchantment is a rationalistic way (intellectualism) of perceiving rationalization itself where no mysterious power appears to... interfere in our life, and we perceive ourselves as being able to cope with all things through prevision. Value pluralism/polytheism means insurmountable conflicts opposing economics and politics, arts and science, each of which follows a specific pattern of development in fight with others. Science is one of "deities" of the value pantheon and is able to trigger conflicts. It may be contested and even rejected for the sake of other values, for example, "mystical" or "ecological." The validity of science itself is not demonstrable scientifically: it can become an object of fight with religion, morale, politics, or economics. Value neutralism takes account of legitimacy of this fight. Science is even indefinite with regard to truth and cannot validate either morale or politics, unless it is within the framework of the fight of value polytheism. If it nevertheless tries to do that, it goes beyond its own limits and its own essence. "Beauty," "goodness," "truthfulness," and "holiness" are incompatible indeed. The best intention can have terrible consequences (Weberian paradox of action). Life possesses insurmountable tragic. Even in its commonness, life possesses the enchantment of polytheistic supra-empirical powers. It is only rationalization that believes it can cope with them, mastering of which only the rationalization can deem itself. This state of affairs, full of tensions between intellectual lucidity and a vital

sense of the tragic, between value neutralism and the paradox of consequences, was designated by Weber as "mystical, but inner true plastics." It manifests a confrontation between (monotheistic) providence and polytheistic fate. This value pluralism by no ways means relativism with Weber. The decision ought to be made not only between god and devil: each time one has to define... who is who/what is what. The opposition between monotheism and polytheism is insurmountable as well. Philosophically, it reflects the opposition between the intelligible and the sensible, if monotheism can be related to metaphysics of intelligibility and polytheism to metaphysics of action. The questions discussed in this context are as follows: Is it appropriate to describe this state of affairs as "remythization" (Habermas) or "neopagan regression beyond autonomy and individuality," or is polytheism only a "softening of monotheistic principle" (Bellah), can the revived polytheism of mythology be identified with "lively polytheism" (Gladigow), and what the latter is, does it define the cognitive and ethical orientations of modern man? The notion of polytheism that heavily influenced the current discussion on pluralism, value pluralism, and individualization of religious feeling is gradually disappearing from scholarly discourse as a genuine object of investigation.

A number of substitutes have been offered. William Shepherd coined the notion "polysymbolic religiosity, which is meant to replace religious exclusivity. For David L. Miller in his "The New Polytheism" (1974) polytheism is an organizing metaphor that means diversity of religious orientations and disparateness in symbolic explanation and in life, which are organized and shaped in new polytheism and cannot be reduced to some monistic solution. Polytheism is deemed as a legitimate model for individualized symbolical systems where gods are not to be trusted but to be used; man makes himself by making his own gods (see ► [Self](#)). Barbara Hargrove diagnosed polytheistic culture in the basic sense for North American society. At the same time, she regretted that this society is less united than ancient polytheistic societies. What seems the most valuable is "to see will,

human, and divine, as manifestations of nature,” by nature meaning mainly sexuality and death. Ellwood gave polytheism the name of “liberation religion” of “being free in the world.” As a reaction, one can see arguments of Christian reconstructionism: Gary North in the spirit of neo-Puritanism insists that there cannot be any neutrality; he translates pluralism back into polytheism again, understanding (and condemning) relativism and social disintegration by the latter.

Cross-References

- [Environmental Theology](#)
- [Eschatology](#)
- [Evil](#)
- [Evolution](#)
- [Monism](#)
- [Monotheism](#)
- [Ritual](#)
- [Violence](#)

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Popular Culture and the Mass Media, Sociology of

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Related Terms

[Cultural studies](#); [Media studies](#); [Sociology of communication](#); [Sociology of culture](#)

Description

The sociology of popular culture and the mass media studies the relationship between mass communication and society, using the methods traditionally established in the sociological analysis and their variation within the so-called media and cultural studies. The media, conceived at the same time as framework and content of popular culture, are often analyzed in the general frame of the cultural processes. In the academic research, an important role has been played by the study of the identity dimension of cultural consumption and, more generally, by the research upon the relationships between communication and popular culture.

The most influential scientific handbooks agree in identifying the emergence and development of the discipline in the late nineteenth and early twentieth century. A symbolic date can be represented by the 1900s Great Universal Exhibition of Paris, when the process begun in the *Great Exhibition of the Works of Industry of all Nations* of London 1851, seemed accomplished: Technological goods and products of the popular culture became the actors of a new social representation, in which commercial goods began their transformation into commodities.

In the years of the social consolidation of the press and the development of cinema and radio, many pioneering studies are made. In those years, among other things, the “technical reproduction” of the art is defined by the German philosopher

Walter Benjamin as a cultural turning point. Benjamin identifies the technical reproducibility of the cultural manufactures as a shift in the relationship between masses and art. In the same period, a new collective subject emerges: the mass public, viewed with suspicion by the psychologists of crowds and analyzed with greater optimism from US sociology. It may, indeed, speak of mass communication only in relation to two poles: on one hand, the development of technical support that enable the widespread use of the goods of cultural production, on the other hand the birth of the mass audience and a strong imaginary industry (now more often defined as “creative industries”). It is no accident that the public will soon become a major “sociological issue” from Gabriel Tarde to Georg Simmel, from Emile Durkheim to the Chicago School, until the US functionalist approach to the mass communication (*communication research*).

The sociology of mass media and popular culture has devoted great attention to study the characteristics of socio-communicative basic principles. In particular, recently John B. Thompson (1995) has identified some key features of mass communication. They can be summarized as follows: (a) commodification of the symbolic goods and attribution of an economic value to cultural products and, consequently, the birth of the imaginary market; (b) the structural separation between the production of symbolic forms and their reception: The context of production and reception, in fact, is always disjoint. This assumption, which constitutes an important reference point for the research on popular culture, has been partially put into discussion with the emergence of cooperative authorship in the so-called web 2.0; (c) extended accessibility of symbolic forms in space and time; (d) public diffusion of symbolic forms; (e) importance of the technological dimension of communication technologies (but anyway in a theoretical frame which rejects any forms of technological determinism).

The separation between the contexts of production and reception, and the technical

reproducibility of the cultural products technique facilitate the access to the symbolic forms not only to several kilometers away, but even at different times. The concept of time-space distanciation was also used by Anthony Giddens (1984). According to Giddens, in the *high modernity* we can remark two phenomena: The first one is constituted by the separation between time and space: distanciation space, in other words, does not necessarily imply even the time dimension. The second one concerns the separation of spaces and places: This phenomenon is given in connection with the eradication of social contexts of interaction and the fragmentation mechanisms of the same interaction. The possibility of developing actions and forms of interaction distance is, in effect, a result of this detachment. The disjunction of time and space elements is culturally important to the development of modern sociology of mass media.

The relationship between media and society represents a major theme in the social sciences and it is the very essence of the whole sociology of mass media. The media (it means media institutions, individuals who are part of and popular culture) have kept a strong relationship with the society, to whom they belong. The media play an important role in contemporary societies and the “media institutions” are inside a very dense network of relationships (Hesmondhalgh and Toynbee 2008). This concept is connected with the question of “power,” one of the key aspects in the cultural studies approach (in particular in the frame represented by the Birmingham’s Centre for Contemporary Cultural Studies, which has been very influential to create linkages between the media studies and the sociology of culture).

One of the most studied mechanisms of the sociology of mass media and popular culture concerns the relationship between media institutions and audience (Burton 2005). This mechanism applies to a specific power of the media, which covers the meaning’s building and relates to the processes through which media texts (i.e., television programs, movies, information, etc.) produce “effects” and/or “influence” over the

public sphere. The media effects study has been a very important topic in all fields of media studies and, in particular, in US communication research (whose most influential authors are Harold Lasswell, Paul F. Lazarsfeld, Elihu Katz and, in more articulated and original perspective, Robert K. Merton).

About the question of the media as instruments of “power” in the logic of construction of social meaning, Denis McQuail identifies two types of media power and six main features of it. The two types refer to the so-called models of hegemony and that of pluralism, while the six main characteristics of the media power are the following: (1) ability to attract and to direct public attention, (2) ability to persuade in matters concerning opinions and beliefs, (3) ability to influence behavior, (4) ability to structure the mechanisms of reality definition; (5) ability to confer status and social acceptance; and (6) ability to provide information quickly and broadly (Sorice 2009).

Finally, several general models have attempted to explain the relationships between media and society. A simple classification is the one who lists the different theoretical approaches following the linkages that the media establish with the society. We can use a tripartite division which refers to: (1) macro-social models, (2) micro-social models, (3) dynamic models. The macro-models are those who consider social media able to impose itself on society, influencing or determining specific effects. In this frame, we can place the sociological approaches to the idea of communication as transmission. In this context, we may place many scientific approaches that of determinism, some Marxist perspectives, some aspects of the political economy of the media (in particular those related to multiple forms of socioeconomic determinism and actually anchored to the idea of economic rationality), and most of the theories and interpretation models born in the functionalist context. The micro-social models are those that are based on the idea that the society “uses” the media: the media, in other words, operate in social dynamics and provide tools for connection and/or self-representation that the society uses

more or less consciously. In this area, we can place the reception studies, some Cultural Studies-based approaches, and some tendencies of the Audience Studies (Hall 1997). The expression dynamic models, finally, refers to those approaches, theories, and modeling which consider the media and society as always interconnected, in an interactive way activating a dynamic of mutual influence. No longer, therefore, the media as variables that deterministically intervene to change the society (macro-social models), and no longer the media that are used by people without any consequences (micro-social models): With dynamic models, scholars moved toward the rejection of effects theories but however accepting the logic of social influence. In other words, the dynamic model refuses the simplistic deterministic approach in favor of a holistic look at the relationship between media and society. In this context, we can place the interactionist approaches, the latest trends of audience studies and recent research directions on the relationship between media and identity.

Self-identification

Science

Sociology of popular culture and the mass media are strongly rooted in the social sciences tradition. It uses both qualitative and quantitative methods to study the relationship between media and society, the social texts and cultural products, the media impact on the public sphere. Sociology of popular culture and the mass media self-identify as a science. Current scientific literature confirms this self-identification. It is not a religion but a social science.

Characteristics

Sociology of the mass media represents a specific area of sociology; it is anyway distinguished from the broader general sociology. In the last decades, it has developed its own specific concepts and a peculiar research methodology.

Relevance to Science and Religion

There is generally great interest for sociology of the mass media and popular culture among the “science and religion” scholars. It happens because sociology of popular culture and the mass media concerns questions of human interest, even involving important topics such as control and manipulation, freedom, pluralism, social meanings, and social and personal identities. There are also some “religious” approaches to media studies (i.e., catholic perspective, personalist approach to media studies, etc.). Almost all the religions have a great attention to media and culture and many religious leaders use to speak about media and society (i.e., the annual Pope’s message for the international day of social communications).

Sources of Authority

Empirical data, repeatable social experiments, and their publication in peer-reviewed papers are authoritative for Sociology of popular culture and the mass media. Their authority is self-derived by the peer-review process and from the underlying assumption of science that empirical data are the most reliable means of learning about the subject. Many sources are also consolidated during many decades of study and researches.

Ethical Principles

The deontological approach to the social research represents a point of reference for the discipline. It is an empirical and nonjudgmental science; these characteristics are strongly connected with its general ethos. In the same time, many international associations have defined rules and ethical principles.

Key Values

Honesty, human interest, grounded based methodology, centrality of the individual (Glaser and Strauss 1967).

Conceptualization

Nature/World

As all the social sciences, it considers itself in the frame of the world but it does not study nature.

Human Being

Individuals and/or member of a human society. All the individuals have the same rights.

Life and Death

It is out of disciplinary field.

Reality

Empirical matters but also social construction.

Knowledge

The results of the empirical study of reality.

Truth

The empirical knowledge is only an approximation to reality. “Truth” is not pertinent to an empirical science.

Perception

All observations/measurements of social reality are biased for many reasons. Perception is very important because even many empirical data are the findings of subjective process of perception. In the same time, it is sufficient to provide empirical and not exhaustive analysis of the society.

Time

Time is one of the fundamental dimensions of social life. It represents (with space) one of the key topics of the discipline.

Consciousness

Consciousness is a higher mental state, involving, both personal skills and collective interactions. Sociology of popular culture and the mass media has a great tradition of study in the theorization of consciousness (i.e., Anthony Giddens’ analysis on society’s structuration).

Rationality/Reason

Rationality/reason is one of the primary perspectives for an empirical science. The different

approaches to sociological methodology are all based upon rules of logical reasoning, deduction, induction, abduction; the research findings must follow rationality schemes to be acceptable to the scientific community.

Mystery

Sociology of popular culture and the mass media consider the mystery as a social topic to investigate. It does not study the mystery as “unknown” or “divinity,” but it can be interested in how people deal with it.

Relevant Themes

The discipline is human centered. Many communication models refer to the concept of dialogue and subjectivity. These are strongly related even to Science and Religion engagement; at the same time, they represent critical turning point because of the scientific discussions about them. Another key concept is constituted by “community,” widely used in the analysis of social identity, the role of the media and the relationship between popular culture and the constitution of the public sphere. It is also a concept variously used and submitted to many different interpretations.

Cross-References

- [Cultural Studies](#)
- [Functionalism](#)
- [Functionalism in Sociology](#)
- [Humanities](#)
- [Media Studies](#)
- [Political Theory](#)
- [Sex and Gender](#)
- [Worldview](#)

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Positive Psychology

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Related Terms

[Psychology of positive human functioning](#); [Science of happiness](#); [Science of human strengths and virtues](#); [Study of character strengths](#)

Description

Positive psychology (PP), a subfield of psychology, is the study of optimal human functioning. PP aims to understand and promote the factors that allow individuals and communities to thrive. PP is a fairly new subdiscipline of psychology, yet it has spurred a flurry of research activity at the beginning of the twenty-first century.

The field is specifically concerned with redressing the overuse of disease and disorder models that guided most psychological research in the later part of the twentieth century.

Prior to World War II, psychologists embraced three major research aims: (1) curing mental illness, (2) making the lives of all persons productive and fulfilling, and (3) identifying and cultivating high talent and genius. However, events succeeding WWII, namely, the foundation of the Veterans Administration (VA) in 1946 and

the National Institute of Mental Health (NIMH) in 1947, narrowed the focus of psychology to primarily curing mental illness. Both organizations encouraged the utilization of mental disease models; the VA provided monetary incentive for psychologists to treat mental illness in veterans, and NIMH was more likely to fund research endeavors framed in terms of pathology. While the formation of these agencies led to great gains in understanding mental illness and providing therapeutic care, their advent abetted neglect toward the other two aims of psychology – facilitating fulfillment for all persons and cultivating talent.

Martin E. P. Seligman highlighted this historical trend in his 1998 presidential address to the American Psychological Association and invoked his fellow psychologists to research “positive” human attributes and processes, that is, to examine the sources of psychological health and wellness and to provide models for understanding mental *health* (as opposed to illness). Since this inaugural call to positive psychological research, the field has grown immensely. Seligman and other key psychologists (such as Mihaly Csikszentmihalyi, Ed Diener, Christopher Peterson, George Vaillant, Ken Sheldon, Robert Emmons, and Barbara Fredrickson) have deliberately utilized a sociology of sciences approach to construct the subfield of PP. In addition to building on the structural forces that comprise psychological science generally (e.g., generating a special issue of the *American Psychologist* devoted to PP; Seligman & Csikszentmihalyi, 2000), positive psychologists encouraged rapid growth in the field by attaining major sources of funding from such donors as the Templeton Foundation, Gallup Organization, and Mayerson Foundation and by forming scientific communities and publications to promote and disseminate PP research (e.g., International Positive Psychology Association; *Handbook of Positive Psychology* Snyder & Lopez, 2002; *The Journal of Positive Psychology*).

PP has set for itself several research goals and has made significant progress toward them thus far. The discipline seeks to understand human

flourishing at multiple levels, including biological, experiential, personal, social, institutional, cultural, and global strata. Three overarching domains of research organize and guide inquiry into thriving: positive states and experiences at the subjective level, positive traits and persons at the individual level, and positive institutions and societies at the group level. First, considering the subjective level, PP examines positive emotions and cognitions based on past experience (well-being and satisfaction), positive emotions and experiences of the present (joy, flow, happiness, sensual pleasures), and constructive cognitions and feelings about the future (hope, optimism). At the individual level, PP abounds with research concerning positive individual traits, such as gratitude, capacity for love, courage, perseverance, mindfulness, forgiveness, creativity, and wisdom. One of the striking contributions in this domain of research is the *Values in Action* taxonomy of character strengths, formulated by Peterson and Seligman (2004). Akin to the American Psychiatric Association’s authoritative classification of mental illness, the *Diagnostic and Statistical Manual of Mental Disorders*, the *Values in Action* taxonomy of strengths is intended to serve as a manual of mental health. Finally, looking at research on positive groups, institutions, and societies, PP examines the organizational factors of social structures that promote optimal functioning.

Self-identification

Science

PP, as its superordinate discipline of psychology, identifies itself as a science because it uses the scientific method to generate hypotheses and models that are subjected to empirical testing. At the same time, positive psychologists are mindful of the limits of empirical methods to answer all of the questions that are at the heart of what makes life good and desirable.

Religion

PP does have interests that overlap with those of religious philosophies, such as describing

virtuous approaches to living or considering the contributions of religious institutions to the development and promotion of character strengths. While PP may also examine how religion affects persons and the psychological processes involved in religious thoughts, emotions, and behaviors, the discipline restricts itself to examination of psychological questions and does *not* address metaphysical questions. For example, positive psychologists may examine how religious beliefs affect well-being, but they will not address if the actual content of a belief is true or false. As a science, PP is only interested in hypotheses that are empirically testable, verifiable, and falsifiable.

Characteristics

PP is distinct from other subdisciplines of psychology in several ways. First, it is specifically concerned with redressing the historically negative bent of psychological research; by self-definition, positive psychology is distinct in its focus on the positive aspects of human behavior, emotions, and cognitions. Positive psychology utilizes human strengths and mental health models, as opposed to the disease models that are so prevalent in the broader field. For instance, instead of looking at posttraumatic stress disorders, positive psychologists are interested in the avenues of posttraumatic growth – that is, in the positive development of individuals in the aftermath of tragedy.

While PP is distinct in its strong emphasis on the positive aspects of human functioning, it in no way maintains a monopoly over such topics. Since the foundation of psychology as an academic discipline, there have always been at least some psychologists concerned with the “positive” side of the field. For example, the Humanist Movement of the 1960s and 1970s was highly engaged with trying to understand human thriving and the development of individual potential (e.g., Maslow’s work on ► [self-actualization](#)). PP does not seek to ignore or discredit previous work that has not identified itself as part of PP. Instead, PP seeks to provide an integrative platform to

both organize and communicate research on positive psychological topics. Additionally, PP research may be done within the environs of other subdisciplines of psychology (e.g., personality or developmental psychology).

Moreover, PP’s distinct focus on positive constructs does not entail a repudiation of more “negative” psychological models and processes. For example, PP encourages research on positive emotions such as gratitude and happiness. However, PP does not cast aside the importance of research on negative emotions such as fear or sadness. Instead, PP does confirm that many “negative” topics are vital avenues of research that warrant continued exploration. In the framework of ► [Hegel’s thesis-antithesis-synthesis model](#), PP sees itself as the antithesis (a focus on the positive) to the reigning thesis (a strong concentration on the negative) in psychological inquiry. Likewise, PP envisions an eventual integrative synthesis whereby both positive and negative aspects of human psychology are well represented in the broad discipline of psychological science (Linley et al., [2006](#)).

Relevance to Science and Religion

PP does see itself as somewhat relevant to the area of “science and religion” in that (1) positive psychologists are interested in the impact of religious behaviors, beliefs, emotions, groups, and institutions on well-being and thriving, (2) some positive psychologists study spirituality (a primary component of religion) as a human strength, and (3) PP is focused on understanding character strengths, which often overlap with the virtues of many world religions (e.g., kindness, hope, forgiveness). In these points of contact, positive psychologists may in some ways participate in research that could also fall under the subdiscipline of psychology of religion. Particularly in regard to the first facet of overlap, PP is utilizing scientific methods to examine the impact of religion on people, and it is thus entrenched in the overlap between science and religion. Moreover, PP is fascinated with questions of human purpose and meaning making, and

both of these considerably overlap with questions posed in religious domains. Though PP is quite interested in questions of “science and religion,” it is necessary to reiterate that it is a science. Although PP may address questions that have religious significance, it examines only those questions that are answerable through the scientific method. In many ways, PP serves as a conduit for conversation between mainstream psychology (which often has an apathetic or antagonistic attitude toward “science and religion”) and religious or philosophical traditions.

Sources of Authority

PP considers recently published peer-reviewed journal articles the most authoritative source of scientific understanding in the discipline. Similar to other sciences, evidence continually accrues either supporting or disconfirming theories as new data is analyzed from both empirical and qualitative research studies. Considering that PP is a very young subdiscipline of psychology and that overarching paradigms of the field are still being established, discipline-specific publications (i.e., *The Journal of Positive Psychology*, *Handbook of Positive Psychology*, Snyder & Lopez, 2002; *Oxford Handbook of Methods in Positive Psychology*, Ong & Van Dulmen, 2007) do play a major role in demarcating the field. However, research falling under the PP umbrella is published in a plethora of peer-reviewed psychological journals (e.g., *Journal of Personality and Social Psychology*, *American Psychologist*, *Psychological Science*, *Developmental Psychology*, *Journal of Counseling Psychology*).

Ethical Principles

As a subdiscipline of psychological science, PP subjects itself to the ethical principles and code of conduct delineated by the American Psychological Association (a copy of the most recently approved ethics code can be found at www.apa.org/ethics). Overall, the APA sets

forth specific guidelines for research with human and animal subjects that support the five main ethical principles of the organization: beneficence and nonmaleficence, fidelity and responsibility, integrity, justice, and respect for people’s rights and dignity. More specifically, PP utilizes the specific research protocols established by the APA, such as obtaining of approval from institutional review boards and procurement of informed consent from participants, to ensure that all participants are treated ethically.

Key Values

Several values are deeply entrenched as the keystones of PP. Most obviously, the subdiscipline values positive experiences, traits, and institutions, and it seeks to understand human thriving and flourishing. The positive includes what is both good and desirable, individually and collectively. Similarly, PP endorses humanistic values and is quite optimistic in its evaluation of the propensities of people to do good, be good, and feel good.

As a science, PP highly esteems theory building and empirical validation/disconfirmation of theories through hypothesis testing. Perhaps more so than other sciences, PP values cross-disciplinary exchange as well as the process of applying empirical evidence to historically significant theories of thriving originating in religious, philosophical, and cultural traditions.

Also highly valued in PP is the focus on bridging the gap between basic research and the application of findings in therapeutic and “real-world” settings. Evidencing this value, top leaders in the field conduct research specifically aimed at effective implementation of positive interventions in therapeutic and nontherapeutic contexts (Seligman et al., 2005). Moreover, leaders in the field have created training programs for PP practitioners; for example, University of Pennsylvania’s Positive Psychology Center offers a masters degree in applied positive psychology. Likewise, *The Journal of Positive Psychology* by its own designation is “dedicated

to furthering research and promoting good practice,” and Martin Seligman highlights the importance of positive prevention and therapy in his introductory chapter of the *Handbook of Positive Psychology*.

In the same vein, PP actively strives to disseminate research findings to the general public and seeks high profile outlets for the promotion of positive psychological research. This push for publicity highlights another key goal of the subdiscipline: to motivate research and promote an interest in positive psychology.

Conceptualization

Nature/World

PP conceptualizes nature in a variety of ways. Theoretically, nature is regarded as an environmental affordance that facilitates or constrains optimal human functioning. Positive psychology is drawn toward understanding people within their social-environmental context. Positive psychologists are concerned with promoting and maintaining social-environmental conditions that facilitate positive functioning, including educational, familial, and religious environments. In the *Values in Action* taxonomy of strengths, the appreciation of beauty and nature is a positive trait included under the broad virtue of transcendence, that, together with other strengths, contributes to a fulfilling life.

Human Being

Various perspectives on what it means to be human are compatible with PP. PP does not make essentialist claims about human nature or the human condition. PP assumes that humans share an identifiable and unique set of tendencies and characteristics that are cross-culturally recurrent and that distinguish them from other species. In the spirit of virtue philosophers such as Charles Taylor and Alasdair MacIntyre, PP operates under the assumption that humans are moral, social beings that have desires, beliefs, and feelings as well as the ability to have evaluative metacognitions concerning these mental states. These evaluative metacognitions contain the

recognition that humans have the potential to transform these desires, beliefs, and feelings for the betterment of their lives, and therefore, humans are motivated to enact and sustain a moral order.

Life and Death

Positive psychology is not particularly concerned with the origins of life. Various theories of life origins are compatible with PP. On the other hand, PP is quite interested in cognitions and feelings about death. For example, considerable research has been conducted on terror management theory and emotional well-being. From a different vantage point, the study of positive aging, a specialty area within PP, has focused on the factors associated with contemplating one's own dying (Hill, 2005).

Reality, Knowledge, Truth, Perception

For PP, these four concepts are interconnected. PP maintains that humans are uniquely gifted with the ability to acquire self-knowledge. Humans are the only species that engage in extensive self-reflection and imagine best possible selves and lives. This reflective nature of the human mind allows for insight into the self and provides the person with the freedom to enact change to actualize the full potential of the self.

However, PP recognizes that knowledge and reality are constructed by the individual and that it is this constructed knowledge and reality (rather than some “pure” knowledge, external circumstances, or others’ perceptions of reality) that truly shapes a person’s ability to thrive and flourish. In the broader field of psychology, perception refers to the brain’s interpretation of raw sensory inputs, and it is recognized that sensory input is not necessarily represented in the mind nor experienced by the person as it actually exists outside the organism. Similarly, PP recognizes that people are not passive recipients of knowledge; instead, when people perceive the world, they integrate new information with preexisting knowledge structures.

To illustrate, it is consistently found that nondepressed persons hold many positive illusions about the self and maintain many positive

biases in their perceptions of the self. Thus, their knowledge of the self and construals of reality may not actually match more objective measures, but these biased constructions are actually quite adaptive and lead to thriving. Conversely, depressed persons often utilize a more pessimistic style of thinking, which leads to more objectively realistic views of the self. However, these “realistic” views generally lead to less thriving as the person will disengage from goals more quickly when challenges arise.

Just as humans are the only species particularly gifted with self-reflective abilities, they also seem to be the only animals that are concerned with questions of ultimate truth or meaning. Moreover, the manner in which a person deals with such existential questions greatly impacts flourishing. A strong sense of meaning and ultimate truth can be an extremely powerful motive while an absence of meaning or existential crisis can lead to despair and disengagement from life.

Time

Time perspective (TP) has been used as a way of parsing optimal human experience. The categories parsed are past, present, and future, and positive psychologists have proposed that a balanced time perspective, including the ability to move flexibly between these frames, is conducive to positive functioning. TP has been conceptualized as a personal characteristic that refers to the relative dominance of past, present, or future in a person’s consciousness. In this sense, TP can predominate a person’s outlook so that they are chronically biased toward one of the three temporal perspectives. Of the three “time zones,” future orientation tends to show the most robust relations with indicators of well-being and positive functioning, such as optimism, hope, and self-determination.

Consciousness

In PP, there is particular interest in very positive states of consciousness or the positive effects from certain ones, such as those attainable from mindfulness meditation (MM) practices or flow states. MM is a state of consciousness that involves consciously attending to one’s

moment-to-moment experience. It has its origins in Eastern contemplative traditions but has largely been unmoored from its original spiritual roots. In the context of mindfulness practice, paying attention involves observing the operations of one’s moment-to-moment, internal and external experience, and its practice is recommended for virtue development across spheres of functioning. Flow involves gaining the control over the contents of one’s consciousness in order that default tendencies toward boredom, dissatisfaction, or anxiety can be overridden (Csikszentmihalyi, 1990).

Rationality/Reason

The concepts of rationality and reason have multiple meanings in PP. One conceptualization of rationality refers to the term embedded in the widely accepted theory of a dual-process mind. As articulated by Kahneman, scientific evidence supports the existence of two mental processing systems: the first system is automatic, fast, and more emotional, whereas the second is conscious, linear, controlled, and rational. In this framework, rationality may be considered the logical rule-governed outputs of the conscious processing system.

Rationality can also refer to scientific and practical rationality in PP. Scientific rationality in PP proceeds as it does in other scientific fields where psychologists employ scientific rationality to investigate other human phenomena. For example, the elements of the good life (positive experiences and positive traits) can be abstracted, reductively classified, operationally described, quantified, and measured. Practical rationality, on the other hand, takes place in reference to concrete life situations and is concerned with deliberation and choice where opinions vary on the proper course of action. The two are related in that the scientifically deduced good life will enable people to become better decision makers with choices, preferences, and the possibility of becoming masterful, efficacious, stronger, and more productive. Living a good life is, in fact, the end result of practical reason.

Additionally, the terms of practical rationality and reason relate to what PP refers to as wisdom.

Wisdom can be defined as “the reasoned search for specific ways to ensure well-being and the implementation of those discoveries in daily existence” (Schloss, 2000). Wisdom is an ideal endpoint for human development and is thus a concept at the heart of positive psychology. The religious conception of wisdom as reflected in perspectives as diverse as the biblical wisdom tradition and Eastern mysticism points to self-transcendent knowledge that reflects a compassionate concern for others and a generative concern for society.

Mystery

PP would define a mystery as something that cannot be understood or explained from a materialist perspective. While psychological science may investigate phenomena commonly understood as mysterious (e.g., meditative experience), the field is only really interested in the knowable aspects of the human psyche. PP recognizes that there are ways of knowing beyond the scientific method, but the field restricts itself to inquiry that is testable and falsifiable. Therefore, mysteries (which are inherently unexplainable) do not fall under the realm of PP; instead, human interactions with mysterious entities, perceptions of mystery, and experiences of the numinous are of great interest to the discipline. Having said this, it should be acknowledged that human happiness, a cornerstone of PP, has historically been viewed as a mystery incapable of being penetrated by scientific psychology. However, positive psychologists would disagree with this assertion.

Relevant Themes

Religiosity/Spirituality as a Human Strength: Definitional Issues and Positive Outcomes

As previously mentioned, one major link between “science and religion” and PP is that PP considers spirituality a character strength, akin to creativity, bravery, kindness, leadership, self-control, etc. Within this milieu, spirituality and religiosity refer to practices and beliefs embedded in the supposition that there is a transcendent (nonphysical) dimension of life.

Religion has also been formulated as a search for significance and meaning in avenues related to the sacred. While definitions of religiosity and spirituality are still somewhat controversial (particularly the debate surrounding the degree of their similarity/distinctiveness), PP does consider religiosity and spirituality as two components of the same essential construct.

Looking at the positive outcomes of religiosity/spirituality, researchers have repeatedly corroborated that religiosity/spirituality is linked to higher life satisfaction (controlling for a variety of personality variables); is associated with positive youth development; mitigates antisocial and risky behaviors; evidences increased social support; is a robust predictor of altruism, volunteerism, and philanthropy; serves as a powerful coping mechanism; and is correlated with positive health outcomes. While there are also demonstrable negative effects of some forms of religion and spirituality, PP is not particularly concerned with the negative aspects of these. On the whole, PP endorses the evolutionary psychology perspective and generally views religion/spirituality as adaptations with functional value (at least in pre-historic environments). Thus, rather than framing religion as some neurosis (à la Freud) or disease that should be eradicated from society to improve mental health, positive psychologists are more prone to depict religiosity/spirituality as adaptations beneficial to the self and the community in a variety (though not all) contexts.

Positive Religious/Spiritual Emotions

One of the main objectives of PP is to examine positive emotions and experiences, which until recently have been poorly understood. Barbara Fredrickson’s ► [broaden-and-build](#) model has greatly enhanced comprehension of positive emotions and their adaptive value. The theory maintains that positive emotions function to expand the organism’s cognitions and behavioral tendencies and also argues that this expansion leads to the acquisition of new resources (such as relationships, physical assets, or skills) across time.

Some of the most profound of such positive emotions – including awe, wonder, and

gratitude – greatly overlap with what have historically been described as religious and spiritual experiences. In fact, scholars argue that an emotion such as awe be designated a spiritual or religious emotion as it broadens the individual's perspective to the point of self-transcendence.

Research by Newberg et al. (2001) corroborates this self-broadening characterization of religious experience. In their imaging studies of cerebral blood flow of Tibetan monks and Catholic nuns (using single-photon emission computed tomography, SPECT), they have found decreased activity in the parietal lobe of the brain during meditative and prayerful states. The parietal lobe, specifically the orientation association area (OAA), is the region of the brain responsible for delimiting the self and giving a sense of orientation in space and time. Thus, during deeply religious states of meditation and prayer, the OAA receives little sensory input, but it still continues to search for limits of the self. As the OAA finds no markers of self/not self, the person experiences an expansion of the self that leads to feelings of unity, awe, and self-transcendence.

Although scholars may argue about the designation of certain positive emotions as “spiritual emotions,” there is no doubt that the investigation of these deeply moving positive experiences is an area of inquiry that most definitely engages the area of “science and religion.”

Cross-References

- [Emotion](#)
- [Evolutionary Psychology](#)
- [Happiness](#)
- [Love \(Alterity, Relationship\)](#)
- [Methodology in Psychology](#)
- [Personality Psychology](#)
- [Virtue](#)
- [Virtue Ethics](#)

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Positivism/Neopositivism

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Positivism is a philosophical approach, based on the idea of objective truth, meaning that observational evidence together with its logical and mathematical treatment is the exclusive source of all worthwhile information. The positivist approach has been a recurrent theme in the history of western thought from the Ancient Greeks to the present day, but it has been significantly developed from the early nineteenth century until the mid-twentieth century. Postpositivism, mainly influenced by Sir Karl Popper's falsification theory and Thomas Kuhn's theory of the paradigm shift, still maintains the idea of

objective truth, but believes that human knowledge is based not on unchallengeable, rock-solid foundations but rather upon human conjectures.

Posthuman Condition

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Related Terms

[Posthumanism](#); [Transhumanism](#)

“Posthuman condition” (PC) is a complex and multifaceted concept that covers many assumptions and definitions of human being and becoming. These definitions are generally inspired by the development of contemporary technoscience.

We can talk about a substantial ambiguity of the concept of PC, which can be declined according to two fundamental meanings: human has become posthuman because of the hybridization with technology (we could name this concept of PC “cultural posthumanism”); human is going to be overtaken by a new posthuman form of life emerging from the huge changes driven by technology (we could name this concept of PC “transhumanism” or “hyperhumanism” or “hyperbolic posthumanism” or “speculative posthumanism”).

These two main concepts of PC have a different relevance to the dialogue between science and religions. Both of them are grounded on the technology-driven transformation of the human condition. In the first case this transformation is explicitly placed *within* the human nature: this becomes the result of the everlasting reshaping by the human being itself, with possible theological implications regarding the idea of a human nature as created by God. In the second case the transformation of human condition is leading us to a chronologically posthuman nature which is generally assumed as “perfect” and at least eternal: a kind of atheistic eschatology.

According to the first aforementioned meaning, the PC can be read within the postmodern perspective as a metaphor of the relational and hybrid contemporary human condition. Such a metaphor is the result of different theoretical sources: postcolonial thought, feminism, post-structuralism, and queer theory among others. Several authors can be included in such a declination of PC: Donna Haraway, who references to the *cyborg* as the icon of the present human condition (Haraway 1991); Katherine Hayles, who says we have always been posthuman (Hayles 1999); Rosi Braidotti, with her “nomadic subject” (Braidotti 2002); Elaine Graham, who outlines that contemporary technoscience calls into question our assumptions informing notions of normative and exemplary humanity (Graham 2002); Joel de Rosnay, with his concept of Cybionte (De Rosnay 2000); and others.

According to the second meaning, the PC is the final result of the transhuman condition of the present humanity that is becoming posthuman. The transhumanist literature is already quite large and ever growing: as main representatives of the movement we can cite Drexler 1990; Vinge 1993; Kurzweil 1999; Moravec 1999. The core assumption of the transhumanism is that contemporary technology, especially through its enhancing effects, is transforming us in a new form of life, which we cannot predict in details but which we can be sure will be “better than human”: to enhance and improve our condition is a fundamental right and a real civil duty.

Thus the latter interpretation of the PC, which has been referred to as *hyperbolic posthumanism* or *speculative posthumanism* or *hyperhumanism*, can still be included in a humanistic view of the human condition: such a concept of PC fails to displace the categories, paradigms, epistemologies, and ontologies of Humanism, risking to repack the dualistic and anthropocentric outcomes of a certain humanistic view.

Thus, the PC can be assumed as the metaphor of the hybridization of human identity or as the description of the final stage of the present human transformation. In both cases technology is the force informing our dynamic identities: given the

new form of technology, which is no longer limited to the external body, but can enter inside it, we are shaped by the relationship with the technological others. Yet this relationship has different consequences in the two aforementioned concepts of PC: in the former the hybridization between our life as shaped by us and technology becomes the new ground for an ontology of the present human condition; in the latter the technology-driven transformation of the human identity has such a big impact to cause the overcoming of the human as such and the birth of a posthuman form of life. Finally the former is a posthumanist description of the human condition, while the latter is a still humanist technophilic and anthropocentric prophecy regarding the end of the human.

Rather than signifying the end of the present human condition we think the PC can be more usefully assumed as a new theoretical tool to call into question some assumptions about current human condition. It is a matter of fact that the contemporary development of technoscience is increasingly changing our view of human body and human identity, but it is not necessary to imagine a chronological overcoming of the present human being: we think that we have to deal not with a new species after humans, but with a new even still human form of life, not totally understandable with the humanistic categories.

In this perspective the PC expresses a hybrid being, whose hybridization is both the result and the condition for *plasticity*, which is emerging as the new formal paradigm of human. This implies that the relationship between human and posthuman cannot be simply assumed as a chronological or semantic sequence (posthuman = enhanced human, or posthuman = human without its “natural defects”), but they meet and clash in contemporary *Weltanschauung*, that is in contemporary view of life.

The plasticity of human being can be the starting point for avoiding the absolutization of the becoming which is the main risk of the first concept of PC, which, in the end, risks to have a nihilistic outcome: a subject of the becoming is always necessary, because a changing without a substance is aporetic. Exactly this “becoming

being” is the paradox of human identity, naturally artificial, but also in need of an ethical reflection and management of its artificialization.

The second concept of PC is based on a dualistic assessment of nature/technology relationship, particularly of human nature/technology. Actually, if the former is defined as only a result of the creation or of the evolution that dichotomy is real, but if we think human nature also as a creating force not only that dichotomy seems difficult to be sustained, but the same human/artificial distinction becomes problematic.

The so-called *technogenesis argument* (Clark 2003) has been elaborated against the aforementioned dualistic view: according to this argument, technology has always been a constitutive part of the human identity, which is at the same time expressed and shaped by it.

Against the rhetoric of an overcoming of the human condition, particularly of the human body and the matter as such, the so-called *materiality argument* has been proposed: human intelligence is related to an embodied mind, so that a disembodied subjectivity is at least implausible and grounded on a dualistic anthropology.

Another possible argument against the second concept of PC is the so-called *anti-essentialist argument*: if the human essence is previously denied, it is no possible to overcome it with a supposed posthuman subjectivity.

In conclusion, the first meaning of PC reveals its post-structuralist and biopolitical nature criticizing what could be defined as the “dialectical identification strategy” of the human, which is explained through polar oppositions (Nature/Nurture, Nature/Technology, etc.). Particularly, the first opposition is localized in the human itself between the life assumed as materiality and the life assumed as the form we give to our materiality. Differently than the first concept of PC, the second is focused on the separation/subjugation of our materiality (i.e., our body) which must be transformed and even overcome through the form given to it by human technology.

The main aim of the theories about the PC is to free the human identity from every metaphysical artifact built to explain the human essence. Yet the conceptual premises of both concepts of PC

are not post-metaphysical nor post-essentialist: they can be assumed as essentialist view on human nature, particularly as a commitment to transformation and hybridization grounded on the metaphysical premise of Newtonian mechanicism and Darwinian evolutionism.

In the end, both the concepts of PC are undoubtedly potential new theoretical possibilities in order to think the human nature, especially in its relationship with contemporary technoscience, but they also need to be balanced with a more appropriated concept of human nature. It is necessary to go over the dualistic approach to nature/culture, and this is possible thinking the human nature as a “plastic substance,” that is as intrinsically dynamic: the human condition is a transitional condition, so that both the meanings of PC (hybridization and transformation) can be included within the human condition (Farisco 2011).

Cross-References

- [Artificial Intelligence, General](#)
- [Body](#)
- [Cyborgs](#)
- [Philosophical Anthropology](#)
- [Philosophy of Mind](#)
- [Technonature and Theology](#)
- [Theological Anthropology](#)

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Posthumanism

- [Posthuman Condition](#)

Postliberal Theology

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Related Terms

[Post-secular theology](#)

Description

Postliberal theology has become (1) the standard designation of an influential North American academic theological movement – or “school” – which developed during the 1970s mainly at Yale Divinity School, mainly in the fields of historical, systematic, and ecumenical theology, and earned its reputation as a distinct program for theological reflection in the mid-1980s.

The notion is also used more broadly as (2) a designation of various anti-secularist, mainly neo-Barthian and postmodern theological programs or movements in the contemporary debate (especially from the early 1990s until the present).

These two understandings are clearly interrelated, although the first is undoubtedly more established than the second. Not the least because the “Yale school” is somewhat indeterminate and vague, it is important to recognize the *interrelations* between the two forms at the same time as one keeps them apart as two *distinct stages* in the development of a certain form of unapologetic Christian postmodern theology.

In the wake of recent debates on theological postmodernism and post-secular thought, it is pretty obvious that the label “► [postliberal theology](#)” has become somewhat detached from its original context, which means that many postliberal theologians of the latter kind find the original postliberal proposals related to Yale theology partly outdated. The reason to maintain the concept of theological postliberalism is mainly that the literature tends to use the label in various extended senses but also because there are clear affinities between the original Yale program and later developments in systematic theology.

The central figure of the international debate of postliberal theology is George A. Lindbeck (b. 1923), but his colleague Hans Frei (1922–1988) was at least as important for the construction of the narrative perspective on theological practice that permeates the postliberal program. Very generally, Lindbeck’s and Frei’s ideas can be seen as a reaction against secular modernity and more precisely, a reaction to the way theology responded to this modernity. Lindbeck criticizes both the conservative theological focus on doctrinal truth as propositional truth and the liberal idea that doctrinal discourse is noncognitive and secondary to a primary form of human religiosity. As such, postliberal theology becomes a renewal of some of the tenets of neoorthodoxy, especially as it had been developed by Karl Barth and Richard Niebuhr, although this renewed “conversation” with neoorthodoxy took place in a methodological manner, very much shaped by the so-called linguistic turn (Richard Rorty) in philosophy and theory, which took place in the 1960s. This last fact is one of the main reasons that postliberal theology also has been understood as emblematic of postmodern theology (e.g., in Murphy & McClendon 1989).

This entry is organized as follows: First the attention is paid to Lindbeck and Yale theology (sections [Postliberal Theology in Its Relation to George Lindbeck](#) and [The Yale School and the Debates](#)). After this survey, something more is said about the later debate in this specific heritage from Yale (section [Transition](#)). This leads over to the second and broader meaning of the notion (section [Postliberal Theology and Neo-Barthian Anti-secularism](#)). Lastly, a further reflection and critical assessment of the notion of theological postliberalism is offered (section [Ecclesiological Reduction of Theology?](#)).

Postliberal Theology in Its Relation to George Lindbeck

In its most programmatic sense, postliberal theology dates back to the release of the Lutheran Yale theologian George Lindbeck’s much debated piece *The Nature of Doctrine. Religion and Theology in a Postliberal Age* (1984) (from now on *ND*). This rather unambitious, and to some extent even preliminary, book was to become one of the few real classics of North American theology in the 1980s.

It is best known for its emphasis on a “cultural-linguistic” and “intratextual” perspective on doctrinal discourse and the consequences of this perspective for systematic theological reflection. Drawing on thinkers such as the later Wittgenstein, Clifford Geertz, and Peter Winch, Lindbeck challenges a more traditional propositional and cognitive approach to doctrinal truth on the one hand and an “experiential-expressive” approach on the other (the latter is characterized by a noncognitivist and symbolic understanding of doctrines). The experiential-expressive approach was associated with the liberal and revisionist theologies in the tradition from Schleiermacher. Furthermore, although without ignoring their attempt to offer a third way, Lindbeck locates similar problems in the thought of neo-Thomistic Catholic thinkers such as Karl Rahner and Bernard Lonergan.

Postliberal theology, in contrast, was characterized by a “cultural-linguistic” model, and presented as a more successful “third way”

between the conservative and the liberal proposals. More specifically, Lindbeck approached Christianity as a distinct cultural form, bound to its fundamental relationship to the biblical narrative, which functions as its primary system of signs. Doctrines should be understood not as first-order propositions of truth, nor as symbolic expressions of some evasive religious feeling, but rather as second-order truths, a kind of grammatical rules that are “communally authoritative rules of discourse, attitude and action” (*ND*, p. 18). Intratextuality, then, is a method of doctrinal validation that understands meaning as immanent, “constituted by the uses of a specific language rather than being distinguishable from it” (*ND*, p. 114).

It is important to notice that Lindbeck’s programmatic call for a postliberal theological approach first and foremost was guided by a thorough *ecumenical* interest. One can argue that the basic questions of the book are related to the “pre-theological” problem of *doctrinal change* in the context of ecumenical debate. Already on the first page of *ND*, Lindbeck states that it is difficult to really believe any report about genuine ecumenical agreement given the propositional and the experiential-expressivist alternatives. Yet, since such agreements are successfully made, Lindbeck opts for a more precise and accurate way to describe the logic of doctrinal dynamics.

However, it is equally important to notice on that this ecumenical problem, which was very much alive at the outset, soon were to be eclipsed by questions concerning general theological methodology. This might explain how and why Lindbeck’s rather modest claims were taken up as a wholly new approach in theology. The displacement in the conception of *ND* and its objectives has been so thorough that even Lindbeck has confessed that he has difficulties reading the book as it was originally intended (see, e.g., Lindbeck’s preface to the German translation of *ND*).

The Yale School and the Debates

Lindbeck’s emblematic work is closely connected to the narrative theology of Hans

Frei, whose major work, *The Eclipse of Biblical Narrative. A Study in Eighteenth and Nineteenth Century Hermeneutics* (1974), can be viewed as the critical foundation for Lindbeck’s attack on the liberal theological enterprise. Frei’s Barthian focus on biblical narrative is the other leg of postliberal theology, and it is immensely important to acknowledge that Lindbeck’s program was grounded in the idea of modern hermeneutics as a kind of forgetfulness of the importance of biblical narrative for any meaningful conception of Christian identity. Yet, since Frei was less active during the 1980s and less involved in the actual debate on postliberalism, his name tends to be connected with the earlier stage of the movement, usually called the Yale school of “narrative theology.”

Most standard surveys of the postliberal theology have come include scholars such as David Kelsey, William Placher, Ronald Thiemann, Stanley Hauerwas, William Willimon, Bruce Marshall, and George Hunsinger, etc. However, as George Hunsinger rightly has remarked, the idea of a consistent Yale school of thought is rather exaggerated and the names included vary considerably between different accounts (Hunsinger 2003). Undoubtedly, a series of British theologians can be associated with the camp of postliberals, though at the time of Lindbeck’s book, many of them had already developed their own variants of his critique. One can mention names such as David Ford, Rowan Williams, Janet Martin Soskice, Nicholas Lash, Andrew Louth, Oliver O’Donovan, and Colin Gunton.

Besides Lindbeck and Frei, it was perhaps William Placher that was most important for the formation of the idea of a “Yale school” of postliberal theology. Placher was one of the leading voices in the first public debates between the Yale camp and distinguished critics scholars mainly from Chicago (among these, we find James Gustafson and David Tracy, who were to be associated with the most articulated suspicion against the postliberals). Placher also wrote the text on the postliberal theology in David Ford’s influential two-volume edition *The Modern Theologians* (1989, which reappeared in the

Second Edition 1997). This contributed further to the image of a coherent movement.

The renowned debate between Yale and Chicago can be understood as a discussion on the very task of theology, its rationale and purpose in and for the world. If for David Tracy, theology was all about correlation between religious tradition and the contemporary situation in order to reach an adequate theological response to the actual human situation in the postmodern situation, the postliberal position came to be recognized as the search for a distinct Christian self-understanding based on a postmodern understanding of knowledge and truth. Lindbeck's pointed formulation of the theological task as "absorbing the universe into the biblical world" (*ND*, p. 135) has been very critically received and often understood as an outright sectarian aspect of the idea of postliberalism. This charge is not wholly wrong, and we will return to it in the last section. However, one must also keep in mind that the two camps – best represented by Lindbeck and Tracy – in various ways shared a critique of enlightenment thought and secular optimism. This similarity and common ground has been obscured by the polemical tenor of the debate and their radically different approaches to the problem of the postmodern. A more nuanced evaluation of the impact of Lindbeck's book and the postliberal program, at least in the first phase, would be to understand it as new form of theological reception of recent developments in philosophy of language and critical theory.

A charge that Lindbeck and the postliberals had to face already from the beginning was the accusation of relativism and carelessness concerning the question of truth. Some layers of the debate about *ND* are obsessed with this problem. Lindbeck's choice to view the cultural-linguistic model as a formal structure for legitimating doctrines opens for this criticism. However, as long as one really reads Lindbeck's book in its entirety (as well as his defenders), it is hard to take this charge seriously. Lindbeck is very clear that his program is to be understood as an attempt to make doctrinal reflection possible as a positive and progressive discourse related to the general claims of the Christian worldview.

Therefore, he also adds a somewhat puzzling excursus on truth based on the idea that the ecumenical usefulness of the postliberal program depends on how well it can be settled in a wider context of belief in propositional truth (*ND*, p. 69). Thus, Lindbeck's program contains ideas that John Milbank later has understood as "metanarrative realism," which means that truth as reference has to do less with single propositions and more with "the entire Christian performance" (Milbank 1990).

Transition

If the problem of relativism was quite exaggerated in the original debate, one can perhaps say that it returns in a more acute way later on. If one dare to speak of phases or strands in the original debate on theological postliberalism, then Stanley Hauerwas has to be associated with the second phase or strand in the sense that his own association with the postliberal camp brought in a new dimension of the problematic; one that was merely hinted at by Lindbeck through his idea of "absorbing the universe." In his reception of postliberalism, Hauerwas, who originally was no Yale scholar, added a flavor of cultural crisis to the discourse on postliberal theology, implying that intratextuality could be taken more ontologically as a way to propose an alternative social vision for theology (compared to the liberal and secular vision that permeated liberal theology).

If Lindbeck and others had understood the problem mainly as a problem of how to approach Christian theology in way that is relevant for the believers in the community, Hauerwas extended the vision and red into the program a more fundamental perspective of a clash between the Christian community and the liberal world. Thus, postliberalism took on an additional political flavor, which implied that the program of postliberalism had become more distinct in terms of theological and ethical content. Compared to Lindbeck's understanding of his own work, as more or less pre-theological, Hauerwas' more epic interpretation of the Christian community as a counterculture twisted the postliberal

agenda into a full-fledged theological vision. This transition made the problem of universal truth much more acute.

A very different continuation of the original postliberal program was proposed by Kathryn Tanner who more or less accepted the cultural-linguistic basis of Lindbeck's argument but questioned the idea of the homogeneity of the Christian identity and the possibility for a single Christian position. In both Lindbeck and Hauerwas, the idea of a distinctive Christian cultural perspective is fundamental for their respective proposals. But is there really a common Christian position? Tanner argues that "[p]ostliberals try to get around the absence of Christian consensus on so many matters at any one time and place by claiming that at least well trained Christians will so agree, and that not all, perhaps not even the majority of Christians are well trained" (Tanner 1997, p. 142). By this, she exposes a dogmatic and even authoritarian trait in the postliberal program that can be countered only by leaving behind the idea that theology ought to reflect an unambiguous Christian self-understanding. Theological creativity, she argues, is still by large shaped by culture. The problem is that cultural frameworks, especially the Christian, are vague and diverse to the degree that any postliberal and cultural-linguistic position must be receptive of this diversity rather than its identity.

Postliberal Theology and Neo-Barthian Anti-secularism

These transitions within the camp of postliberal theologians shed some preliminary light at the second use of the notion postliberal theology, understood as "a designation of various anti-secularist and postmodern theological programs or movements in the contemporary debate."

It is possible to argue that Tanner's subtle continuation of postliberalism takes leave of some characteristic traits in order to reach for a more ambiguous and inclusive notion of the Christian identity, while Hauerwas' change of postliberal emphasis, from method to cultural

critique, was to become typical for the dominant forms of postliberalism in the 1990s. However, the most prominent postliberals in this sense, besides Hauerwas, were soon to develop more autonomous projects.

One of the most influential postliberals in this more autonomous sense is John Milbank, whose work *Theology and Social Theory* (1990) became formative for a British scholarly movement that later came to be labeled Radical Orthodoxy. Milbank is arguing for a postmodern theology in the radical sense of an upheaval from the normative influence of modernity, enlightenment, and secularity. One of the new perspectives he offers is to understand the secular, and especially the modern secular society, as founded on an exclusion of the theological that ultimately presupposes a theology of its own. From the Christian point of view, Milbank claims that this theology can be viewed both as heretic and pagan, depending on which aspect one approaches. The whole book is an attempt to show how theology can be understood as the social theory of the Christian vision of society, while the social theory of secular Western thought is a nihilistic theology of secular society. The strategy here is to argue that everything is embedded in theological discourse and that Christian theology is the theology that makes best sense in that perspective. The other major task that Milbank sets out to accomplish is to show that the "ontology" of the Christian view of society is based on a principle of love and justice, while the secular society relies on a principle of violence.

In all this, we recognize the element of cultural conflict that was present in Hauerwas. This reflects a continued development of Lindbeck's undeveloped idea of a wholly Christian worldview separated from the secular alternative. Milbank's heavy attack on the secular has been so influential that it is possible to think of the 1990s as the decade where the theological postmodernism of the original postliberal attempts (here mainly exemplified by Lindbeck) came to a more full expression in terms of a full-fledged Christian ontology. This theological postmodernism has resulted in various dialogues with "postliberal" thinkers in other fields, especially

radical philosophers, such as Gilles Deleuze, Slavoj Žižek, Giorgio Agamben, Jean-Luc Marion, Michel De Certeau, etc.

Compared to earlier forms of theological postmodernism, such as Mark C. Taylor's and Charles Winquist's, (but also David Tracy's) proposals in the 1980s, this new reception of radical philosophy is very clear about its robust Christian identity, which means that it is not primarily interested in a self-critique of the Christian discourse. If Mark C. Taylor's postmodern theology, especially as presented in his book *Erring*, represented a kind of deconstruction of the Christian standpoint by means of its precarious position in the secular situation, the postliberal form theological postmodernism deconstructs the secular by means of its theological advantage over the secular *qua* theology (Taylor 1984). This also explains why the label "post-secular" has come to the fore in recent years, as an alternative to "postliberal" and "postmodern."

To this form of post-secular continuation of postliberalism we can associate a large number of influential contemporary scholars from various traditions, such as Graham Ward, Sarah Coakley, Catherine Pickstock, Gerhard Loughlin, Paul J. Griffiths, Douglas Harink, Barry Harvey, Phillip Blond, and Merold Westphal, just to mention a few.

Ecclesiological Reduction of Theology?

The North American Scholar Gary Dorrien has entitled one of his books *The Barthian Revolt in Modern Theology* (Dorrien 2000). A quite suitable title for a survey of the progressive theology of the early twentieth century. In a certain sense, it would not be wholly wrong to name the postliberal change in focus that took place in the wake of Frei and Lindbeck as a "Barthian revolt of postmodern theology." If there is one name that stands forth as some kind of common inspiration for many of the radical programs within our broad notion of theological postliberalism, it is Karl Barth, whose theological attack on cultural Christianity shares many traits with contemporary postliberal attacks

on the theological liberalism of our time, not to mention the critique of secular liberal society at large.

The most striking similarity, apart from the numeral references to Barth himself, is the idea of theology as an autonomous discourse, not in need of any apologetic dialogue or correlation between the secular and the sacred. This means, furthermore, that the notion of the Church and the Christian community comes into the fore as the primary locus of theology. Compared to David Tracy, who singled out three public realms for theology, the Church, the academy, and society at large, postliberals such as Lindbeck and Hauerwas cannot but take the Church to be the primary realm as the only place for any true theological discourse.

To some extent, this is a bit paradoxical since another fundamental trait in postliberal theology has been to pinpoint the social and cultural character of all discourses, which means that there must be many potential theological realms. This trait is most obvious in Milbank's reading of the secular society as imbued with a theology of its own. However, the paradox is resolved as soon as we understand that postliberals, in a typical Barthian manner, argue from the presupposition that there is no neutral ground to evaluate and compare these theologies. There is a necessary conflict between the realm of the Church and other cultural realms. Christian theology is therefore obliged to reflect from within the Christian social sphere.

No doubt, this retrieval of Barthian themes in a postmodern context has been very invigorating for the theological debate at large. The problem, which becomes especially obvious in the context of a dialogue between religion and science, is that this radicalized Christian conception of theology supports a doubtful Christian identity of postmodern academic theology. Theological postliberalism has talked much about the Church as its primary context, but it has very often done so from the academic point of view. In terms of sociology of knowledge, the broad influence of various branches of postliberalism has exercised a pressure toward a renewed identification not only between Christian theology and the

Christian community but also between academic theology and Christian interests.

More polemically put, this means that various postliberal critics of Christendom have used the old structures of Christendom to reinforce the old confessional position of academic theology. This works wholly against the original postliberal intention, according to which the cultural-linguistic perspective opened up for a thorough distinction between the idea of a neutral ground and a meaningful theology. Instead of using this insight in order to make the academy more pluralistic, however, postliberalism has not developed the necessary tools for discriminating sufficiently between its own operations as Church theology and its possible role as academic theology in a pluralist academy.

Thus, it is still mainly the proponents of “liberal” theological perspectives that actively try to engage in dialogues with other religions and with science. In its more fashionable postliberal mode, contemporary academic theology seems to have forgotten various aspects of the task of being related to the academy at large. Not in the sense that postliberal theologians are isolated or hesitant to engage in any dialogue with philosophy and theory, on the contrary. But – with some exceptions, such as Nancey Murphy (Murphy 1997) – theologians with postliberal inclinations are not usually that interested in the religion-science dialogue. One reason is of course that science in their eyes still represents a naïve idea of the preponderance of secular reason. But it might perhaps also be understood as a consequence of the premodern nostalgia that lurks beneath several postliberal visions.

This tendency – this ecclesiological reduction of theology through postliberal influence – has also sharpened the conflict between theology and religious studies. Barthian aspirations has always been difficult to relate to a general scientific study of religion, and it largely remains for postliberal theologians to show how their important perspectivist criticism of the secular can open itself for a more thorough and self-changing dialogue with other perspectives.

Cross-References

- [Bible as Literature](#)
- [Philosophy of Language](#)
- [Radical Orthodoxy](#)
- [Religious Experience](#)
- [Systematic Theology](#)
- [Truth](#)

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Postmetaphysical Theology

- [After-Metaphysical Theology](#)

Postmodern A/theology

- [Religion, Theory of](#)

Postmodern Religious Theory

- [Religion, Theory of](#)
-

Postmodern Theology

- [Religion, Theory of](#)
-

Postmodernity

- [After-Metaphysical Theology](#)
-

Post-Post-Modern Pragmatism

- [Pragmatism on Religion and Science](#)
-

Post-Secular Theology

- [Postliberal Theology](#)
-

Potential Energy

- [Energy in Physics](#)
-

Practical Logic

- [Logic, Informal](#)
-

Practical Reasoning

- [Logic, Informal](#)

Practical Theology

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Related Terms

[Academic theology](#); [Religious education](#); [Religious practice](#)

Description

The theological discipline *Practical Theology* deals with the theological research of the field of theory-practice relations within Modernity's religion. Practical theology is a field of various studies, and at the moment there is no shared or undisputed consensus about the internal relationship of the two concepts "theory" and "practice" in this discipline. Practice may be viewed (1) as an expression of theory *or* (2) theory may be looked upon as a superstructure upon practice *or* (3) both may be interrelated in complex ways.

The subjects of practical theological research may include organized forms of practice within congregational churches and more individualistic expressions of religiosity as well. In concrete, practical theology will cover a broad field of disparate disciplines: Liturgy, homiletics, pastoral care, hymnology, ► [religious education](#), catechesis, ► [sociology of religion](#), and congregational leadership. These studies may include further subdivisions often determined by the adequate methodologies: cultural studies, medial studies, ritual studies, semiotics, rhetoric, theories of the sociology of religion and general theories of religion. The list is not final but subject to current changes.

Historically, the discipline of practical theology presupposes the rather general theory-practice distinction within academic theology

that came up during the German Enlightenment in the eighteenth century. In earlier times, the notion of “*theologia practica*” had epitomized the experiential theology of faithful interpretation of the bible contrasted by the “speculative” scholastic theology which, however, sixteenth century Reformers accused for failing the true interests of faith. As an example, Martin Luther says in a famous statement: *Vera theologia est practica et fundamentus eius est Christum* (“True theology is practical, and its fundament is Christ”). This rather indeterminate definition of practical theology was left behind during the development of Protestant tradition in seventeenth, eighteenth, and nineteenth century where new distinctions came up generated by the oscillating theory-practice relations between church leadership, the individualized experiences of faith and theological studies. These upcoming distinctions between an academic interest and the concrete practices of ► [Christian faith](#) enforced the development of a specific theological discipline, practical theology. In premodern society both religious practice and theological reflection had been part of society’s religion although in differing ways. During the period of so-called Orthodoxy “theoretical” theology, i.e., church teaching and doctrine had the undisputable and normative prevalence compared to the role of individual religious experience that was considered secondary and applicative to the doctrinaire teaching. Later on, in the period of *Pietism* this relationship generally was turned upside down: Not *teaching*, (*Lehre*, German) but “Life,” (*das Leben*, German) had the dominating primacy. In the early Modernity during *Enlightenment* the first steps were taken to define a sober distinction between the actual religious practice and the academic, critical task of intellectual inquiry. Such a distinction does not generally imply any oppositional separation between “science” and “religion,” science being “rational” and religion (and theology) being irrational. At the contrary, Modernity’s ► [academic theology](#) seeks to bridge over this gap trying to synthesize the interests of the faith and the interests

of critical inquiry. These two perspectives should not be regarded as exclusive toward each other. So modern theology in its self-critical stand, on the one hand, will develop religion’s emancipating potentialities and criticize religion’s mythological and suppressing worldviews and – concurrently – on the other hand, theology may acknowledge the complexity and valuable contributions of science. From the days of Enlightenment an onward Protestant religious tradition generally has denied any final division between faith and science. Faith and science may represent certain functionally differentiations of modern culture and society (Luhmann), but they are not exclusive to each other. From now on theology seen as “the theory of religion” will establish its position researching the practice of faith in an academic attitude. The practice of the “enlightened” faith and the academic task finally shares the concern of the realization of human freedom.

Reflecting these conditions the German theologian *Friedrich Schleiermacher* at the beginning of the nineteenth century played a unique historical role in his structuring and clarification of the relations between theology and religious practice. Challenged by modernity’s idealistic philosophy and concurrently criticizing religion’s inherent “barbaric” tendencies Friedrich Schleiermacher insists that theology as a theoretical endeavor studying the expressions of faith shares the spirit of liberation with modern culture. So, theology still has to take place at the university being part of the academic universe. Concurrently, Schleiermacher in his insisting on the concept of religious freedom finds that religion has to be dealt with in terms of personal and congregational autonomy. The state should neither organize the practical issues of church guidance nor should the state dominate the individual’s religiosity. Nonetheless the church needs academic support for the leadership in actual practice. The Christian religious communication circles at differing levels of individual and communal exchange inside church seen as a concrete, positively given religious

community. Therefore the church's leadership needs integrative and academic perspectives in order to clarify and correct its guidance and teaching. Only through theological research and critical reflection at an academic level the church may avoid bare traditionalism and arbitrary decisions in its enhancement of the autonomous life of faith. Consequently, Schleiermacher values theology (including practical theology) as a kind of "positive academic task" related to the congregation of faith. The task is to equip church leaders in their guidance of the church in order to evoke the emancipating experience of autonomous self-consciousness; in so doing theology is a "positive" academic affair compared to the "clean" exclusively "theoretical" sciences like, e.g., philosophy.

To serve this "positive" goal Schleiermacher differentiates the academic theology in three distinct groups of disciplines, which he describes in the famous "tree metaphor." As "root" of the tree serves the *philosophical dimensions* of theology that have to clarify the religious "idea." Thus philosophical theology defends the faith against unjustified assaults and corrects the faith against misuse and unclear conceptualizations. The "trunk" of the theological tree consists of the *historical disciplines* (exegesis of the Hebrew Scriptures and of the New Testament's scriptures; church history and dogmatic, which is a discipline that later on has found its place within the philosophical disciplines), and finally *practical theology* is the "crown of the tree." There is no valuation inherent in the conceptualization of practical theology as the "crown." Practical theology comprehensively deals with the "teaching of the art" (*Kunstlehre*, German) of church leadership. In Schleiermacher's perspective such a correlation between theology and religious practice includes radical academic freedom, the freedom to inquiry, and critique and the recognition of the actual church leaders' autonomy at the same time. Through differentiated, complex, and weighted exchange both the academic task and the religious autonomy should meet in a balanced relationship.

Since the days of Schleiermacher in the early nineteenth century the discipline of practical

theology in its connection to religious practice has undergone huge methodological and partly also substantial refinements. But still the basic distinction between the academic task of critical research and the commitment to concrete religious practice seems to sustain. Among the most important new perspectives may count that the relationship between the institutional church of early Modernity in Schleiermacher's time and modern culture has changed dramatically. Whereas religion used to be embedded as part of a firm church institution dominating the field of religious expressions nowadays religiosity often exists with just casual and loose formal connections to specific religious congregations and institutions. In such case practical theology cannot keep up a consciousness of being the "teaching of the art" of church leadership directed toward a specific congregation. Rather, practical theology nowadays has to reconsider its general task of studying theory-practice relations in a way that connects to a much broader field of modernity's recent religious movements. Such may include the study of religion in the new medial situation with internet and mobile phone.

Self-identification and Characteristics

- (a) Practical Theology (at least in the European context) generally identifies itself as partaking of the academic universe. Hereby it is not excluded but rather included that there may be very differing opinions of the specific goals of concrete fields of research.
 1. Part of the research will be empirical, e.g., practical studies may research the sociology of the actual life and faith practice of a concrete parish or a religious community. Practical theology in this case seems quite "secular" and "scientific" offering a theoretical reconstruction of the practice of faith in liturgy, worship, and congregational life. However, most practical theologians will not find their end goal in a mere statistical or empirical research.

2. Rather theologians will insist on the integrative and hermeneutical dimensions of their work. Empirical data, liturgy, and other practices of faith may express culturally given symbolic representations. Such representations will call for further and more substantial interpretation. Practical theologians will often insist that the specific issue at stake in a concrete research has not yet been subject to any adequate description unless a comprehensive interpretation respecting the material's own complexity has been undertaken. In opposition to mere statistical, analytical, or empirical research and in opposition to reductive methods practical theology generally wants to insist on the theological dimensions of practice by emphasizing such a comprehensive, interpretational task.
3. In a final step spokesmen of practical theology may want to bring their research into an *active response* to concrete practices of faith that are actually taking place. By theology's transgressing a mere *researching* stand in its relation to practice and in its turning to an actively *responding* to and *restructuring* of practice, however, practical theology may get close to being itself part of religious practice. Actually, practical theology may take the position of an advisor's role in making suggestions for adequate solutions to concrete issues concerning the practice of church and practices of faith. These may for example touch the concrete organization of the religious community, liturgical changes, and methods for pastoral care.

Despite such interactions between theory, research, and practice, generally the practitioners of the discipline of practical theology will deny any direct "religious" dimension of their work. Referring to their methodological and systematic framework they will insist on the academic, nonreligious standing of their endeavour.

Conclusively, in the sense of an ordinary science only a small part of practical theology strictly may be named "science"; so it is at least

if by "science" is meant empirical or physical research. Nonetheless, in a broader, hermeneutical, social, and interpretational sense practical theology like other philosophical, social, and humanistic disciplines will share the stand of a hermeneutical method of research being itself systematically and methodologically disciplined in its dealing with complex and irreducible themes of symbolic representation. In this point practical theology takes a position not unlike other hermeneutical methods and disciplines, e.g., literary critics, psychology, and theatricality. Further, certain levels of *interaction* between actual practices of faith and theological research may evolve. However, the interaction between theological research and actual practices of faith will not imply that practical theology itself should be recognized as "religious."

Relevance to Science and Religion

Practical theology deals with actual religious practices which are social, ritualistic, and interpretative and do not present perspectives of its own concerning specific issues, e.g., the "Science and Religion" theme.

Sources of Authority

The methodological clarification made by Friedrich Schleiermacher in his *Kurze Darstellung des theologischen Studiums* from 1811, [1830²] might be said to be a main text. Nowadays, we may find a very broad and differentiated field books and articles; cf. Christian Gretlein and Michael Meyer-Blanck (Eds.). (1999). *Geschichte der Praktischen Theologie. Dargestellt anhand ihrer Klassiker*. Leipzig.

Ethical Principles

Practical theology is undertaken in responsibility to the highest general academic standards for research and publication.

Key Values

Practical theology does not represent any other specific values than the general values of academic research and publication.

Conceptualization

As a field of research concerning concrete interrelations of theory and ► [religious practice](#), the discipline itself does not represent specific theological or academic points of view besides the general academic standards. So the discipline does not represent specific valuations or inclinations concerning disputed metaphysical or scientific issues, e.g., about nature, human being, life and death, reality, knowledge, truth, perception, time, consciousness, rationality, and mystery.

Cross-References

- [Freedom](#)
- [Secularization](#)
- [Systematic Theology](#)
- [Theological Anthropology](#)

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Pragmatism (Theological Interpretations)

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Description

Pragmatism is originally an American philosophical movement with vague boundaries rather than a tradition. The movement emerged in the late nineteenth century, flourished at the beginning of the twentieth, and has reappeared strongly at the end of the twentieth and the beginning of the twenty-first century as current pragmatism. Academic theologians have been inspired and challenged to respond to the thrust of pragmatism and develop theological interpretations of pragmatic thought especially since the 1960s. This has mainly been an American movement with its impact on Protestant theology during the last roughly 50 years when the dominance has changed from German to American. Today much of what is named constructive theology, in the Protestant world, is informed by pragmatic reasoning although this identification is rarely used.

Self-Identification

Theological pragmatism is neither a religion nor a science but a movement and methodical perspective in the history of ideas. It proceeds from the liberal tradition of thought, emphasizing the liberation from anything that dictates or constrains an independent inquiry. In religion and science-discussions, theological pragmatism has promoted ways of thinking that does not strictly follow the authority of a religious tradition or the rationality of any single scientific discipline. Instead conceptions have been developed of what is meaningful and true in terms of what provides orientation for human life and promotes coherence between religious practice and common intellectual principles.

Characteristics

It discards any foundationalist attempt to attain indubitable knowledge as well as it rejects a reduction of what can be regarded as true only to empirical test in positivist terms. A leading idea is that what is true is what is meaningful. From the perspective of theological pragmatism this can be spelled out in terms of what leads to human flourishing and advances humane values. Theology should, from a pragmatic point of view, serve the cause of religion for an orientation in life. And religion should be sensitive to results from scientific investigation and theological reflection and recognize the limits of religious claims.

Relevance to Science and Religion

Theological pragmatism does not give any superiority to religious claims, but rights to them as significant perspectives of the world, with the possibility and demand to be judged by their fruits and not their roots. Because it stands critical against both religious assertions on the basis of belief as well as scientific positions grounded in restricted disciplinary investigations, theological pragmatism has a distinctive voice trying to bridge between religion and science. And at the same time it serves as a two-ways critique of both religion and science.

Sources of Authority

There is no given authority from a set beginning, but the authorization comes in the end, with the result and effect for human life and a humane world. The means for this is a rational analysis of the circumstances in which we live and the creative efforts to improve these by the critical and constructive potential of religion and theology. Building on leading insights from philosophical pragmatism, current theological pragmatism has learned and benefited from feminist influences and contextual and political theologies, delivering important, although not authoritative, methodical perspectives.

Ethical Principles

To honor the independent inquiry of the states of affairs in the human world from a perspective of theological reflection, using the resources of religious tradition without subscribing to any given authority except what advances the fulfillment of humane values.

Key Values

To provide adequate orientation for human life and promote instrumental values for a social context which serves human flourishing.

Conceptualization

Nature/World

Theological pragmatism learns from naturalism to focus on the world we know without reducing reality to the empirical world. What is the natural and what is the social world cannot be clearly divided because what is regarded as natural givens and social constructs are interwoven.

Human Being

Humans have a unique capacity and responsibility and need to focus on the results of her behavior. Instead of being led by dogmatic assumptions or a restricted perspective, the objective should be to cultivate what is distinctive human and promote humane values.

Life and Death

At the core of theological pragmatism there is an ambition to argue for and encourage all that enhances life, particularly human life. There is very little occupation with the notion of everlasting life since the focus is on this very life in the world and how we live it. Death is the limit beyond which we cannot tell.

Reality

Theological pragmatism focuses on the empirical world without reducing reality only to what can

be empirically tested. There is openness for what can be regarded as mystery and hence not explainable.

Knowledge

Knowledge has a great instrumental value in building a more humane world. Theological pragmatism proceeds from a principle which says we will never be sure about what is the final truth or absolute knowledge.

Truth

Truth is conceived as the result of a rational inquiry judged by instrumental values, and not the property of things "out there." Truth is replaced by meaning as the decisive arbiter in theological pragmatism. But truth is not rejected as a valid concept, rather reconsidered in light of instrumental values and regarded as always in the making rather than contained in any set of conceptions.

Perception

In theological pragmatism, there is a focus on the empirical world, i.e. what can be perceived. But there is also generally openness for the possibility to conceive, and sometimes also perceive, dimensions of reality which go beyond the strictly empirical sensations.

Time

With time follows experience, and with experience learning that adds to human views. Not always in good directions, but in total to a development in many respects for humanity. This main view is in the background of the positive approach of theological pragmatism in general to the ordinary flow of time and the evolution that follows. This is to be said without claiming any blind optimism about a linear development.

Consciousness

The human consciousness, bound to bodily existence, is unique as far is known. This leads theological pragmatists to concentrate on human capacities without ruling out, or affirming, any other kind of consciousness in reality.

Rationality/Reason

An underlying aim of theological pragmatism is to build, critically and constructively, on religious tradition, and to present religion in a secular world so it can be understood, and argued for, in rational and reasonable ways. By this procedure, religion and theology can also contribute to a contemporary rationality and reason that runs the danger of being reductive.

Mystery

That which is enigmatic lies in the domain of sciences to explore and eventually explain by means of disciplinary investigations. But what goes beyond the explainable and is regarded as mystery is often the point of departure as well as the point of arrival for religious speculations and theological reflections. And theological pragmatism defends the rationale in dealing with mystery, but tries also to build bridges between these issues and everyday life.

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Pragmatism on Religion and Science

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Related Terms

[New pragmatism](#); [Post-post-modern pragmatism](#)

Pragmatism's Philosophical Outlook

Pragmatism emerged as a distinct philosophical movement during the second half of the nineteenth century, and its “classical” era stretches well into the twentieth century, when it gradually blended with, and was superseded by, analytical and positivistic approaches. Its leading exponents were Charles Sanders Peirce (1839–1914), William James (1842–1910), and John Dewey (1859–1952). Other notable figures include George Herbert Mead (1864–1931), Clarence Irving Lewis (1883–1964), F. C. S. Schiller (1864–1937), and Sidney Hook (1902–1989). During the 1970s and 1980s, pragmatism reemerged as a distinct philosophical movement, mainly through the work of Richard Rorty (1931–2007) and Hilary Putnam (b. 1926). This entry concentrates entirely on what can reasonably be considered the founding figures of classical pragmatism, namely, Peirce, James, and Dewey (for more on contemporary pragmatism, see the entry on ► [Neopragmatism](#)).

Pragmatism's philosophical outlook is thoroughly naturalistic and transactional in the sense that human life and human practices are understood to have emerged and developed through an immense number of transactions with the environment. Although there are significant differences between everyday routine actions and abstract scientific reasoning, there is still continuity in all human behavior in the sense that it has evolved in response to problems in our interaction with the environment. Accordingly, pragmatists vigorously oppose dualistic analyses of human mind and

thought, such as René Descartes' (1596–1650) division between thinking and extended substance (*res cogitans* and *res extensa*). They also oppose mental analyses of belief solely in terms of inner states. In the spirit of Alexander Bain (1818–1903), beliefs are defined as habits of action – as that upon which we are prepared to act. Accordingly, genuine doubt – as opposed to Cartesian “paper doubt” – is a highly practical affair, an irritating uncertainty about how to act under specific circumstances.

Pragmatists understand human interaction with the environment to move along the axis equilibrium, loss of equilibrium, doubt, inquiry, resolution of doubt, and restoration of equilibrium. When there is equilibrium between organism (for instance, a human being) and environment, life is mainly directed by instincts and habit. However, problems frequently arise when established habits and patterns of action have unexpected and frustrating results. This gives rise to doubt, which is both frustrating and threatening. The human response to doubt is *inquiry*, where the elements of the situation are examined with the purpose of formulating a problem that directs inquiry. Once a problem is specified, we can develop hypotheses about how to resolve the problem and then put the different hypotheses to the test. As soon as we find a satisfactory solution, doubt is laid to rest, and the process of inquiry comes to an end. The new equilibrium contains a wider repertoire of habits and ways of responding and is, in that sense, richer than the previously upset equilibrium.

The overall pragmatic understanding of both science and religion is in line with its general naturalistic approach. In this context, it deserves mention that the views of classical pragmatists are clearly influenced by rather liberal versions of Protestant Christianity, which dominated the educated classes of the American northeast, where Peirce, James, and Dewey spent most of their lives. Hence, they lay much emphasis on the moral and existential functions of faith and downplay the role of dogma and religious authorities.

Science and religion can both be understood and analyzed as elements of the repertoire we draw on in interaction with the environment

to find satisfactory solutions to problematic situations. To use a terminology that the classical pragmatists did not use themselves, we can initially say that science and religion are different human *practices* (or rather different sets of practices) that enable us to interact more smoothly and fruitfully with the environment. Furthermore, adequate understanding of human practices requires an adequate general understanding of human practices, a pragmatic ► *philosophical anthropology*, which functions as a kind of interpretative scheme in the examination of different human phenomena.

Despite some differences in the classical pragmatists' approaches to both science and religion, we can say that, in general, pragmatism conceives of the relation between science and religion in terms of a division of labor, where religion is concerned with the existential and moral elements of life, while science is the systematic examination of the nature of the forces which govern the physical universe. Considered as *ideal types*, the two practices complement one another and can coexist without conflict, provided that we have an adequate understanding of both.

Peirce: Scientific Reasoning and the Reality of God

Peirce was a brilliant logician, scientist, and mathematician, but he never succeeded in obtaining any stable academic position and, thus, spent much of his life in relative poverty. His writings only gained a larger audience when seven volumes were compiled and edited by Harvard University Press between 1931 and 1958.

Peirce himself claims that the fundamental ideas of pragmatism took form in a discussion club in Cambridge, Massachusetts, during the 1870s, "The Metaphysical Club" with Peirce and James among the organizers. He developed some of these ideas in two articles named "How to Make Our Ideas Clear" (1877) and "The Fixation of Belief" (1878). Here, Peirce suggests the pragmatic method as a method to clarify the meaning of statements such as "diamonds are

hard." According to Peirce, such statements can be clarified by specifying what we (empirically or experientially) expect would happen in different situations involving diamonds, for instance, that we can use diamonds to scratch surfaces made of other materials, that a diamond would not be crushed if we hit it with a hammer, and so on. The conjunction of all these expectations constitutes the meaning of the statement "diamonds are hard." Peirce sums up his thought in what later came to be called "the pragmatic maxim":

Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (Peirce 1935, § 402)

The pragmatic method is not only useful to clarify meaning; it can also help us resolve certain pointless disputes in philosophy and theology. When confronted with a controversy like that between the doctrine of transubstantiation and symbolic understandings of the Eucharist, we can ask the question: Are there any experiential effects that one side predicts and the other denies? If yes, we have a method to resolve the dispute. If no, the controversy turns out to be a pseudodebate, a mere play with words, because the alternatives actually *mean* the same.

Peirce's view of the relation between religion and science differs depending on whether religion is seen mainly as a practical affair, where sentiment and instinct are more reliable than reason, or a theoretical affair, where it becomes much closer related to scientific inquiry. In practical matters, conservatism is the first rule since we should trust the vast fund of human experience through the ages to be basically right. There is, accordingly, a stark contrast between the different attitudes appropriate in practical and theoretical affairs. In science, which is the paradigm of theoretical reasoning, a scientist should be prepared to "drop the whole cartload of his beliefs, the moment experience is against them" (Peirce 1931, § 55). Such tentative commitments are, according to Peirce, utterly inappropriate in practical affairs. We should not, for instance, only tentatively accept the universal ban on incest, because we should expect that social

habits that have developed over a long period of time have survival value and contain important lessons. Nonetheless, as the example shows, both science and religion are *communal* practices, where well-founded views can only be attained within a community large enough to root out “the vagaries of me and you.”

For Peirce, scientific inquiry – like any inquiry – is triggered by doubt and driven by a desire to replace doubt with belief. He famously distinguished three phases of scientific inquiry: (1) *abduction* (the tentative formulation of a theory which, if true, would explain the problem), (2) *deduction* (the deduction of some prediction which the hypothesis makes that is possible to verify or falsify experimentally), and (3) *induction* (the process where we gather data to determine whether the predictions hold true or not). Each phase contains different kinds of challenges and modes of reasoning.

Science is never the root of religion: religious commitment is born out of man’s “religious sensibility,” a sensibility which is not primarily rooted in theoretical reasoning (Peirce 1936, § 433). However, theoretical reasoning can serve to give a religious sensibility more definite shape. Here, the first phase of inquiry is the most relevant. Abduction involves giving imagination free play, a process that eventually results in the formulation of hypotheses. Applied to the cosmos as a whole, Peirce holds that free play of the imagination leads any sane man to the hypothesis of God, but not so much in terms of a teleological argument for God’s existence based on traces of benevolent design (like in teleological arguments for God’s existence), but rather in terms of the existence of that correlation between thought/reasoning and reality that makes inquiry meaningful. It is the very possibility of science, rather than any specific scientific results, which leads any sane man towards the hypothesis of God, and the reassurance to be had from this theoretical insight is mainly optimism regarding the future prospects of inquiry. This, Peirce claims, is an often neglected argument for the reality of God, and he adds that given its independence of specific scientific results, a community of religious believers can fully

resolve that “any change that (scientific) knowledge can work in (its) faith can only affect its expression, but not the deep mystery expressed” (Peirce 1936, § 432). Even when religion and science draw on the same type of reasoning, adequate understanding of both types of practices indicates that they are not in conflict.

James: The Scientific Study of Religion and Its Limits

If Peirce stresses the importance of community in most aspects of life, James’ approach to religion is much more individualistic. James was convinced that religion plays its most important role in the experiences of subjects struggling to find existential meaning in a universe that often seems indifferent to their endeavors. As such, religious beliefs differ significantly from scientific hypotheses, and the criteria for how to make choices in science and religion must look rather different.

James spent most of his life at Harvard University and played a crucial role in the development of psychology as a scientific discipline with the publication of *The Principles of Psychology* in 1890. Here, James advocates a naturalistic or, as he calls it, “positivistic” approach to psychological phenomena. He writes in the preface:

This book, assuming that thoughts and feelings exist and are vehicles of knowledge, thereupon contends that psychology, when it has ascertained the empirical correlation of the various sorts of thought or feeling with definite conditions of the brain, can go no farther – can go no farther, that is, as a natural science. (James 1890 p. 6)

If it does, it becomes metaphysics. This theme is echoed in his Gifford lectures of 1901–1902, *The Varieties of Religious Experience*. Here, James distinguishes between *existential* and *spiritual judgments*. Psychology can make existential judgments about religious experiences, that is, study their origins in terms of psychological or somatic causes. However, psychology can never determine the *value* of a religious experience in terms of a spiritual judgment. Consequently, he attacks “medical materialism,” the reductionist view according to which science proves that

religious experiences are nothing but somatic or psychological states of the experiencing subject, as metaphysical rather than scientific. Science can never pass spiritual judgments on religion or religious experience, not even in extreme cases such as that of the founder of the Quaker movement, George Fox (1624–1691), whom James himself characterizes as “a psychopath or *détraqué* of the deepest dye” (James 1902, p. 7).

Spiritual judgments have nothing to do with the causes of experiences, but are “based on our own immediate feeling primarily; and secondarily on what we can ascertain of their experiential relations to our moral needs and to the rest of what we hold true” (James 1902, p. 18).

Here, we encounter a distinctly Jamesian theme: there is a territory of “overbeliefs,” different philosophical, existential, and religious standpoints which shape our outlook on life and which science can neither verify nor falsify. We are, according to James, rationally entitled to choose overbeliefs on pragmatic grounds, hence preferring those we find satisfactory because they appeal to our emotional and existential experiences. Most well known is probably James’ defense of “the will to believe doctrine”: “Our passionate nature not only lawfully may, but must, decide an option between propositions whenever it is a genuine option that cannot by its nature be decided on intellectual grounds” (James 1897, p. 11). The right to believe that James refers to applies only to the choices that are *live* (more than one alternative appeals to us), *momentous* (choice is significant and definitive), and *forced* (refraining from choice is practically indistinguishable from choosing one side, like in the case of Christianity versus agnosticism). With this doctrine, he attacks thinkers such as W. K. Clifford (1845–1879) who claimed that “[i]t is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence” (Clifford 2001, p. 85). That attitude is completely inappropriate in the spheres of life where conclusive evidence is never forthcoming, and a refusal to make up one’s mind actually means choosing disbelief over belief.

In *Pragmatism* (1907), the defense of the right to believe on pragmatic grounds is restated;

however, here the difference between the scientific and the religious setting is downplayed. Scientific theories are (just as much as overbeliefs) beliefs with definite consequences, and as such, their truth value is determined by whether or not they work well when put to use in prediction and application. Pragmatic criteria are thus not limited to the realm of overbeliefs but in use everywhere, although they look different depending on context. However, James qualifies his account by adding that for a belief to be true, it must function well in the long run and harmonize with other beliefs we hold true: “the greatest enemy of any one of our truths may be the rest of our truths” (James 1907, p. 31).

The so-called pragmatic theory of truth is one of the most controversial and debated elements of James’ philosophy. Most philosophers agree that there is a logical difference between what is true and what has good consequences and that even if belief in the existence of God has good consequences, even in the long run, it may turn out to be false. Still, it seems that this is exactly what James denies when he claims that a satisfactory belief is thereby rendered true. There is not enough space to cover the extensive general discussion on the relation between pragmatic criteria and truth here. As regards religion, whether this objection is devastating or not depends – as critics such as Bertrand Russell (1872–1970) are well aware – on what you mean by the concept “God” (e.g., Russell 1945). Near the end of *The Varieties of Religious Experience*, James supplies a pragmatic analysis of “God” which he opposes to more traditional philosophical definitions. Speaking of “the unseen region” beyond our own consciousness, he writes the following:

Yet the unseen region in question is not merely ideal. For it produces effects in this world. When we commune with it, work is actually done upon our finite personality, for we are turned into new men, and consequences in the way of conduct follow in the natural world upon our regenerative change. But that which produces effects within another reality must be termed a reality itself, so I feel as if we had no philosophic excuse for calling the unseen or mystical world unreal. . . . I only translate into schematic language what I may call

the instinctive belief of mankind: God is real since he produces real effects. (James 1902, 516f)

A real, as opposed to illusory, God is thus a God which performs a transforming function in believers' inner lives rather than the *ens realissimum* of classical theology. It is the former rather than the latter kind of God towards which pragmatic arguments point, and this also means that although religion can be studied scientifically to a limit, the two practices are not in conflict.

Dewey: Religion, Science, and the Quest for Certainty

Dewey, too, was attracted to the idea of a division of labor between science and religion, but he was convinced that such a division of labor could only be effected if we reconstruct our understanding of both science and religion. We need to break the hold of what he called the "spectator theory of knowledge," a view which construes knowledge acquisition as a passive process, where the object of knowledge remains unaffected throughout, and the paradigm metaphor for knowledge acquisition is that of seeing. A supreme intellectual challenge is that the spectator theory of knowledge fails to give any coherent account of the most successful forms of knowledge acquisition that we know of – mainly scientific inquiry. As a consequence, Dewey holds, "[c]onditions and forces that dominate in actual fact the modern world have not attained any coherent intellectual expression of themselves" (Dewey 1984, p. 62).

Dewey was immensely productive throughout his long career, and apart from philosophy, he also published extensively on psychology and pedagogy. In his philosophy, which he often labels "instrumentalist" rather than "pragmatic," he attempts to spell out the intellectual consequences of an adequate understanding of scientific inquiry. Here, I will only go into these ideas to the extent that they are relevant for understanding the relation between science and religion.

Dewey suggests that rather than distrusting scientific inquiry, we should dismiss the metaphysical presuppositions of the spectator theory of knowledge and develop new accounts of knowledge acquisition that offer a more coherent articulation of the transactional nature of scientific inquiry. Such an account should acknowledge that knowledge acquisition is an active process and that the objects of knowledge are constituted as objects of knowledge through the processes by which they become known. Scientific theories extend our capacities of prediction and control, but are not to be conceived of as a corrective of our ordinary conception of the environment.

Religion is of special importance here since it has become so closely allied to the spectator theory of knowledge, primarily in its conception of God. In *A Common Faith* (1934), Dewey argues that the alliance is in fact contingent and historical and, hence, possible to dissolve.

Dewey refuses to see religious experiences as set apart by the object which is experienced. Instead, he holds that religious experiences are set apart by a particular quality involving the relation between ideal and actual states of human life. Dewey here distinguishes between "religion" and "the religious." Religion is the doctrinal and institutional elements of religion. The religious is a quality of experience which is present whenever current states of affairs are improved and brought closer to what we consider *ideal* states of affairs. Such experiences as religious experiences are possible because human beings are capable of forming ideals *and* pursuing them intelligently. The religious thus exists prior to religion, and often enough, religion hampers the religious, for instance, by linking the religious to intellectually and morally dubious claims. Dewey's proposed solution is to liberate the religious by reshaping religion:

It is admitted that the objects of religion are ideal in contrast with our present state. What would be lost if it were also admitted that they have authoritative claim upon conduct just because they are ideal? The assumption that these objects of religion exist already in some realm of Being seems to add

nothing to their force, while it weakens their claim over us as ideals, in so far as it bases that claim upon matters that are intellectually dubious. (Dewey 1934, p. 41)

Dewey hence rejects the traditional theistic understanding of God as “a particular Being” and claims that to liberate the religious impulse, we should rather understand God as “the ideal ends that one acknowledges as having authority over ... volition and emotion, the values to which one is supremely devoted” (Dewey 1934, p. 42).

A shift in our modes of thinking about both science and religion makes possible a reconciliation of the two practices along the lines of a division of labor. It is tempting to understand this division along the lines of the fact-value distinction, between what is the case and what we think should be the case. This is correct as far as it goes, but it is important to remember that Dewey rejects the classical fact-value distinction because of its dependence on a spectator theory of knowledge. Inquiries are instituted where there is a frustrating absence of equilibrium with the environment, so any “factual” inquiry actually presupposes certain value judgments (such as that something is problematic about present conditions). Furthermore, values are not merely subjective whims, but are accountable both to what is possible and what can be shown to function well all things considered. Inquiry into ideals thus requires the operation of intelligence just as much as inquiry into the factual, and there is just as little space for appeals to revealed truths or supernatural sources of knowledge.

Summary

In sum, we can say that although the classical pragmatists have somewhat different views of both science and religion, there is still basic agreement among them on two points of central importance for our view of (the relation of) science and religion: (1) that a pragmatic philosophical anthropology is an important interpretative framework for an adequate understanding

of both kinds of practices *as* human practices and (2) that with the help of (1), we can describe the relation between science and religion in terms of a division of labor, which means that they, at least as ideal types, are not in conflict. Neither do they compete with one another.

The idea of a division of labor implies that science and religion perform different functions in human life, and although the function of religion is described in somewhat different terms by Peirce, James, and Dewey, they can still be said to agree that religion is mainly concerned with the ideal and moral aspects of life, both individually and communally. As already mentioned, this view is in line with much liberal Protestant thought at the time, but it can also be considered a serious attempt to show how two of the most significant practices in human life can be reconciled despite a long history of conflict and mutual distrust.

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Pratītya samutpāda (Sanskrit)

- [Dependent Arising](#)

Predestination

- [Causality in Physics](#)

Predictability

- [Causality in Physics](#)

Prediction

- [Astrology](#)

Prevention Psychotherapy

- [Counseling Psychology USA/Europe](#)

Primatology

- [Biology of Religion](#)

Principle of Relativity

- [Relativity](#)

Prion

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An infectious agent that is composed only of proteins. Prions cause a number of diseases, including “mad cow disease” or bovine spongiform encephalopathy (in cattle – transmissible in some cases to humans), scrapie (in sheep), and Creutzfeldt-Jakob disease (in humans). They are thought to cause infections and multiply by causing similar normal host proteins to convert into their abnormally structured form via refolding.

Prions and Memory

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Prions are proteins that can flip between two different conformations. When they adopt one of the conformations, they can reproduce by converting other proteins into copies of themselves. Such replicating prions are harmful if “offbeat” prion domains attach to one another to clumps. This state causes them to gain a toxic function leading to neurological disorders like “Bovine Spongiform Encephalopathy” (BSE) in cattle and “variant Creutzfeldt-Jakob Disease” (vCJD) in humans.

Searching for the means that stabilize long-term memory in *Aplysia*, Eric Kandel and coworkers focused on replicating prions that lack such “offbeat” domains. They identified beneficial prion-like properties in a neuronal member of the CPEB family (cytoplasmic polyadenylation element binding protein) that

regulates mRNA translation. It is hypothesized that conversion of CPEB to a self-perpetuating prion-like state in stimulated synapses helps to sustain the perpetual protein synthesis necessary to maintain long-term synaptic changes.

Prismatic Clock

► Prismatic Theology

Prismatic Language

► Prismatic Theology

Prismatic Theology

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Related Terms

Judeo-Christian tradition; Prismatic clock;
Prismatic language; Theories of light and color

Description

► [Prismatic Theology](#) is a theological perspective within the Judeo-Christian tradition based upon a method of study that combines the science of light with the interpretation of Scripture. ► [Prismatic Theology](#) is therefore defined as the study of sacred text through the science of light, light energy, color, and optics. By applying the science of light to the study of biblical text, ► [Prismatic Theology](#) creates a bond between science and religion. The following information offers a brief overview of the prismatic method of study and its origins.

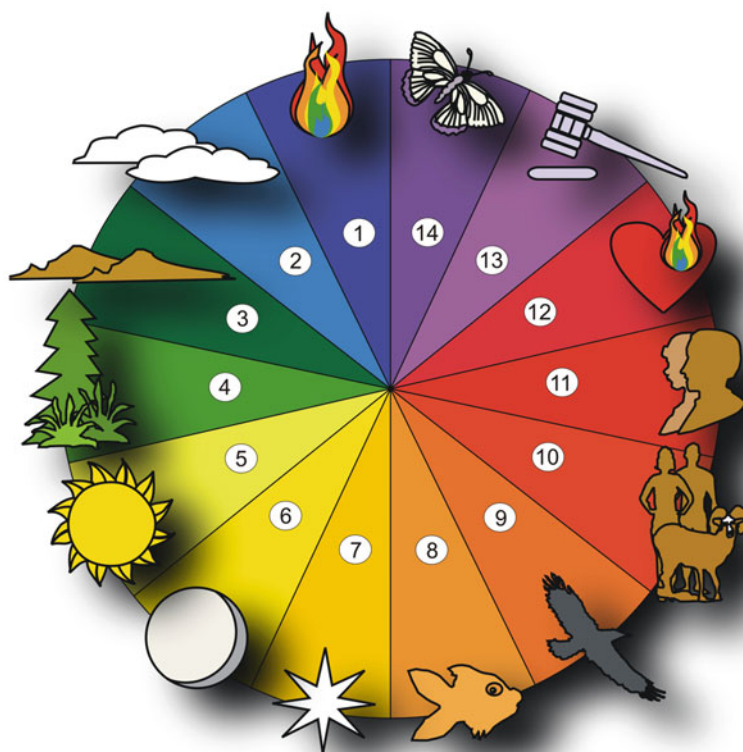
► [Prismatic Theology](#) begins with the understanding that light, color, and image was the

oldest and therefore *primary* form of spiritual communication between God and the human soul/spirit/mind/heart. From this viewpoint, it follows that the development of human languages, oral and written, became a *secondary* form of spiritual communication between God and the human soul/spirit/mind/heart during the unfolding of human history. Hence, the sacred texts of the Judeo-Christian tradition are perceived to be *secondary* forms of communication. This perspective does not diminish the importance of biblical text or the sacred quality of the text. It simply asserts that a *primary* form of spiritual communication not only pre-dated the development of sacred text but may have influenced the writing and recording of sacred story.

Thus, the prismatic theologian critically searches biblical text for evidence of the *primary* communication through light, color, and image which may be entwined within or obscured by the *secondary* form of communication through written language. Genesis 1 provides ample evidence of the *primary* form of communication embedded within sacred text because the text itself follows the color order of the visible spectrum of light. Therefore Genesis 1, as recorded in the Hebrew Bible, forms the foundation for the prismatic method of study.

The ancient writers of Genesis 1 did not need to understand the science of light in order to employ the visible spectrum as a framework for the story. The visible spectrum of light was easily observed in the rainbow and other natural prisms. Although the origin of Genesis 1 is arguably dated to either sixth or seventh century B.C.E., (Friedman 2003) employing the visible spectrum as a storytelling method insured that this text would be supported by the *future* of the science of light (Fig. 1).

The prismatic perspective of Genesis 1 features a color wheel depicting six color families in the visible spectrum beginning with violet light in the 400 nm range and ending with red light in the 700 nm range of light energy. When violet light merges with red light, the color purple becomes visible, but this color has no measurable light energy of its own (Mayer). Thus, the Genesis account of Creation employs a total of seven color families as the story unfolds – violet;

Prismatic Theology,**Fig. 1** The prismatic perspective of Genesis 1

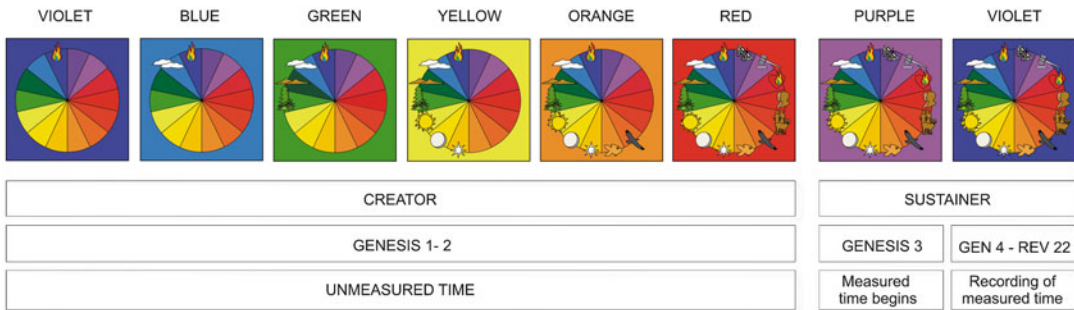
blue; green; yellow; orange; red; and purple (Newton 1952). Moving in a counter clockwise direction, the images around the rim of the color wheel are suggestive of drawings representing 14 aspects of the Genesis account of Creation – light; sky; dry land; vegetation; greater light; lesser light; stars; sea creatures; birds; animal kingdom; image of God; likeness of God; the gift of dominion; and the gift of freewill (Barker 1985a). It is with this foundational tool in hand that ► [Prismatic Theology](#) is birthed. The resulting method of biblical study offers two subjects for consideration: A ► [Prismatic Clock](#) which depicts the unfolding of biblical history and a ► [Prismatic Language](#) that returns the human intellect to its primary language of light, color, and image.

The Prismatic Clock

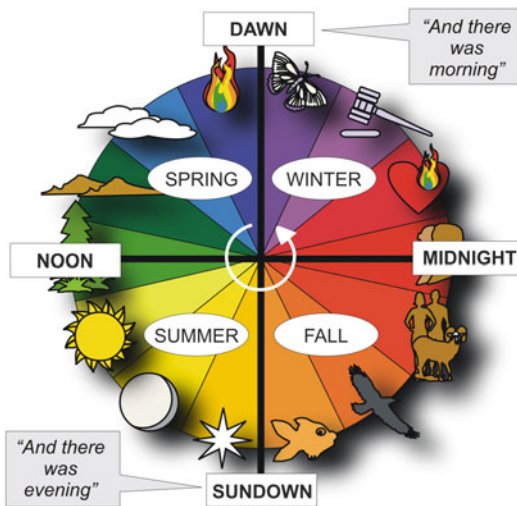
In addition to a colorful depiction of the Genesis account of Creation, ► [Prismatic Theology](#) offers

the reader of Scripture a prismatic perspective of time. Beginning with the phrase, “*And there was evening and there was morning,*” Gen 1:5b, the passage of time on each Creation “Day” is seen as one symbolic journey around the color wheel rather than one literal 24-h revolution of the earth on its axis (Fig. 2).

The phrase marks the conceptual hours of “Dawn” and “Sundown.” The conceptual hours of “Noon” and “Midnight” are then deduced along with four conceptual seasons which correspond to the light energies and colors represented on the wheel. Gen 1: 4-5a indicates that light was separated from darkness. The light was called “Day” and the darkness was called “Night.” Thus, it is important to note that the color wheel allowed the storytellers to include nighttime hours that are full of daylight. By employing the visible spectrum of light as a framework for Genesis 1, the storytellers could depict the nighttime as conceptual hours that are separated from the darkness (Fig. 3).



Prismatic Theology, Fig. 2 The passage of conceptual time on each creation day



Prismatic Theology, Fig. 3 The eight-day perspective

The prismatic perspective of Genesis 1–3 features an 8-Day perspective of the passage of *time* rather than the traditional 6-Day perspective of the *creation* process. The 8-Day perspective of time acknowledges God as both Creator and Sustainer of all that was, is now, and is to come. Hence, ► [Prismatic Theology](#) supports a timekeeping purpose for Genesis 1. Beginning with the creation of light on the first “Day,” the prismatic perspective transports the reader of Scripture out of *unmeasured* time during the creative process into *measured* time by the end of the seventh or Sabbath “Day.” It is a journey through the visible spectrum of light.

It is a well documented fact that the measurement of time began with lunar observations thousands of years before the birth of sacred

text. The recording of measured time began during the third millennium, B.C.E (NIST 1995). When viewed in prismatic form, the opening narratives of Genesis provide a time clue, Gen 3: 8, that marks the end of the Sabbath “Day” and the simultaneous dawn of an Eighth “Day” on which 6,000+ years of recorded biblical history unfolds, bringing us to the present time (Fig. 4).

It is impossible to know how the ancient storytellers tried to measure the passage of time on the Eighth Day; however, one mathematical possibility stands out in hindsight as a reasonable calculation. When each division on the Eighth Day Clock is assigned a 600-year measurement of time, 4 seasons of 2,100 years emerge. Each season depicts a “*time, times and half a time*” measurement, Dan 12:7; Rev 12:14 (Barker 1985b). Simultaneously, the 4 seasons of 2,100 years each can also be divided into 700-year increments of time.

How, when, why, or if this timekeeping method was successfully used in ancient history will forever be unknown. One theory suggests that the ► [Prismatic Clock](#) may have originated within a culture of visual and oral storytellers who chose to adopt the colorful timekeeping method as an alternative to the worship of sun gods, sun disks, and their shadows of darkness during first and second millennium B.C.E (Rohr 1970). Presently, the only way to resurrect this valuable timekeeping method is through a prismatic reading of Genesis 1 (Fig. 5).

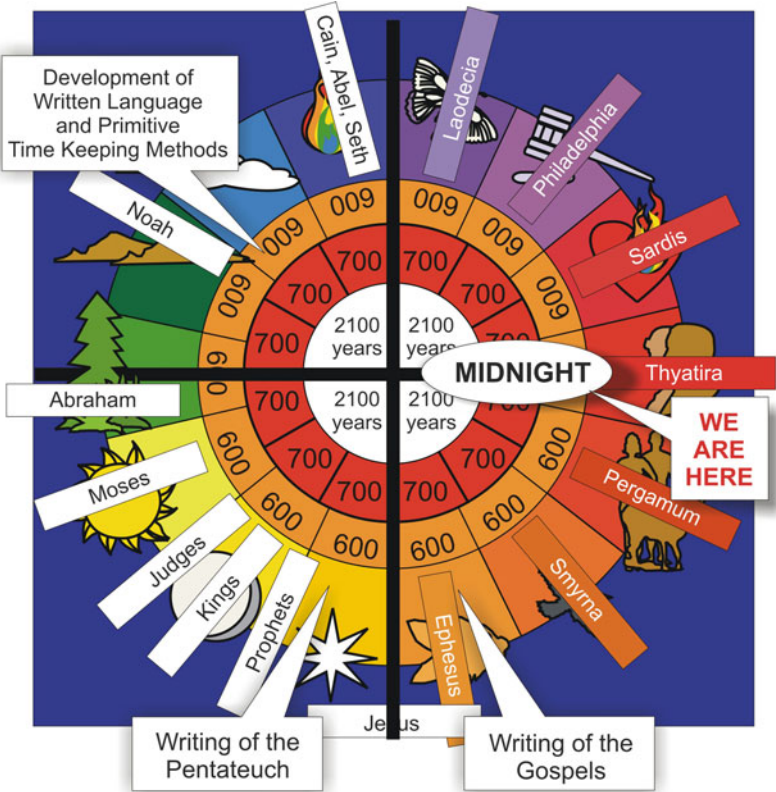
Because the whole of biblical history unfolds during the passage of time on the Eighth Day Clock, the clock becomes a tool with which



Prismatic Theology, Fig. 4 The passage of measured time on the eighth day

a prismatic study of Scripture becomes possible. With the aid of the Clock, the prismatic theologian can draw conclusions based on the major aspects of the Hebrew Bible accurately corresponding to the images on the left side of the color wheel. This is either accidental or divinely prescribed.

Likewise, the prismatic theologian can draw conclusions based on the major aspects of the Greek New Testament, the unfolding of biblical prophecy, and the corresponding images on the right side of the wheel. Again, this is either accidental or divinely prescribed. Presently, it could be said that humanity is approaching the conceptual hour of “Midnight” on the Eighth “Day” from the prismatic perspective. With 6,000 years of recorded biblical history and more than 2,000 years of projected prophecy, the [Prismatic Clock](#) fulfills the words written in Isaiah 46:10: “I make known the end from the beginning, from ancient times what is still to come.” In the literal



Prismatic Theology, Fig. 5 The unfolding of biblical history on the eighth day

Prismatic Theology,
Fig. 6 The seven voices



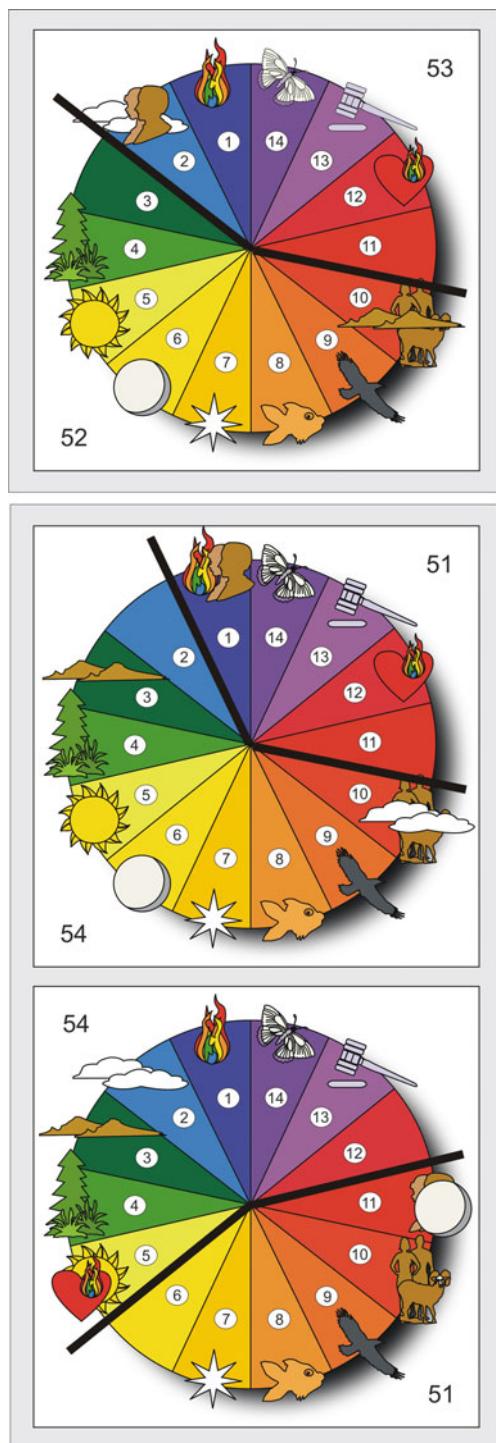
24-h sense however “*the day and the hour remain unknowable*,” Matt. 24: 36; 25:13 (Barker 1985c).

The Prismatic Language

In addition to offering a ► [Prismatic Clock](#) as a tool for biblical study, ► [Prismatic Theology](#) also offers the reader of Scripture a spiritual language based on the universal images of creation that are common to the whole of humanity. When viewed in prismatic form, the Genesis account of Creation reveals seven complementary relationships, each of which visually communicates spiritual ideas and concepts to the soul/spirit/mind/heart through light, color, and image. Hence, the resulting ► [Prismatic Language](#) returns the human soul/spirit/mind/heart to its *primary* form of communication through light, color, and images of

creation beginning with an understanding of the seven voices on the color wheel (Figs. 6, 7).

The seven voices featured on the rim of the wheel form the root of a universal vocabulary which, in total, consists of 210 spiritual concepts. The concepts invite engagement with a “*common tongue*,” Gen 11:1, (Barker 1985d) which focuses on humanity’s relationship *with* the Creation as well as humanity’s role *within* Creation. The communication is void of doctrine; ritual; cultural norms; creeds; statements of confession; rules of societal law; etc. The only fixed communication is that which comes from the scientific purpose and natural reasons for each aspect of creation. Thus, the prismatic perspective of Genesis 1 provides humanity with a fresh starting point – a blank slate – with which to create new avenues of spiritual communication in a diverse global society.



Prismatic Theology, Fig. 7 A sampling of the prismatic language

This illustration features 6 of the 210 spiritual concepts found at the center or middle of the vocabulary structure. The six spiritual concepts featured in this sampling include relationships between the following entities: the dry land and the flesh of the animal kingdom; the human mind and the sky; the human mind and the creation of light; the sky and the flesh of the animal kingdom; moonlight and the human mind; the human heart and sunlight. Once the spiritual concepts are pondered and considered, the *primary* form of communication can be applied to a prismatic study of the whole of Scripture for the Judeo-Christian community. In doing so, the [Prismatic Language](#) illuminates the presence of a *primary* form of communication embedded throughout the *secondary* language of biblical text.

How, when, why, or if this visual language was used in ancient history will forever be unknown. The [Prismatic Language](#) may have originated within a culture of visual and oral storytellers who once drew pictures in order to ponder spiritual ideas, converse with one another, and pass their understandings from generation to generation. The only way to resurrect the primary language of light, color, and image is through a prismatic reading of Genesis 1. With this tool in hand, however, the words of the psalmist are illuminated through the science of light, color, and image in their fullest sense: *The heavens declare the glory of God; the skies proclaim the work of his hands. Day after day they pour forth speech; night after night they display knowledge. There is no speech or language where their voice is not heard. Their voice goes out into all the earth, their word to the ends of the world.* Psalm 19:1–4 (Barker 1985e).

Ethical Principles and Values of Prismatic Theology

► [Prismatic Theology](#), as a methodology that enhances the interpretation of biblical text, respects the past and present work of biblical scholars and archeologists who continue to

construct a responsible historical/critical methodology for biblical study insuring that the texts are interpreted in their historical/cultural context. Likewise, ► [Prismatic Theology](#) respects the work of past and present scientists who continue to call for definable; testable; measurable; repeatable; and predictable standards to insure the credibility of scientific information before it is published. Hence, the guiding ethical principles of ► [Prismatic Theology](#) are rooted in the desire to honor, uphold, and maintain the same high standards practiced in biblical scholarship and scientific research, while adding a new dimension to biblical study and the “Science and Religion” dialogue.

► [Prismatic Theology](#) values the ongoing investigation of Scripture as well as ongoing research in the science of light, light energy, color, and optics. It also values harmony of purpose; commonality of quest; and acceptance of differing opinions between religious communities and scientific communities. The prismatic method of study upholds these key values by unveiling a prismatic perspective of time and a ► [Prismatic Language](#) through light, color, and image which can be applied to future conversations between people of all faiths.

By combining the science of light and the study of Scripture, ► [Prismatic Theology](#) provides an unknown piece in the spiritual puzzle of the Judeo-Christian tradition. ► [Prismatic Theology](#) is not to be embraced by the faint of heart. It is both spiritually and mentally challenging to combine the science of light with the words of Scripture. Those who employ the prismatic method of study most successfully will be those who come to the method with the mind, heart, and eyes of a child.

Cross-References

- [Biblical Studies](#)
- [Creation in Judaism](#)
- [Eschatology](#)
- [God of the Gaps](#)
- [Natural Sciences in Judaism](#)
- [Natural Theology](#)
- [New Age Religions](#)

- [Revelation](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)
- [Time](#)

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Probability and Statistics

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Related Terms

[Statistics and probability](#)

Description

Probability and statistics is a discipline in mathematics and logic. For some proposals, it is better to make a description by separating in two subdisciplines.

Probability is a branch of mathematics that deals with calculating the likelihood of a given event's occurrence, which is expressed as a real number between 0 and 1. An event with a probability of 1 can be considered a certainty. An event with a probability of 0.5 can be considered to have equal odds of occurring or not occurring. An event with a probability of 0 can be considered impossibility. Probability theory applies precise calculations to quantify uncertain measures of random events. Probability expresses how likely it is that an even occurs. The assignment of probabilities to events is not an easy task in which a probability function is used.

The probability is the measure of the frequency with which you get a result (or set of results) regarding to a randomized experiment, in which all possible outcomes are known and conditions are sufficiently stable. Formally, this measure is defined by means of a set of axioms as A. N. Kolmogorov proposed in 1933. The axioms of probability are the minimum conditions to be hold so that a function defined on a set of events returns probability of each event in a consistent way. These axioms are the following:

- Ax. 1. The probability of each event, A , is greater or equal to 0: $P(A) \geq 0$.
- Ax. 2. The outcome of the experiment is always an element of the sample space, Ω : $P(\Omega) = 1$.
- Ax. 3. If $A_1, A_2, \dots$ are mutually exclusive events, that is, the intersection of each couple is the empty set, then the probability of the union is equal to the total of the probabilities:

$$P(A_1 \cup A_2 \cup \dots) = P(A_1) + P(A_2) + \dots \\ \Leftrightarrow A_i \cap A_j = \emptyset.$$

The probability requires not only the development of basic concepts as axiomatic but also the sample space, the algebra of events, random variables (defined on populations), distributions or models associated with the variables.

The sample space, Ω , could be both a countable or uncountable collection of events. The definition of event is not simple. Some probability models are based on really complicated

space of events (Ω), where some subsets are not consider events. In those cases, it is possible to assign probabilities only to some subsets of Ω . Only the subsets to which probabilities can be assigned are considered events. This family is named the algebra of events. In particular, when Ω is a finite set, the family of all its subsets (the power set) is algebra of events by itself that means any subset of Ω is an event and therefore it has a probability assigned.

A random variable, X , is a function that assigns real numbers to events. It is named random due to the number assigned is unknown; however, the possible values X can take are known: the set of such values is called support set. For example, suppose that we flip two dices. The possible outcomes are $\Omega = \{(1,1), (1,2), \dots, (6,6)\}$. The amount $X = \text{"sum of the results"}$ is a random variable whose support set is $S_x = \{2, \dots, 12\}$. The probability of event $(6, 6)$ is the same of the probability of getting $X = 12$. Random variables have a distribution that characterized their behavior. Random variables are very useful in mathematic modeling and industry. Probability also studies the asymptotic behavior of random variables (central limit theorem and law of large numbers).

Statistics is a branch of mathematics dealing with gathering, analyzing, and making inferences from data. Statistics is the science which treats of the collection, classification, and analysis of events described numerically. The data analysis allows the explanation, description, and comparison of the phenomena of real life. Originally associated with government data (e.g., census data), the subject has now applications in all the sciences. Statistical tools not only summarize past data through such indicators as the mean and the standard deviation but can predict future events using frequency distribution functions. Statistics provides ways to design efficient experiments that eliminate time-consuming trial and error. Double-blind test for polls, intelligence and aptitude test, and medical, biological, and industrial experiments all benefit from statistical methods and theories. The results of all of them serve as predictors of future performance, though reliability varies.

Statistics has three key parts: (1) groups of numbers, data collection techniques, and sampling, ways to summarize, analyze, and explain data; (2) the application of probability techniques and tools required in the study of uncertainty; and (3) the comparative study of populations and samples, study of the inherent variability introduced by sampling and development of inferences.

Statistics requires the development of basic concepts such as population, sample, descriptive statistics (collection techniques and exploratory data), and inferential statistics (the study of a sample to draw conclusions about the population using mathematical techniques and theory probabilities).

The relationship between probability and statistics can be displayed from the approach of a problem. On a probability problem, the properties of the study population are assumed known. On a statistic problem, questions about these properties are formulated and then answers are given in relation to a sample of the population. In a statistical problem, the characteristics of a sample are available to the experimenter and this information will enable it to draw conclusions about the population. Recent developments in probability and statistics include topics such as nonparametric regression and density estimation, option pricing, probabilistic methods for multivariate interpolation, robust graphical modeling, and stochastic differential equations.

Self-identification

Science

Probability and statistics study the physical world by means of observation and experiment; in this sense, this discipline is highly considered a science. However, the question about if everything is determined by randomness is open to philosophical debate. What is certain is that every day thousands of people are using tools from probability and statistics and many research studies are based in statistics analysis of data. As any other science, there are a lot of applications in real life of them. An important application of

probability theory is the diagnostic test. The uncertainty is present because there are no perfect tests and questions or decision problems must rely on the behavior or long-term average of diagnostic tests. Probability theory is used to quantify this behavior. Mathematical models are used in the form of distributions to represent the behavior of the tests.

Statistics plays an important role in the decision-making processes, for example, before launching a new drug to market, the completion of a clinical trial, that is, an experimental study, is required. The data from this study should be compiled and analyzed to determine the viability of the product on the market. The study of statistics involves the collection, organization, analysis, and interpretation of numerical data. The statistical concepts are applied in areas such as psychology, agriculture, medicine, engineering, industry, finance, etc. Sometimes it takes a new statistical nomenclature as in the study of statistics in biology: biostatistics, or the case of bioinformatics, which is the result of applying statistical techniques on large masses of biology data processed by a computer.

The use of probabilistic models and statistical methods for analyzing data has become a common practice in all scientific disciplines.

Religion

The probability theory is an axiomatic system. This system begins with basic truths, similar to a religion, and from them, we construct a logical system. This logical system provides a means of quantifying uncertainty.

As a particular system of beliefs, probability is a degree of knowledge or belief. The degree of knowledge is called the frequency interpretation of probability, while belief is the epistemic of "degree of belief" or Bayesian interpretation. A frequency probability is a property of the world. A Bayesian probability is a mental construct that represents uncertainty. It applies not directly to events, but to our knowledge of them, and can thus be used in determine situations. A Bayesian can speak of the probability of a tossed coin, for example, even if he believes that with precise knowledge of the physical

conditions of the toss, he could predict exactly how it would land.

The difference between the two interpretations is not merely semantic, but reflects different attitudes to what constitutes relevant knowledge. A frequentist would take the probability of throwing a head with a biased coin as some value p (not equal to 0.5). A Bayesian, however, would continue to regard the probability of a head as 0.5 since unless he suspected the direction for the bias, he would have no more reason to expect the next throw to be a head than a tail. The frequentist would estimate the value for p from a number of trial tosses. The Bayesian would revise his initial probability assessment with each successive result. As the number of trials tosses is increased, the values of the two probabilities will tend to converge. But the interpretations of these values remain distinct.

Randomness is an essential component in modeling and analyzing nature.

Characteristics

A distinctive feature of this discipline is their relationship with others. The calculation of probability and statistics applied today in most areas: business, industry, education, marketing, finance, etc.

The probability leads to a deductive reasoning, that is, from the population to the sample, while the statistical reasoning from the sample to the population, that is, inductive reasoning. In both cases, results are basic for the study of other disciplines and sciences.

Relevance to Science and Religion

The probability and statistics have played a role in the development of modern society. General methodological tools have been provided for variability, determine relationships between variables in an optimal design studies and experiments, and improve forecasts and decision-making under uncertainty. In 1961, England introduced the teaching of probability

and statistics to students between 16 and 19 years for their expertise in mathematics. The reasons for premature initiation of these disciplines are as follows: The probability and statistics are a fundamental part of general education for future adult citizens, who need ability to read and interpret statistical tables and graphs, which usually appear in media. Probability and statistics are also an aid to personal development of critical thinking based on objective assessment of evidence and events.

In recent years it has developed the term “statistics literacy” to recognize the role of statistical knowledge in basic training; however, this discipline takes a real interest in other social areas such as governments and societies and institutes which develop numerous conferences looking for statistically literate of society by reasoning, thinking, and statistical literacy. The main objective of these conferences is the reasonable and efficient application of statistics to the solution of statistical problems by experts and practitioners. The agencies responsible for statistics (institutes and government agencies, research centers, and government in general) need the collaboration from all sectors of society in the process of collecting data. The information should be collected by means strictly and reliable techniques so that decisions are sound and they revert in global development.

Sources of Authority

Besides the mathematicians and statisticians, Fermat, Pascal, Bernoulli, Poisson, Fisher, Snedecor, among others, there are some of them more relevant like the following:

Thomas Bayes (1702–1761), a British mathematician, statistician, and religious leader who wrote “Essay towards solving a Problem in the Doctrine of Chances,” which was published in 1763 after his death. In this work, the famous Bayes Theorem was included.

Pierre-Simon Laplace (1749–1827), a French mathematician whose work was pivotal in statistics with the publishing of “*Théorie analytique des probabilités*” in 1812. Laplace

is universally known by the formula of probability given by the number of favorable events divided by the total number of events.

Andrey Nikolaevich Kolmogorov (1903–1987), a Russian mathematician who advanced very significantly in the field of probability theory. In 1933, Kolmogorov published the book, “Foundations of the Theory of Probability,” laying the modern axiomatic foundations of probability theory. A bibliography of his works appeared in 1989 in “Publications of A. N. Kolmogorov”. *Annals of Probability* (Kolmogórov 1989). E.T. Jaynes realized that probability theory is a generalization of Aristotelian logic which reduces to deductive logic in the case that our hypotheses are either true or false. In *Probability Theory: The Logic of Science* (1996) Jaynes set a modern thinking about Bayesian probability and statistical inference, developing the notion of probability theory as extended logic, and showing the advantages of Bayesian techniques (Jaynes 1996).

Ethical Principles

The ethical principles of probability and statistics are included in agendas and decalogues of government statistic societies, for instance, the Statistical Institute of Puerto Rico. They list, among others, the following ethical principles: searching of objectivity, prevention of predetermined outcomes, safeguard privileged information, display professional competence, protection of the interests of subjects, maintenance of confidence in the statistics, and exposition of both the independent review results, as the methods used.

Key Values

The General Assembly proclaimed the United Nations on October 20, 2010, as World Statistics Day, to recognize the importance of statistics in our societies. On this day, we celebrate the many accomplishments achieved by official statistics and the key values of service, integrity, and professionalism.

Conceptualization

Nature/World

The nature and the world represent universes of discourse where experiments are performed and events occur.

Human Being

Human beings perceive and interpret reality and events that take place. In probability and statistics, a human being is also the expert who makes decisions based on their perception of reality and facts that take place in it.

Life and Death

Life and death are opposed states in living things. In probability and statistics, life and death also can be understood as the execution time of the experiment (life) and the end of the experiment (death).

Reality

The reality is the universe in which we perform the experiments and in which we observe the events that occur.

Knowledge

The result of any empirical study of universes into the reality. Sample set, all kinds of data and information which come from experiments in real life.

Truth

Truth is only an approximation to reality. Furthermore, the information can change the probability of a future event and its certainty, usually by the collateral effects. We can explain better with some examples: if the news say that a bank has liquidity problems, being false, the bank will probably have problems. On the other hand, if the news are that a road has collapsed, being true, probably the road will be fine.

Perception

Some researchers, in probability and Statistics, think that the human being has a somatic indicator that calculates the probability of occurrence of events. The information is stored from human

experience throughout life, and the somatic indicator feeds from all these data. Researchers believe that this indicator works similar to intuition but that is different, although often these feelings can be confused.

The subjective probability is conditional on the amount of experience and data stored by humans. For example, in front of an unfortunate event like death of a loved one, it is as painful as unexpected (unlikely). That is, the death of an elderly will be less painful than the death of a child, since our perception of the event is conditional on its probability and it seems more likely the death of old and therefore, more acceptable and less painful.

Time

Time is one of the fundamental dimensions of probability. Time is a continuous variable, and it is one basic measure in any experiment. In many of experiments, time is the only variable of interest. The probability distribution of time and its properties are important contributions to the study of probability and to interpretation of statistical data.

Consciousness

Consciousness is the amount of confidence in the probability of an event. This is often related to subjective probability.

Rationality/Reason

The information is always biased per each individual in real life. The amount of information becomes more confidential and poor knowledge become distrustful. A lot of researchers relate the rationality as the amount of knowledge in the following sense: Human beings are as rational as amount of knowledge they have.

Mystery

Knowledge can never be complete. The events that occur in reality may be clear consequences of the facts or may not have an easy explanation. To possible future events, humans also face the uncertainty that probability and statistics do try to solve. However, there is always a degree of uncertainty that cannot be resolved and that we

define as mystery, in the sense of lack of knowledge.

Relevant Themes

Four issues are particularly relevant in relation to this discipline: first, the logic from both the mathematical point of view and from the rationality of human beings. The logic is the discipline necessary to achieve properly apply and understand the results. The second is Boolean algebra and the algebra of events, necessary for a mathematical treatment of the whole sample space events. Another important issue is the universe and the universe of discourse specifically associated with each experiment. Finally, chance, it is particularly important to ensure the independence of the experimental evidence.

Cross-References

- [Formal Logic](#)
- [Game Theory](#)
- [Graph Theory](#)
- [Mathematics and Religion](#)
- [Mathematics in Human Learning](#)
- [Mathematics, Formal and Contemporary](#)
- [Operations Research in Applied Mathematics](#)

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Problem-Solving

- [Coping, Psychology of](#)

Process of Believing

► [Credition, the Process of Belief](#)

Process Theology

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Related Terms

[Neoclassical theism](#); [Philosophy of organism](#);
[Process-relational theology](#)

Description

The phrase “process theology” refers to a variety of novel approaches to reconceiving both the nature of God and the world in light of the philosophical and metaphysical works of the twentieth-century philosophers Alfred North Whitehead (1861–1947) and Charles Hartshorne (1897–2000). Process theology received its name because everything – God included – is subjected to a constant process, which results in change and novelty within both the world and God. Due to the centrality of flux, most process theists deny that either God or any creature within the world is capable of having the following attributes: immutability, impassibility, omniscience, or omnipotence. Instead, God’s nature and vision is forever growing in response to repeated reciprocal interactions with the world and all of the creatures therein. Since the God-World relationship is so important, process theology is alternatively known as process-relational theology.

For some, but not all process theologians, ultimate reality is understood as consisting of multiple components or elements that are each coeternal and co-necessary, yet are also mutually grounding or presupposing. This pluralistic

metaphysics operates as a sort of complex adaptive system, providing a new way forward for dealing with the concerns that arise within the field of philosophy of religion over the one and the many, theodicy, and free will. Additionally, the unique metaphysics inherent within forms of process thought opens up completely new avenues for successful dialogue between the various world religions and between religion and science.

Self-Identification

Science

Process theology does not self-identify as a science. However, many of the core philosophical concepts within process thought have exercised influence within the various sciences, especially physics, ecology, biology, psychology, and neurotheology. There are process physicists and psychologists; people who are influenced by either the cosmology, metaphysics, or epistemology espoused by Whitehead and Hartshorne. These individuals attempt to prove or disprove various concepts that are found within the philosophical frameworks of Alfred Whitehead or Charles Hartshorne via the tools and methods of the different natural and social sciences.

Whitehead in particular had complex ideas about physics, consciousness, geometry, and systems theory that can be found within his magnum opus, *Process and Reality* as well as his earlier work, *Science and the Modern World*. What is of particular interest is that contemporary sciences may be capable of verifying or dismissing some of Whiteheadian process thought’s more controversial claims – the idea of “prehensions” and “panexperientialism.” Prehensions (lit. to seize or grasp) are the nonsensory form of perception that all creatures share. A prehension is a fundamental receptive mode of experience, whereas sensory perception is a later derivative mode. Panexperientialism means that all creatures or “actual entities” have some degree of experience (not necessarily conscious experience, which is a higher phase of experience according to Whitehead). This means that even

an atom has some degree of experience or feeling and an extremely rudimentary form of freedom and agency. Advances in neurology, biology, and enhanced measuring technology/instruments should be able to pin down the plausibility or implausibility of prehensive experience and panexperientialism.

Religion

“Whatever suggests a cosmology, suggests a religion” (Whitehead 1926). Interestingly enough, process theology has not branched off as its own unique religion. Instead, its central tenets have been worked into the different preexisting religious frameworks, most notably liberal and progressive forms of Protestant Christianity. For example, it would not be uncommon to hear Whitehead’s name mentioned at a Unitarian Universalist sermon. In the mid-twentieth century, Whitehead’s philosophy sparked a process Christology and more generally, a process hermeneutics.

In recent years, however, more process theologians are inclined toward religious pluralism, and they find in Whitehead’s pluralistic metaphysics a new way of allowing for all of the religions to be genuinely different, yet each equally valid. It is relatively simple to identify at least three (God, a World, and Creativity) if not four (God, a World, Creativity, and the Receptacle) distinct yet related philosophical/religious ultimates in Whitehead’s metaphysics.

What process theists, most notably, John Cobb Jr. and David Ray Griffin, have done is to suggest that each religion is geared toward one or more of Whitehead’s proposed ultimates. For example, Buddhism and Daoism may be focused on what Whitehead defines as Creativity, whereas Judaism, Christianity, and Islam are concerned primarily with God. The point of this matching up of world religions with Whiteheadian metaphysics is that an argument can be made that if this sort of picture is true, then there is a real reason for a Buddhist to engage in dialogue with a Christian – they can each enrich one another’s religious experience and life by bringing in a new religious object with its associated hopes, ways of

salvation, and exercises and techniques. If all of the religions are the same deep down on the esoteric level – as the perennial philosophy would suggest – then there is really nothing to be gained through interreligious dialogue. If the religions are all different, then it seems that one should be right and the others wrong. Process theists using Whitehead’s metaphysics as a model have presented the religious studies community with a third option.

Characteristics

The God of process thought stands in stark contrast to the view put forth by “classical” or “traditional” theism. In classical theistic accounts, God is understood as being omnipotent, omniscient, immutable, and simple. Process theists reject all of these divine attributes in favor of a divine persuasive lure, maximal knowledge, reciprocal growth, and dipolar theism.

God, through his/her “mental pole,” acts within all creatures by providing “initial aims,” which serve as lures toward the best possibilities for action given the circumstances of the present moment. Best in this case means actions, which will issue in novel and creative experience within the world with a maximal but balanced degree of intensity. The point is that the creatures have their own degree of self-determination and freedom to either choose or reject this initial aim from God. God literally cannot be omnipotent for process theists because God is not the only religious or philosophical ultimate. There is always God and “a World” not necessarily our particular world with its specific laws of physics, but some world or other, which would consist of simplistic finite “actual entities” (perhaps subatomic “occasions of experience” or something akin to the strings in various forms of string theory or M-theory). This proposition also entails a rejection of *creatio ex nihilo*, which further serves to separate process theists from classical theists.

Process theists would advocate for some form of *creatio ex amore* or *creatio ex materia* instead of out of nothingness.

Almost all of process theology's distinctiveness comes from the affirmation of a pluralistic metaphysics and the reconceived notion of deity. For example, the problem of evil is dissolved because God cannot coerce or determine events due to the sharing of power with all of the finite actual entities, which make up the world. The God-World relationship is understood analogously to the body/soul relationship with God being the soul of the universe, and thus, omnipresence is one of the few "omnis" that are retained by process theology, omnibenevolence being another. All of the actual entities comprise the body of the universe and exist within God (but are not identical with God.) This position is one possible version of the doctrine known as panentheism (literally, all things are within God), but not that all things *are* God or that nature is God (pantheism).

Although process thought is highly original, some of its most basic points like the fundamental role of process/change can be traced back to Heraclitus in the west and Daoism in the east. In more recent times, the work of Hegel and Teilhard de Chardin suggest some parallels. A key difference between Whiteheadian/Hartshornean process thought and Hegelianism is that there is no concept of an Absolute Religion (Christianity in Hegel's case), which represents the pinnacle of human religious experience. The same can be said for Teilhard de Chardin, who posited an omega point for the process of evolution. For process thinkers, there is no mandatory or prophesied end point; instead, there are "cosmic epochs," which may suggest certain limitations on what can and cannot happen in that particular universe. However, there can be an infinite amount of cosmic epochs, so the process of God influencing a world with theoretical possibilities and then weaving back the experiential knowledge gained from that world into the divine nature is ongoing, perhaps *ad infinitum*.

Relevance to Science and Religion

Process theology – along with the emergent theism of Samuel Alexander – represents two of the

more productive areas for dialogue between the scientific community and the religious community. A large portion of the frustration on the part of scientists stems from the fact that most religions are content to discuss the miraculous and the supernatural. Process theology denies any form of supernaturalism or of miraculous activity within the world on the part of God. Process theology is a form of naturalistic theism not supernaturalistic theism.

This means that God is not capable of suspending the laws of physics, which govern our universe. Instead, God must operate within the nomological parameters of the universe and can only persuade the world's creatures to act in one way or another. The universe and everything that is in it work in an organismic fashion, with each part being interrelated to a greater or lesser extent, and thus, there is mutual influence and a mutual immanence. Whitehead called his philosophy not process philosophy *per se* but the philosophy of organism.

Whitehead and, generally speaking, all process theists accept most of the major scientific theories of the last 150 years. Evolution is frequently cited as being one of the major sources of conflict in the religion and science debate, but it is not problematic for process theologians because they accept the theory of evolution. Of course, with a robust account of a deity, it would be wrong to state that process thinkers hold to the exact same view of evolution as most biologists.

Process theists discuss evolution in terms of creativity as the ultimate of all ultimates. This creativity is conceived as a blind impersonal force, which cannot account for the apparent upward trend and teleological aim that seems evident in the natural world. This is where God would come in as the poet of the world persuasively leading creation toward a more perfected vision of beauty and goodness.

Process theology also is relevant to the contemporary ecological debate. The old Biblical view of dominion that arises in Genesis is set aside in place of the concept of stewardship, but the key difference is that process thought

provides a full-scale worldview that explains why all creatures have intrinsic value. The answer lies again in panexperientialism or the idea that all creatures have some degree of experience although rarely conscious experience. Whiteheadians differ from Deep Ecologists like Arne Naess and George Sessions in pointing to the fact that there is a hierarchy of experiences, and even though all things have an intrinsic value and play a role within the larger ecosystem, it is foolish to propose a complete ecological egalitarianism. A human being has a greater intrinsic value than a mosquito or bacterium, but that does not mean that a human has a greater *inherent* value. The species which have the least *intrinsic* value appear to have the greatest *ecological or inherent* value since they provide the base support for the pyramid of life.

Sources of Authority

The sources of authority for this discipline can be broken into three parts: (1) individual scholars, (2) journals, and (3) organizations/institutions.

1. The most prominent authority is Alfred North Whitehead and specifically his books: *Religion in the Making*, *Process and Reality*, and *Adventures of Ideas*. After Whitehead, the other originator of what will become the process movement is Charles Hartshorne. Out of his numerous works, *Creative Synthesis and Philosophic Method* and *Omnipotence and Other Theological Mistakes* stand out as the most important for process thinkers. The next generation of process theologians consists of John Cobb Jr., Lewis Ford, Stephen T. Franklin, Marjorie Suchocki, Daniel Day Williams, and David Ray Griffin. Cobb and Griffin have collaborated on a number of works including their authoritative introduction entitled *Process Theology: An Introductory Exposition*.
2. Many journals accept work related to process thought, but there is one in particular that is solely dedicated to process philosophy and theology: Process Studies.
3. The single most important repository for all things process theology is the Center for Process Studies (www.ctr4process.org) located on the campus of Claremont School of Theology in Claremont, California. This is the official site for all of Charles Hartshorne's works as well as nearly every article or book published that is in any way related to process studies.

Ethical Principles

Process theology has frequently been criticized for its either lack of a complete ethics or its perceived aesthetically based ethics. In truth, there is no one consistent ethics other than a general framework that one can derive from process philosophy's central metaphysical propositions. For Whitehead, as for most process theists, you cannot separate an ethical system from a cosmology, even though this has been the dominant approach as evidenced in utilitarian and Kantian deontological ethics. The cosmic aim of life is to issue in novelty of ever increasing intensity and complexity of feeling, and thus the social and individual levels are to follow this universal pattern. "Beauty, moral and aesthetic, is the aim of existence" (Whitehead 1938).

The goal in a Whiteheadian-based ethics is to "maximize importance." Importance is defined as follows:

Importance is a generic notion, which has been obscured by the overwhelming prominence of a few of its innumerable species. The terms morality, logic, religion, art, have each of them been claimed as exhausting the whole meaning of importance. . . . By this false limitation the activity expressing the ultimate aim infused into the process of nature has been trivialized into the guardianship of mores, or of rules of thought, or of mystic sentiment, or of aesthetic enjoyment. No one of these specializations exhausts the final unity of purpose in the world. The generic aim of process is the attainment of importance, in that species and to that extent which in that instance is possible (Whitehead 1938).

In the end, the only thing close to ethical principles would be: follow the divine/initial aim in each moment, maximize importance in

the concrete situation you find yourself in, issue in novelty, and be adventurous.

Key Values

There are at least five key values of process theology. (1) It solves longstanding problems within the field of philosophy of religion. For example, it provides a compelling answer to the problem of evil. (2) It gives people a new option for understanding the nature and function of God, which is distinct from the previous three options: classical theism, pantheism, and deism. (3) It provides a paradigm for mediating successful interreligious dialogue through its acceptance of a pluralistic metaphysics. (4) It provides a novel account of experience, feeling, and consciousness, which hinges upon the ideas of prehensions and panexperientialism. (5) It allows for a more productive ecological discussion by creating a middle ground between deep ecologists who focus on the importance of lower organisms in the ecosystem and humanitarians and animal rights activists, who focus on the importance and value of higher organisms.

Conceptualization

Nature/World

Nature is understood as consisting of all of the "actual entities" (spatiotemporal experiential events with both physical and mental phases of experience) and societies (spatiotemporal groupings of actual entities also called occasions of experience) that make up the world. There are two types of things: aggregational societies and compound individuals. An aggregational society would be a rock or tree, which contains no higher-order entity, which coordinates the activities of the other members within the society. This means that a rock is no more than the atoms or molecules that make up the rock; there is no higher-order agency. However, a compound individual would be any organism that does have a higher-order entity akin to a mind or soul, which can direct the activities of its constituent parts. Your cells in

your body have a degree of self-determination, but at the same time they also fall under the control of your mind. In general, it should be stated that nature and the world are alive and that experience is taking place all around us on all levels, all the way down to atomic occasions of experience.

Human Being

A human being is understood as a compound or enduring individual. Once again, a compound individual is a living organism that has a dominant or regnal member, which coordinates the subordinate members within the society (e.g., a mind influencing cells in the case of humans). It should be noted that a human is not one numerically identical substance or soul that is unchanged over time. Due to the centrality of process, every human is constantly undergoing change from one occasion of experience to the next and, thus, is always somewhat different from one moment to the next. This is a similar ontology and epistemology to many later forms of Buddhism.

Life and Death

Something is alive when it reaches a complexity threshold where novelty and creativity outweigh the power of the law of averages imposed by the laws of physics. It is about the degree of freedom and mentality within a given creature. All entities are dipolar with a physical pole that merely receives data from the past and a mental pole, which creatively alters or uses the data from the physical pole. Living entities are those entities, which have a significantly larger mental pole, so nothing lower than cellular occasions of experience. In one sense, a lesser death occurs all the time with the ending of one occasion of experience, but in a more profound sense, death occurs with the breakdown of the various necessary functions of the coordinate members making up the spatiotemporal society that is a particular human being.

Reality

Reality for most humans consists of whatever physical (other actual entities) and conceptual

data (other entities and/or eternal objects/Platonic Forms) that makes up the actual world of the surrounding environment of a specific person, in a specific place, at a specific time. This data need not be limited to the five senses because most prehensions are a presensory or nonsensory activity.

In a broader conception, ultimate reality would consist of the following: all of the actual entities in the universe or multiverse, a dipolar God understood as one actual entity or a serially ordered society of occasions of experience; a large number of forms in a quasi-Platonic sense, Creativity understood as a sort of metaphysical force and perhaps, a “Storehouse” or Platonic-like Receptacle which stores information and allows for an experience of personal identity over time between one occasion of experience and the next.

Knowledge

Knowledge is information that is either (1) already available to be physically or hybridly prehended or (2) information that is gleaned from a creative process of playing with past information in a highly conscious and novel way. Thus, there is both an objective and a subjective dimension to knowledge, its acquisition, and its creation in the form of information.

Truth

Truth is understood as conformity to fact or correspondence with reality. Most process theists ascribe to a correspondence theory of truth because it is the theory by which most people appear to actually live their lives.

Perception

The most thorough account of perception can be found in Part III of *Process and Reality*. Put simply, it is a nonsensationist version of perception where a nonsensory or presensory grasping or prehending takes place where some aspect of the object or entity being perceived is actually brought into the constitution of the prehending subject. Sensory perception in its more classical form is actually a derivative mode of perception from the more fundamental positive physical prehensions (Fig. 1).

Time

The common understanding of time suggests that time is asymmetrical in the sense that the present is related to the past in a wholly different way than the present is related to the future. It is also commonly believed that time is in constant motion or flux; things are always becoming and then perishing. Lastly, there is a belief that time is flowing in one direction, from the past through the present and into the future, and hence, the past is irreversible.

According to David Griffin’s version of process theology, panexperientialism implies pantemporalism. The idea is that all actual entities are spatiotemporal events and are also related to other events, and therefore, the concept of time has always existed, even in the subatomic realm. There is no version of nontemporalism where time is an illusion, or temporal/nontemporal dualism with some actual entities being temporal and others not. Instead, all actual entities are temporal, and our common sense notions of time listed above are also affirmed.

Consciousness

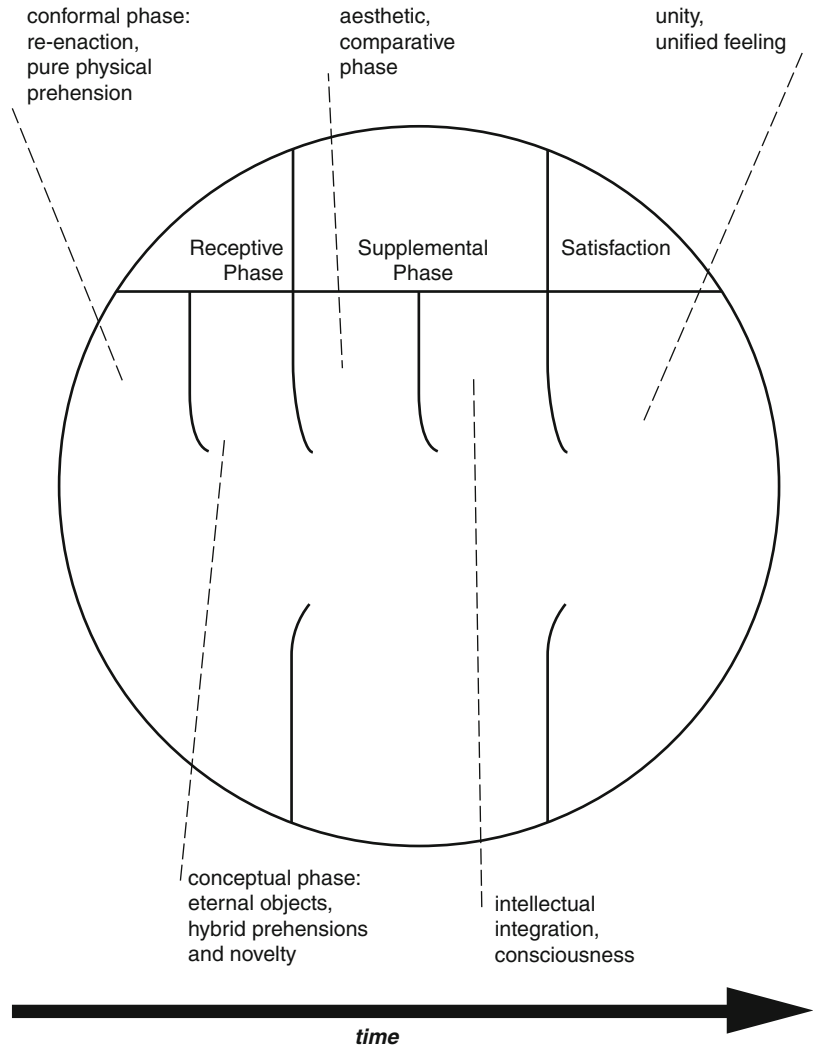
Consciousness refers to a later and higher phase of experience during the process of concrescence. What this means is that each actual occasion of experience goes through various stages: receptive, preconscious prehensions, a supplemental phase, and a satisfaction. As the vast data within each moment comes together within an organism that has a structural makeup that is complex enough, it will likely have some small portion of the overall information taken in from its prehensions, highlighted and valued up. This is known as the process of adversion. The items which have been valued up and/or later, derivative data frequently rise to the level of consciousness. It should be reiterated that although all creatures have some degree or form of experience, not all creatures have conscious experience, which is reserved for a select group that likely have a central nervous system.

Rationality/Reason

Rationality is the pursuit of a unifying, coherent theory that takes into account all that we

Process Theology,

Fig. 1 The process of a concurring actual occasion

The Process of a Concurring Actual Occasion

presuppose in both practice and experience. For most process theists, there are certain universal human experiences, but there are also major regional variations. In the end, rationality is going to consist of both a situational and an objective, perennial dimension.

Mystery

It would seem that the precise nature and function of the constituent components of the pluralistic metaphysics inherent within process theology will always remain somewhat mysterious. Also, any

piece of information or data that is taken up by a person, but never brought to the higher-phase experience of consciousness may seem to be mysterious. The possibility of life after bodily death is another area that Whitehead, Hartshorne, and others have relegated to the mysterious.

Relevant Themes

One additional issue concerns supernaturalism and scientific reductionism. For most process

theists, both of these notions are antiquated and do not do justice to the best available evidence. Some process theists like David Ray Griffin have pursued the panexperientialist route instead of scientific reductionism. Reductionism results in materialism or physicalism, where physics is the sole arbiter of truth, a physics, which in the end, deals with vacuous entities devoid of any intrinsic value or experience.

Other more recent attempts, like those of Philip Clayton, Paul Davies, Arthur Peacocke, Stuart Kaufman, and Terrence Deacon have tried to wed process thought with the new discoveries in emergence theory. Put simply, process theists are unhappy with the old religious/theological models but they are equally concerned about the prevailing mode of scientific understanding. Therefore, they have sought out or latched on to burgeoning scientific disciplines and constructive religious models.

The relationship of process theology to an even smaller constructive theology based on the philosophy of Samuel Alexander – emergent theism – is one final point of interest going forward into the future. Both of these theologies are capable of incorporating most, if not all, of the major scientific theories of our time, but exactly how they can enrich one another or which one may be of more use in the future remains to be seen. The merger of these two systems could be critical for the creation of a new way of conceptualizing the science and religion debate. This is, hopefully, fertile ground for additional research.

Cross-References

- [Concept of God in Contemporary Philosophy of Religion](#)
- [Constructive Theology](#)
- [Dependent Arising](#)
- [Evil, Problem of](#)
- [Interreligious Dialogue](#)
- [Panentheism](#)

- [Philosophy of Religion](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)

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Process-Relational Theology

- [Process Theology](#)

Production and Distribution of Goods and Finances

- [Globalization, Sociology of](#)

Production of Sounds

- [Speech](#)

Program Complexity

- [Computational Complexity](#)

Progressive Judaism

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Related Terms

[Liberal Judaism](#); [Reconstructionist Judaism](#);
[Reform Judaism](#)

Description

Progressive Judaism is a term given to describe a variety of Jewish religious groups and movements which, since the nineteenth century, have sought to reconcile their faith with modernity in a deliberate, programmatic way, usually in explicit contradistinction to traditional understandings of Judaism. They include, among others, Reform Jews, Liberal Jews, and Reconstructionist Jews, who, having disassociated themselves from the authority of Jewish tradition to a lesser or greater extent, have come to represent a wide spectrum of views with regard to theology and practice. It is worth noting that the labels can have different meanings in different places; for example, Liberal Judaism in Britain roughly corresponds to Reform in the USA, while Anglo-Reform is closer to US Conservative Judaism. Today, according to the statistics reported by the World Union of Progressive Judaism, there are more than 45 countries with Progressive congregations, around 1,200 Progressive, Liberal, Reform, and Reconstructionist congregations around the world, and approximately 1.8 m people affiliated with the World Union's constituent movements globally.

The Reform movement had its origin in the eighteenth century European Enlightenment, with its emphasis upon rationality and humanism. The Jewish Enlightenment, the *Haskalah*, was characterized by an interest in secular studies, such as philosophy, literature, and languages, and an obsession with raising the intellectual

mores of Jews in order to justify the hopes for political and social emancipation. One towering figure stood out on this stage, the Orthodox Jewish philosopher Moses Mendelssohn (1729–1786), who redefined Judaism in its tribal particularities as “revealed legislation” but who emphasized that Judaism's essential teachings, including its belief in a creator-God, its ethics, and its hope of eternal life, were universal truths available to all mankind through the proper application of reason. In a Romantic-era reaction to the Enlightenment in the nineteenth century, a number of Jewish scholars, including Leopold Zunz (1794–1886) and Heinrich Graetz (1817–1991), established a more historically orientated approach to Judaism known as the *Wissenschaft des Judentums* (or scientific study of Judaism), which came to regard Jewish identity as the sum of Jewish history. Such an approach dispensed with the ideas of divine legislation and a chosen people, and effectively adopted a materialist methodology that refrained from bringing in a supernatural dimension for explaining historical developments.

From these intellectual beginnings emerged the Reform movement, which had taken institutional form in Germany, the USA, England, and France by the 1840s, although the earliest stirrings occurred in Germany in the 1810s. By the 1880s, Reform would dominate North American synagogal life, while it would only ever be a denominational minority elsewhere. There is a debate among scholars as to the precise motivations and driving forces behind these progressive developments in each country, with greater or lesser weight being given to the political ambitions of assimilationist lay Jews, the influence of religious leaders and intellectual pioneers of Reform, and the critique and emulation of the surrounding Christian societies. In any case, with few exceptions the reforms adopted tended to be a mixture of theological and ritual innovations that divided wider Jewish opinion. By deliberately contrasting themselves with the traditionalists, the reformers provoked the rise of what would now be described as ultra-orthodoxy and neo-Orthodox Judaism, the first of which seeks to turn inward and away from the profane

world and its secular knowledge, and the second of which seeks to engage cautiously with it, adopting and adapting those aspects of modernity that, it is believed, can be reconciled with Jewish tradition without causing violence to it.

What were the reforms? At first, the changes were focused on manners and decorum in synagogue services, and on conforming to wider societal (i.e., Christian) norms of behavior. The use of the vernacular in the liturgy was encouraged at the expense of Hebrew, the services themselves were shortened, music was frequently included, and it became possible in some places for men and women to sit together. Reform “ministers” dressed like Christian clergy and the balance of their role shifted away from Talmudic learning and *halakhic* (legal) expertise toward sermonizing and pastoral care. Many reformers became ideologically relaxed when it came to observing *kashrut* (food laws) or the festivals and Sabbath in accordance with rabbinic tradition. Some adopted the practice of bringing newborn babies to synagogue for a blessing (like a christening), and of praying bare-headed (as was the Christian practice), and many replaced the *bar mitzvah* ceremony, that is, the rite of passage at which a boy reads publically from the Torah scroll for the first time, with the confirmation service at which a boy’s knowledge of the religious teachings and duties of Judaism were tested (like a catechism). In the USA, in particular, the idea of celebrating the Sabbath on a Sunday was actively advocated. Of course, many of these reforms in behavior implied subtle (and not so subtle) shifts in thought, and it was not long before these were made explicit, leading to more abstract theological innovations being introduced and debated, such as challenging the divine origins of the ► *Torah* or Law, or transforming the future hope of a Messiah into that of a messianic age, or propounding the universalist message of Judaism (“the Mission of Israel”) in contrast to its commonly perceived particularity, or emphasizing the idea of Judaism as a religion against the view of the Jews as a nation in reluctant exile, with the dangerous implication that they could not be trusted as patriotic citizens of England, France, or Germany.

It would be these theological developments, and the sense of intellectual and religious freedom, that would prove so important in the long run, since many of the new practices, especially those relating to decorum, would be adopted by the traditionalists.

In Germany, which took the lead in the movement, two distinctive positions emerged in the classic Reform period, usually associated with the *Wissenschaft* scholar-rabbis, Abraham Geiger (1810–1874) and Samuel Holdheim (1806–1860), both of whom understood Judaism primarily in terms of moral law and monotheism. Whereas Geiger viewed Reform Judaism as the latest expression of an evolutionary development, Holdheim was more revolutionary in his justification for change. For Geiger, history revealed how each generation of Jews had given fresh meaning to the traditional liturgy and practices that had sought to express the core ethical-monotheistic aspects of Judaism, leading to a perpetual state of organic change as the Jewish religion adapted itself to local circumstances and cultures. In this account of “progressive revelation,” modern Jews, who had evolved from a tribal nation to become the proponents of a religious system, had engaged with and developed the rabbinic traditions of medieval Jewry, just as their ancestors had engaged with and developed the traditions of Biblical Judaism. Thus Geiger reinterpreted the traditional expectation of a Messiah to liberate the Jews as a future messianic age of spiritual enlightenment. For Holdheim, history suggested that the destruction of the Second Temple and of Jerusalem in antiquity had brought to an end the need for the civil and ritual laws of Biblical Judaism. It followed that Rabbinic or Talmudic Judaism, which had remained mired in the ceremonial laws originating with the Temple and the Jewish State, had lost its way. What was called for now was a radical break with the past, and a recognition that only the moral teachings of the *Torah* were worth preserving. Holdheim felt he could justify the abolition of the ceremonial laws with the coming of the messianic age, which had been made manifest in modern Jewish political emancipation.

Sources of Authority

Arguably, the Reform movement organized itself according to two principles that define all modernizing variants of Judaism: progress and autonomy. From the *Haskalah* came the prioritization of human reason and autonomy, and from the *Wissenschaft* came the historicist view of the Jewish past, including its traditions and its sacred texts, as developments brought about by mundane historical-cultural forces. The recognition that the human intellect and its conception of religion had progressed over time persuaded reforming Jews, as individuals and as congregations, that they possessed all the authority they needed to define Judaism for themselves in their own day. Thus, reformers came to view the traditional sources of Jewish authority, that is, the *Torah* or the Bible, in a very different way from traditionalists. It came to be seen as encapsulating a variety of distinct, often contradictory, stages in Jewish history, thought and ethics, rather than as an integrated, unified body of religious revelation that was the foundation of Orthodox thought. Many modernists adopted the findings of biblical-criticism with relish, delighting in their newfound freedom to dismiss the morally and scientifically challenging aspects of the scriptures as manifestations of the unenlightened chauvinism and ignorance of earlier ages. The divine Law revealed at Sinai might be said to have originated in Heaven (*Torah min Ha-Shamayim*), but this should not be interpreted in a simplistic or naive fashion; even if inspired by God, the Law had been mediated by flawed human agents. Modern biblical scholarship with its concerns for the identification of multiple authors, contextual history, and linguistic mastery of the sources was a tool by which one might uncover the ethical principles that represented the authentic understanding or essence of Judaism. Such an approach would free it from the biases and errors that had, in the past, necessitated extensive theological gymnastics by traditional defenders of the truth and moral authority of God's divinely revealed *Torah*. With regard to their attitude toward the enormous body of rabbinic laws and traditions, including the Mishnah and the Babylonian and

Jerusalem Talmuds, the reformers adopted a range of different views, from those following Geiger, who regarded such literature as historically, culturally, and religiously significant feature of Jewish tradition, still of value for Jews today, to those more in sympathy with Holdheim, who was impatient and dismissive of what he saw as a primitive, misguided conception of Jewish religion, best forgotten. Generally speaking, the *Halakhah*, that is, the religious law, has not possessed the binding force or authoritative status for progressive Jews that it has for the Orthodox. At the same time, progressive Jews have tended to display an active interest in non-Jewish thought as (potentially, at least) authoritative sources of knowledge that can be synthesized with or understood to complement Jewish thought, especially in the realms of morality, ethics and science.

Key Values

Here, as elsewhere, the autonomy and commitment to change so prized by reformers has led to a range of views. In the US, Reform was split between moderate leaders such as Isaac Mayer Wise (1819–1900) and the followers of Holdheim's radicalism, such as David Einhorn (1809–1879). Over the course of the nineteenth and twentieth centuries there were a series of rabbinic conferences or platforms which codified in an authoritative way the key values of the reformers. The Pittsburgh Platform of 1885, convened under Kaufmann Kohler (1843–1926), showed the radicals to be in the ascendant at that time, declaring that “we accept as binding only its moral laws, and maintain only such ceremonies as elevate and sanctify our lives, but reject all such as are not adapted to the views and habits of modern civilization.” Mosaic and rabbinic laws had “originated in ages and under the influence of ideas entirely foreign to our present mental and spiritual state” and these were denounced in that “their observance in our days is apt rather to obstruct than to further modern spiritual elevation.” They declared themselves to be a religion, rather than a nation, and thus distanced themselves from Zionism and the political hope

for a Jewish State. Judaism was presented as “a progressive religion, ever striving to be in accord with the postulates of reason,” and, along with Christianity and Islam, was concerned to promote “monotheistic and moral truth.” By 1937 and the Columbus Platform, however, there had been a retreat from some of these positions, such that the land of Israel was now embraced as a profound expression of Jewish identity (“Judaism is the soul of which Israel is the body... a center of Jewish culture and spiritual life”). The text, drafted by Samuel S. Cohen (1888–1959), also willingly admitted that many traditions had been too easily set aside in the past:

Judaism as a way of life requires *in addition to its moral and spiritual demands*, the preservation of the Sabbath, festivals and Holy Days, the retention and development of such customs, symbols and ceremonies as possess inspirational value, the cultivation of distinctive forms of religious art and music and the use of Hebrew, together with the vernacular, in our worship and instruction.

This trend can continue to be traced in the 1976 statement “Reform Judaism: A Centenary Perspective,” in which the authors, led by Eugene Borowitz (1924–), identified a number of historical experiences (including threats to political freedom, the explosion of new knowledge and technologies, and the spiritual emptiness of much of Western culture) that “taught us to be less dependent on the values of our society and to reassert what remains perennially valid in Judaism’s teaching.” At the same time, the Holocaust was seen to have “shattered our easy optimism about humanity and its inevitable progress” so that even while Jews remain committed to the hope for the messianic fulfillment of humanity yet “we have learned that the survival of the Jewish people is of highest priority.” The emphasis on the universalist values enshrined in the “mission of Israel” to humanity was also tempered somewhat by the realization that Jews continued to be regarded as a people apart and viewed with hostility by so many.

Early Reform Jews, newly admitted to general society and seeing in this the evidence of a growing universalism, regularly spoke of Jewish purpose in terms of Jewry’s service to humanity...

Until the recent past our obligations to the Jewish people and to all humanity seemed congruent. At times now these two imperatives appear to conflict. We know of no simple way to resolve such tensions. We must, however, confront them without abandoning either of our commitments. A universal concern for humanity unaccompanied by a devotion to our particular people is self-destructive; a passion for our people without involvement in humankind contradicts what the prophets have meant to us... Previous generations of Reform Jews had unbound confidence in humanity’s potential for good. We have lived through terrible tragedy and been compelled to reappropriate our tradition’s realism about the human capacity for evil.

And while there was frustration that, in the face of Orthodox opposition, Reform Judaism had not yet been recognized as a legitimate expression of Judaism within Israel, such political frustrations could not weaken the loyalty Reform Jews felt towards the “newly reborn” Jewish State to which they were bound “by innumerable religious and ethnic ties,” nor would it prevent them from encouraging individual Jews to make *aliyah* (that is, to emigrate to the land of Israel). Likewise, the 1999 “Statement of Principles of Reform Judaism” (drafted by Richard Levy) with its tri-part focus on God, the *Torah* and the land of Israel, sought to reassert traditional and Zionist values alongside the classic reformist ones. In contrast to official declarations before it, no mention is made of modern biblical-critical understandings of the *Torah*, preferring to highlight its role as the foundation of Jewish life; to “cherish the truths revealed in Torah” about God’s ongoing revelation to the Jews and the record of their ongoing relationship with God; and to view it rather as a manifestation of *ahavat olam*, God’s eternal love for the Jewish people and for humanity. With regard to traditional ritual, the Statement noted that while “some of these *mitzvot*, sacred obligations, have long been observed by Reform Jews, others, both ancient and modern, demand renewed attention as the result of the unique context of our own times.”

In Britain, the Reform movement developed in a quite different direction. David Wolf-Marks (1811–1909), the first minister of the first Anglo-Reform synagogue, had internalized the

criticism of traditional Judaism voiced by many evangelical Christians. He sought to bring Judaism back to what he saw as its core beliefs of the Bible, and dismissed the rabbinic traditions as a kind of corruption. Unlike in the US and Germany, Anglo-Reform Judaism's emphasis upon reason did not result in the adoption of biblical criticism, which would have undermined the authority of the Word of God, and it was left to Claude Montefiore (1858–1938), co-founder with Lily Montagu (1873–1963) of Anglo-Liberal Judaism, to reform Reform around the turn of the century by injecting it with a more historical-critical character. Montefiore was also one of the pioneers of interfaith dialogue, an activity that has enthused progressive Jews much more than it has Orthodox Jews. As Montefiore saw it, not all the light has shone through Jewish windows, and this led him not only to dialogue with religious thinkers of other faiths, but also to become one of the first critically-acclaimed Jewish experts in New Testament studies and one of the earliest proponents of the Jewish reclamation of Jesus as a good Jew. Britain was also important in terms of drawing together from across the world those who shared a common set of progressive values, for it was Montagu who established the World Union of Progressive Judaism in 1926. Both Anglo-Liberal Judaism and the WUPJ continue to this day to champion the progressive Jewish interest in those truths that can be found in teachings outside of Jewish tradition, together with a profound commitment to the development of Jewish-Christian relations. Ironically, when it comes to official institutional interfaith representation, progressive Judaism is often sidelined by Christian partners in dialogue in an attempt to avoid offending the sensibilities of Orthodox Judaism, with whom the majority of British Jews are affiliated.

It is also worth noting Reconstructionism, a denomination that emerged in the US in the early twentieth-century and which is often viewed as a kind of compromise between Jewish religion and Jewish secularism. Its founding figure, Mordechai Kaplan (1881–1983), a Conservative-trained rabbi, came to believe that, as

a result of modern developments in philosophy, science and history, the theology of Jewish tradition was largely redundant. He established the Society for the Advancement of Judaism in 1922 and published *Judaism as a Civilization* in 1934. Essentially, Kaplan's vision of Judaism rejected supernaturalism while remaining committed to the Jewish community, such that Jewish religious life was to be maintained without any belief in a personal, supernatural deity or in His revealed Law. "God" was to be understood to be a metaphor, the sum of all natural processes that allow man to become self-fulfilled. Other reconstructionist teachings included the ideas that Judaism should be regarded as a continuously evolving religious civilization, an all-embracing way of life incorporating languages, literature, customs, civil and criminal law, art, music, and food; that the authority of religious observance comes from its status as the historical manifestation of the will of the Jewish people; and that the synagogue is regarded as a centre for communal activity. While it has not been successful in terms of affiliated numbers, in terms of its teachings it has undoubtedly influenced many other progressive Jews.

There has always existed a tension within progressive Jewish communities between the competing values of traditional religious authority and what might be described as the humanistic, liberalizing agenda. It seems fair to say that the Reform platforms considered above record a return to tradition that would have left some of the more radical founding fathers dismayed. In particular, there has been an acceptance of the significance of the Land to Judaism and an acknowledgement of the State of Israel as a legitimate element of modern Jewish identity, an increasing use of Hebrew in the liturgy, and renewal movements that emphasize traditional approaches to religious observance and Talmudic study. But as has been made clear by the principal organization of Reform in the US and Canada, the Central Conference of American Rabbis, personal autonomy still has precedence over authority of these platforms. And this principle holds true of other progressive groups, too.

Ethical Principles

From the beginning, Reform-minded Jews saw themselves as the guardians of ethical monotheism, a belief in one God who cares for humans and who expects them to care about each other, in contrast with the ceremonial law which was understood to lie at the heart of traditional Judaism. While none of the progressive Jewish denominations have been comfortable with creeds or mandatory lists of principles from which they can be said to derive their ethical worldview, a number of common beliefs do appear in their writings and statements of purpose. There is the idea of the “Mission of Israel,” that is, the responsibility to promulgate to the nations of the world the teaching of the unity of God as described in the *Shema* (“Hear O Israel, the Lord is our God, the Lord is one”). Along with a view of the *Torah* as the co-product of divine inspiration and human agency in the distant past, there is an optimism in the rationality of humanity that makes it an obligation to interpret and re-interpret this source of moral guidance appropriately for each generation. And there is a commitment to the social justice taught by the Hebrew prophets and embodied in the concept of *Tikkun Olam* (that is, mending or rebuilding the world), which is itself closely associated to the ancient hope for a future messianic age of peace for all humankind. It is worth remembering that Kaplan, the father of Reconstructionist Judaism, defined God as “the power that makes for human salvation” and by this he meant, among other things, that “to believe in God means to take for granted that it is man’s destiny to rise above the brute and to eliminate all forms of violence and exploitation from human society.” (*Judaism without Supernaturalism*, 1958).

Historically, progressive Jews have celebrated the Bible and rabbinic literature as enshrining the basic ethical framework for the Jew, although they have always reserved the right to censor the moralistic teachings of the Jewish traditions and to modify them in the light of modern ethical sensibilities. The Pittsburgh Platform (1885) focused on the disparity of wealth, deeming it

“our duty to participate in the great task of modern times, to solve, on the basis of justice and righteousness, the problems presented by the contrasts and evils of the present organization of society.” The Columbus Platform (1937) gave an even higher priority to defining Reform’s ethical worldview. Judaism was described as blending religion and morality into “an indissoluble unity,” with the love of God defined in terms of one’s love of fellow men. Social justice was sought by applying the teachings of Judaism to economic order, industry, and to national and international affairs. Jewish religion was presented as working towards a social order which protects men from material disabilities of old age, sickness, and unemployment and, and it cited the prophets’ ideal of universal peace, as committed to the moral education, love and sympathy necessary “to secure human progress.” The 1976 statement “Reform Judaism: A Centenary Perspective” reflected upon the successes of the Reform movement in the century since the establishment of the Union of American Hebrew Congregations and the rabbinical training centre Hebrew Union College-Jewish Institute of Religion. According to this account, one of its proudest achievements was that its teaching “that the ethics of universalism implicit in traditional Judaism must be an explicit part of our Jewish duty, [and] that women have full rights to practice Judaism” now appeared “self-evident to most Jews.”

In relation to wider cultural debates, progressive Jews have tended to adopt a socially liberal approach towards gender-equality (women Reform rabbis were ordained in the US in 1972 and in Britain in 1976), to abortion, to civil divorce, and to homosexuality (with many groups fully supportive of gay marriage and accepting of gay rabbis and cantors). Large numbers were involved in the US civil rights movement and the peace movement, and many have approached the Israeli-Palestinian problem by asserting their commitment to justice for what they see as the wrongs perpetrated against Palestinians as an expression of their commitment to prophetic and religious Zionist ideals.

Characteristics

While the idea of “the Judeo-Christian tradition” is often exaggerated, in many ways Judaism and Christianity are the most similar of the world religions, in large part because they emerged from a common ancestor in the first century. They share much of their scriptures (although they read the Hebrew Bible very differently, and they have each generated the later sacred writings of the Talmuds and the New Testament respectively) and they also share much of their ethical codes (despite the fact that many critics of Judaism contrast the so-called New Testament God of Love with the Old Testament God of Judgment). Of course they do differ on core issues such what is meant by the unity of God, who or what is the Messiah, who are the true people of Israel, and whether the *Torah* or Law has been abrogated. Other important differences include the complicated reality that Judaism tends to be defined as both a religion *and* in relation to the Jews as a people, rather than as a religion per se, and the importance of *Eretz Yisrael*, that is, the Land of Israel, to the majority of Jews, which strikes many Christians as an unspiritual obsession. When it comes to traditional teachings such as the role of women, the belief in the afterlife, or the divine nature of scripture, progressive forms of Judaism can often appear to share more in common with progressive forms of Christianity than with their more conservative co-religionists.

Progressive Jews differ amongst themselves regarding their professed beliefs, but this is rarely regarded as a problem since diversity is understood to be the inevitable result of the long-held commitment to personal autonomy. God can be viewed anywhere along a continuum from the biblical deity who intervenes in history to the power-that-makes-for-human-salvation. The *Torah* might be God’s revelation refracted through human culture or it might be simply a collection of ancient wisdom writings. The *halakhah* or religious law issued by rabbis might be regarded as binding or, more often, as general guidance. *Kashrut* or food laws may be observed, or encouraged, or ignored.

Intermarriage with non-Jews might be frowned upon or accepted. A Jew might be defined according to matrilineal descent (that is, of the mother), or it may be acceptable to have one Jewish parent and to have been raised as a Jew.

Science and Religion

A defining characteristic of the project of Reform was the claim to reconcile Judaism with the best scientific and philosophic knowledge of the day. Its proponents saw themselves as the rightful heirs of the *Haskalah* and embraced the positivist scientific worldview of the Enlightenment. Just as Jews had been doing for hundreds of years, progressive Jews stressed the rationality of Judaism in contrast to the allegedly irrational teachings of Christianity, such as the incarnation or the trinity, and also, as we have seen, they denigrated many of the teachings of Orthodox Judaism. The Pittsburgh Platform (1885) declared

We hold that the modern discoveries of scientific researches in the domain of nature and history are not antagonistic to the doctrines of Judaism, the Bible reflecting the primitive ideas of its own age, and at times clothing its conception of divine Providence and Justice dealing with men in miraculous narratives.

Likewise, the Columbus Platform (1937) affirmed that

Judaism welcomes all truth, whether written in the pages of scripture or deciphered from the records of nature. The new discoveries of science, while replacing the older scientific views underlying our sacred literature, do not conflict with the essential spirit of religion as manifested in the consecration of man’s will, heart and mind to the service of God and of humanity... God reveals Himself not only in the majesty, beauty and orderliness of nature.

At least until after the second world war, the story was very much one of a positive “response to modernity,” as the title of Michael Meyer’s (1988) seminal history of the Reform movement has it. The emphasis upon humanistic rationalism led to the adoption of biblical criticism, with all the implications that this had for a demythologized understanding of the history

and nature of Judaism. And many progressives were at pains to stress their acceptance of the findings of contemporary scientific thought, especially social sciences like sociology and psychology, a preeminent example being Kaplan's *Judaism as Civilization*. But later official pronouncements did not enthuse about science to quite the same degree. The Centenary Perspective (1976) was somewhat ambivalent about "the explosion of new knowledge and of ever more powerful technologies," and the Statement of Principles (1999) did not mention scientific progress at all. Arguably, the impact of science has been somewhat superficial and has never really gone much further than a rejection of crude supernatural beliefs and an integration of philosophical and historical analysis with Jewish theology. It did not result in a particularly strong interest in the natural sciences, for example. Exceptions to this rule included geological estimates of the age of the earth and biological evolutionary theory, which, among US progressive Jews, came to take on an iconic status in the science-religion controversy.

The theory of evolution possessed certain obvious attractions to Jewish reformers, not least as a parallel to the idea that the religious understanding of humankind in general, and of Jews in particular, had evolved over time and would continue to do so. But Darwinism, with its core tenets of competition, cruelty, and chance proved problematic. At first, Reform Jews such as David Einhorn and Isaac Mayer Wise rejected Darwinism because, like so many other religious thinkers in their day, they could not accept the idea of humans as descendants of lower animals. Wise denounced such view as "homo brutalism," and went on:

In a moral point of view the Darwinian hypothesis on the descent of man is the most pernicious that could be possibly advanced, not only because it robs man of his dignity and the consciousness of his pre-eminence, which is the coffin of all virtue, but chiefly because it presents all nature as a battleground, a perpetual warfare of each against all in the combat for existence, and represents the victors as those praiseworthy of existence, and the vanquished ripe for destruction... (*The Cosmic God*, 1876, 51).

But Wise did not reject the idea of evolution per se, only the Darwinian version. And in fact a theistic, teleological conception of evolution, which viewed organic evolution as a natural law and the means by which God achieved His purposes, became commonly accepted among progressives. Emil Hirsch (1851–1923) was probably typical in arguing in *The Doctrine of Evolution and Judaism* (1906) that evolutionary theory was not yet scientifically proven as an adequate account of life for it failed to account for life's origins, had not yet overcome the gaps in the fossil record, and could not explain the shift from the unconscious to conscious. Yet, he suggested, in its assumptions about the order and lawful nature of the universe, and in its recognition of the interdependence of human and non-human forms of life, a non-atheistic version could be easily reconciled with Judaism, which provided the meaning and purpose that were lacking. Kaplan would later go further by stating "We may accept without reservation the Darwinian conception of evolution, so long as we consider the divine impulsion or initiative as the origin of the process." (*Judaism as Civilization*, 1934, 98). In the 1950s and 1960s, there was less interest in attempting to reconcile Judaism with scientific theories, although Gunther Plaut (1912–2012) wrote about a divine goal of greater awareness corresponding with increasing complexity in *Judaism and the Scientific Spirit* (1962). By the 1980s Reform Judaism could be found opposing (Christian) Scientific Creationism, albeit this public activism was motivated primarily by the potential violation of the boundaries between Church and State in general, and science and Judaism in particular. Without espousing the pre-War confidence that evolutionary theory and Judaism could be readily integrated, and without making any comments on the type of evolution envisaged (whether Darwinism or theistic), the Central Conference of American Rabbis had no difficulty taking a stance and asserting that "the principles and concepts of biological evolution are basic to understanding science" (*On Creationism in School Textbooks*, 1984). The case of evolution, then, demonstrates the historically

strong desire among progressives to align with the scientific worldview whenever possible, even while privileging, ultimately, a theological or political perspective.

Cross-References

- [Bible as Literature](#)
- [Biblical Studies](#)
- [Creation in Judaism](#)
- [Creationism](#)
- [Evolution](#)
- [Feminism in Judaism](#)
- [Judaic Studies](#)
- [Language and Literature, Hebrew](#)
- [Messiah](#)
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- [Natural Selection](#)
- [Philosophy in Judaism](#)
- [Redemption in Judaism](#)
- [Revelation in Judaism](#)
- [Science and Religion](#)
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Protestant Education

- [Religious Education, Protestant](#)

Protestant Epistemology

- [Epistemology, Reformed](#)

Protestant Reformation

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The general terminology conventionally employed to characterize a complex and far-reaching series of events in Europe during much of the sixteenth century that had significant long-term effects on religion, politics, and even forms of commerce and economic organization. The original “Protestants,” led by the German monk Martin Luther, challenged the absolute authority of the Pope over both spiritual and secular matters and sought a return to the simplicity of the Christian churches of the first centuries. They also focused on the right and obligation of individual Christian believers to read the Bible and to interpret its meaning for themselves as well as to organize congregations without central control from Rome.

Providence

- [Divine Action](#)

Proximate Causes

- [Biology of Religion](#)

Psyche

- [Soul](#)

Psychiatry

- [Clinical Psychology](#)

Psychiatry in America

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Description

Psychiatry is generally described as that branch of medicine that addresses both the diagnosis and treatment of mental, emotional, and behavioral disorders. Disorders include, among other things, depression, anxiety, and schizophrenia.

People early on recognized how emotions played an important role in mental disorders. In medieval times, it was believed that it was demonic influence that caused such disorders. From the Middle Ages up until the eighteenth century, there was no attempt to address those mental abnormalities which might have provided help for those that were mentally ill.

It was only in the twentieth century that some reformers looked for improved conditions for the mentally ill. This was sometimes useful insofar as there were improved conditions in some asylums. But there were many asylums in which patients with certain forms of mental disease had little help. However, by the nineteenth century, there were reformers, among them, Dorothea Dix, who fought for improved conditions for people in asylums.

By the twentieth century, one could first begin to see a systematic approach that provided for those who were mentally ill. Scientists and psychiatrists began to investigate what caused mental and behavioral disorders. The German psychiatrist Emil Kraepelin was the first who divided psychosis into two different classifications: manic depressive psychosis, on the one hand, and schizophrenia on the other. Another very important intervention was provided by Sigmund Freud. He was the first person to relate the patient's problem to their behavioral and emotional history. He observed that individual histories were apt to give some clues or interpretation to whether the patient suffered from neurosis or psychosis.

Self-identification

Psychiatry is essentially a science because it looks for and discovers the sources of one or another psychological dysfunction. As previously noted, it was the German psychiatrist Emil Kraepelin who first divided psychosis into two different classifications: manic depression and schizophrenia. But it was Sigmund Freud who turned to the behavioral and emotional history of the patient as providing clues as to the cause of a specific psychoneurosis.

Psychiatry encompasses a discussion between the doctor and the patient and an interpretation of the patient's problem. But the examination must also encompass the differences between psychological problems and medical problems, a distinction necessary to deciding what treatment is best for the patient.

Characteristics

The major difference is that psychiatry does not address a physical problem alone, but is on the lookout for psychological distortions. In other words, it is not just about the failure of body parts; it is about the distortion in the way the mind may process things or sometimes misunderstand them, especially in hard times, such as the loss of a beloved, a crisis at home, experiencing a sense of failure, or some other form of discomfort.

Psychotherapy is distinctive among other specialities and traditions insofar as it has put together a wide variety of treatment strategies that can be applied to different psychological disorders. Psychiatry encompasses both psychological and physiological problems. What appears to be psychological is generally addressed through a discussion that transpires between patient and psychiatrist. What appears to be physiological is generally treated through the use of drugs that are known to influence neurotransmitter functions in the brain. Other times, electroconvulsive treatment may be useful.

Depending on the nature of a patient's problem, a psychiatrist may use interpretation in some situations, or prescribe medicine. Psychotherapy addresses a broad range of disorders. For example, depression is understood as a mood disorder characterized by intense feelings of loss, sadness, hopelessness, failure, and rejection. Neurasthenia is a condition caused by irritability, lack of concentration, worry, and hypochondriasis. It was G.M. Beard who first introduced this latter term into psychiatry in 1869.

Of course, at its beginning, psychotherapy did not have the access to many of the strategies that are available today. Over time, a number of different treatment strategies have been discovered that combat different psychological disorders. It should be understood that physicians are licensed: They have been thoroughly trained to treat patients with mental disorders, using interpretation of the patient's plight and/or medication, and sometimes uncovering a condition that is not altogether "psychological."

Relevance to Science and Religion

Science is extremely pertinent to psychiatry. Among other things, psychiatrists must be competent in knowing how to treat a patient not only with words and interpretation but also with medication. The psychiatrist needs to understand the psychological source of problems but also takes note of whether the problem is predominately psychological or physiological, and to act accordingly.

Sources of Authority

The sources for this speciality tradition encompass medical training which can take place only after the individual has received a college degree. The traditional route is a 4-year training in college followed by additional training in psychiatry. This usually encompasses 3–4 years of training in a department of psychiatry.

Ethical Principles

The ethical principles encompass not only the achievement of the knowledge one must learn about patients, diseases, and treatments, but also something about the interpersonal interaction between doctor and patient. Among the ethical principles, one must consider the privacy of the patient. That is, while the patient's problems may be discussed with other professionals whose specific knowledge may be essential to treating the patient, there are no other kinds of discussion about the patient without the patient's consent.

Key Values

The key value of this speciality/tradition is to help patients address their problems. Doctors must abide by confidentiality and not disclose the patient's problems with others except with consent from the patient.

Other key values include being well trained and keeping abreast of new knowledge as it

emerges in the field. In the medical world, there are ongoing findings both as to the cause of one or another disease and its potential cure. Therefore, doctors must stay abreast of journal articles, particularly those that are specific to their field.

Conceptualization

Nature/World

Each of us is defined by our innate nature as well as by our connection to the external world.

Human Being

As someone who is deserving of a good life.

Life and Death

While death is inevitable, the focus of all physicians, including psychiatrists, is to preserve life insofar as is possible.

Reality

For psychiatrists, the goal must sometimes be to help establish reality for a patient. This is particularly true for patients who disclaim their current reality.

Knowledge

A psychiatrist must have both medical and psychological knowledge in order to help a patient.

Truth

Psychiatrists are interested in knowing about their patient's ability to discriminate between truth and fictitious beliefs. A psychiatrist's training is important, but so is their ability to "get" a patient's feel, both in terms of affect, interest, and willingness to open up.

Perception

The best doctors observe not only a patient's physical condition but are also able to reach their hopes, dreams, and fears.

Time

Psychiatrists are very keyed into the meaning of past, present, and future as experienced or hoped for by their patients.

Consciousness

Consciousness (awareness) is a prerequisite for patients who can be treated by psychological insight.

Rationality/Reason

Rationality is important, but so is reasoning. The ability to reason is essential to rationality.

Mystery

All psychiatrists know that there are some unknown mysteries that impact each of us: These may or may not be established in the psychotherapeutic process. It depends on a patient's willingness to explore true meaning of some of their fears, angers, depression, etc.

Relevant Themes

This is a difficult question to answer. Psychiatrists must be well trained, but the best of them have the ability to notice not just a patient's words but also his or her affect, ability to interact, and the scope of the patient's insight into their dreams, hopes, and fears. Psychiatrists must have compassion for the patients, but must also intervene when the patient appears to be making perilous or un-thought through decisions.

Psychiatry in Europe

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Description

Psychiatry is a medical specialty that is concerned with the diagnosis, treatment, and prevention of mental disorders including research into these topics. Mental disorders are diagnosable illnesses that affect brain functions and that lead to cognitive, affective, motivational, perceptual, and behavioral symptoms. The term

“Psychiatry” was first coined in 1808 by the German physician Johann Christian Reil and it is composed of the ancient Greek word “psyche” (soul) and the word “iatros” (medical doctor) (Berrios and Porter 1999). Due to the high prevalence of mental disorders in the general population, Psychiatry plays an important role for public health and health economics in general (Schneider et al. 2011). In the last about 60 years, many successful treatments have been developed, and Psychiatry has become a therapeutic discipline. Moreover, psychiatric research in many neurobiological subdisciplines has advanced our understanding of mental disorders as disorders of brain functions (Gelder 2009). Therefore, it can be expected that translation of these basic research findings may also improve diagnosis, treatment, and prevention of mental disorders in the future.

Self-Identification

Science

Psychiatry is a very interdisciplinary science with strong relationship to natural and life sciences, but also to social sciences and the humanities. Modern psychiatric research combines biological, psychological, and social perspectives to investigate causal factors and disturbances of brain functions in mental disorders. Scientific methods range from genetics, molecular neurobiological methods to investigate the functioning of nerve cells including protein, neurotransmitter, and neuroreceptor functions, analogous investigations in animal models of mental disorders, research on the level of interacting cell populations in different parts of the central nervous system including neuroimaging techniques and electromagnetic approaches, to behavioral and particularly neuropsychological approaches as well as health services research and research into social factors and social treatments of mental disorders. The ultimate aim of these various research efforts is to improve the understanding of mental disorders mostly in terms of so-called bio-psycho-social disease models, and to develop better treatments and preventions for these mental disorders. In general, current treatment approaches

are multimodal in nature which means that biological, in particular psychopharmacological, psychotherapeutic, and social therapeutic approaches are combined. In the last two decades, evidence-based guidelines for the diagnosis and treatment of different mental disorders have been established, mostly on basis of well-conceptualized randomized double-blinded clinical studies.

Religion

Psychiatry does not self-identify as a religion. Before Psychiatry developed as a medical discipline, in the ancient Greece and Rome, mental disorders (particularly those with psychotic symptoms) were considered supernatural in origin by many people – although already Hippocrates hypothesized that physiological disturbances may be the cause of mental disorders. In particular by religious people, exorcism was often used to treat mental disorders. Also in the Middle Ages, particularly women with mental disorders were considered to be possessed by the devil or to be witches, were persecuted and killed. It is one of the important merits of the psychiatrist Wilhelm Griesinger (1817–1868) that he conceptualized mental disorders as brain disorders and that, in line with this view, he established Psychiatry as an empirical science.

Characteristics

Psychiatry as a scientific discipline is concerned with brain dysfunctions underlying mental disorders. Other specialties of medicine that in some way share this interest in disorders of brain functions are Neurology and related disciplines like Neurosurgery and Neuroradiology, as well as Psychosomatic Medicine and, as a nonmedical discipline, Psychology. Psychiatry is distinguishable from Neurology in that it focuses on disorders of brain function whose pathological substrates in the brain have not yet been fully discovered by current diagnostic techniques. Exemptions are so-called organic mental disorders like delirium, dementias, or amnesic disorders, which are diagnosed and treated by both medical specialties. Psychiatry differs from Psychosomatic Medicine in that it

focuses on disorders whose symptoms are directly related to brain dysfunctions, whereas Psychosomatic Medicine focuses on disturbed interactions between brain and mind on one hand, and other organs like heart, lung, or stomach on the other. Psychiatry differs from Psychology being a medical specialty which is devoted to the treatment of patients with mental disorders, although nowadays, psychologists specialized in Psychotherapy are also entitled to treat such patients.

Relevance to Science and Religion

Because of its interdisciplinary orientation, Psychiatry may also be interested in the scholarly area called “Science and Religion.” First, the self-conception of Psychiatry as a discipline is closely linked to theoretical presuppositions with regard to the idea of man. In particular, during the recent years, Neurophilosophy has been developed as a subdiscipline between the empirical neurosciences (among them Psychiatry) and the so-called Analytical Philosophy of Mind. One of the central questions of this subdiscipline is the so-called problem of free will and of personal responsibility. Second, religious delusions are among the classical psychopathological symptoms in mental disorders. This symptom represents only one example of a general problem in Psychiatry which is the proper differentiation between healthy experiences, thoughts, emotions, and behaviors on the one hand, and psychopathological symptoms on the other. Third, using functional neuroimaging techniques, psychiatrists akin to other neuroscientists have attempted to study the neural correlates of religiosity.

Sources of Authority

Sources of authority in Psychiatry are influential psychiatrists whose work represents milestones in the development of the scientific and therapeutic discipline. Wilhelm Griesinger (1817–1868) not only conceptualized mental disorders as disorders of the brain, but also can be regarded as one of the protagonists of community-based

care in Psychiatry. He also closely linked the principles of psychiatric nosology (regarding the description of diagnostic entities) to the clinical course of mental disorders, an aspect that was later on followed up in more detail by Emil Kraepelin (1856–1926). One of the milestones that Kraepelin contributed to Psychiatry has been the concept of “natural disease entities.” Like somatic disorders, this concept also considers mental disorders as biological, natural phenomena resulting from disorders of brain functions. Another influential proposition made by Kraepelin was the dichotomy of endogenous psychoses into dementia praecox and manic-depressive illness, which is still maintained in current operational diagnostic manuals (World Health Organization 1992). By focusing on the symptomatological, but possibly also pathogenetic heterogeneity of dementia praecox, Eugen Bleuler (1857–1939) coined the diagnostic term “schizophrenia” as a group of mental disorders resulting from disturbances of brain connectivity. The development of psychotherapy as one important therapeutic approach in Psychiatry is mainly connected to Sigmund Freud (1856–1939) who developed the theory of psychoanalytic treatment, and to J. Watson and B. F. Skinner who are considered to be founders of the behaviorism and behavioral therapy. In modern Psychiatry, many psychotherapeutic approaches integrate different aspects both from psychoanalysis and from behavioral therapy. Another important milestone in the development of modern Psychiatry is the development of a methodologically reflected psychopathology that mainly goes back to Karl Jaspers (1883–1969), and to Kurt Schneider (1887–1967) who developed the influential triadic system of diagnoses in Psychiatry. Up to the present, psychopathological symptoms are the main criteria on which current psychiatric diagnoses and therapeutic decisions are based. The current authoritative source for diagnostics in Psychiatry is the International Classification of Diseases (ICD) (World Health Organization 1992) that is edited and used by the World Health Organization, and that is currently revised for version ICD-11. A milestone in the development of current psychopharmacological therapies was

the discovery of therapeutic psychotropic actions of substances like chlorpromazine (by Henri Laborit, Pierre Deniker, and Jean Delay) in 1952 and of lithium (by John F. Cade) in 1949. As authoritative sources for current treatment regimes in Psychiatry, a number of evidence-based guidelines for the treatment of different mental disorders have been developed and edited by different national and international psychiatric societies ([World Psychiatric Association](#)).

Ethical Principles

National as well as international societies of psychiatric have also developed ethical codes to govern the conduct of psychiatrists. For example, the World Psychiatric Association has set a psychiatric code of ethics in 1977 (and revised it in 1999). This code includes issues such as confidentiality, human dignity of incapacitated patients, patient assessment, up-to-date knowledge, research ethics, genetics, discrimination, torture, euthanasia, and death penalty. The ethical principles are closely related to the key values of Psychiatry (see below).

Key Values

The key values of Psychiatry mainly relate to the treatment of humans with mental disorders. An important basis for the successful treatment of mental disorders is a good relationship and contact between physician and patient that is characterized by confidence, empathy, and humanity. The responsibility of the psychiatrist for the patients with mental disorders has been complemented in recent years by the important aspect of empowerment of patients, which aims to strengthen the patients' autonomy and own responsibility for their treatment as far as possible.

Conceptualization

To most of the following terms, Psychiatry does not provide an explicit and formal

conceptualization. Therefore, the following passages will give examples of how Psychiatry is related to these terms and topics.

Nature/World

Nature may be considered to be the sum of physical, biological, and biochemical factors in the environment of an organism, for instance, of a patient. The term "world" appears to have a broader definition that additionally includes social (sociobiological) aspects of the environment. In Psychiatry, it is well known that environmental factors may strongly influence the occurrence and maintenance of mental disorders.

Human Being

Like in other natural sciences, the human being is regarded as a highly developed biological organism equipped with a complex brain, which enables many higher functions like language, executive functions, and social cognitive functions. Some of these higher brain functions may be considered to be evolutionary new acquisitions that are specific to the human species.

Life and Death

Like in all medical specialties, life is defined as the presence of physiological functions in biological organisms. Death is regarded as the cessation of these physiological functions. The so-called brain death is a special case that raises ethical questions in medicine. In this state, other bodily functions are maintained, whereas no brain activity is observable.

Reality

In Psychiatry, external reality that is represented by the physical world around biological organisms, especially humans, is distinguished from an internal reality, which is the subjectively experienced reality in humans (and possibly in other animals).

Knowledge

Knowledge can be subdivided into an objective type of knowledge, which, for example, is represented in textbooks and libraries, and into

a subjective type of knowledge, which corresponds to information maintained in long-term memory in the brain.

Truth

In contrast to reality, which in Psychiatry may be subdivided into an objective (external) and a subjective (internal) part, truth is more narrowly conceptualized as only the objective reality that is represented by the physical, biological, biochemical, and social environment. Because the environment is too complex and only in part accessible with the human sensory organs, truth in its strongest definition may not be approachable for humans or other living beings.

Perception

Perception is considered to be the way in which humans and other living beings obtain information about the external physical world via the different sensory organs which they are equipped with. Perception includes both conscious and unconscious information flow. In Psychiatry, perceptual disturbances like hallucinations are major psychopathological symptoms, in particular in schizophrenia.

Time

Time can be objectively measured in relation to environmental changes. Human subjective perception of time may differ from these objective measurements. For human beings, time is also an important category as regards the development of personal schemes of life and life perspectives. In some mental disorders like dementia, the orientation in time may be severely disturbed as a classical psychopathological symptom.

Consciousness

Consciousness is defined in many different ways in the literature. In Psychiatry, quantitative and qualitative disturbances of consciousness are a further important psychopathological symptom that is especially characteristic for organic mental disorders.

Rationality/Reason

Rationality may be defined as a proper and healthy way of thinking that is guided by

understandable reasons. Rationality is disturbed in several mental disorders that present themselves with formal thought disorders and/or baseless fears, obsessions, compulsions, or delusions.

Mystery

In the Ancient as well as in the Middle Ages, mental disorders have often been considered to be mysteries, and the same is true for the very complex and astonishing functions (and sometimes dysfunctions) of the human brain. Nowadays, in Psychiatry, many specialists share the view that both the complex functions of the human brain and the complex psychopathological symptoms observed in mental disorders may at least in principle be fully explainable using current and future scientific approaches.

Relevant Themes

An additional topical issue in Psychiatry as regards “Science and Religion” is the challenge to overcome the stigma of mental disorders. The stigma has significantly reduced in the public during the last decades, but is still present. It dates back to the Ancient and Middle Ages, in which mental disorders were misconceptualized as being supernatural in origin and in which patients suffering from mental (brain) disorders were redlined as being criminals or asocial people. It is another very important aim of contemporary Psychiatry to combat the current stigma of these patients by clarifying the biological nature of mental disorders.

Cross-References

- ▶ [Empathy](#)
- ▶ [Evolution](#)
- ▶ [Free Will](#)
- ▶ [Gene](#)
- ▶ [Neuroimaging](#)
- ▶ [Neurology in Europe](#)
- ▶ [Neuropsychology](#)
- ▶ [Neuroradiology](#)
- ▶ [Neurosurgery](#)
- ▶ [Perception](#)

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Psychoanalysis of Religion

► Psychology of Religion

Psychoanalysis/Depth Psychology

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Related Terms

[Psychoanalytic psychology](#); [Psychodynamic psychology](#)

Description

Sigmund Freud (1923), the founding father of psychoanalysis, defined psychoanalysis as a triptych that is (a) a method to gain knowledge about psychic processes, (b) a psychological treatment, and (c) a theory of psychological development and functioning. Its basic assumptions include an emphasis on the role of unconscious processes and psychological conflict, the influence of the past on the present through complex developmental pathways, the importance of psychosexual desires from early childhood on, and the role of psychological causality.

Since its inception, psychoanalysis has met with fierce criticism from different fields, including psychiatry, philosophy, and religion. In particular, early biological psychiatry opposed Freud's valuing inner life and individual life history and instead emphasized that psychiatry had to concern itself only with biological factors in psychiatric disorders. Philosophers have mainly criticized the empirical status of psychoanalysis, and particularly its views on the nature of science and the validation of scientific theories. From the field of religion, Freud has been criticized for his view that religion is based on a psychological illusion. More generally, psychoanalysis' openness about sexuality, its promoting of atheism, and its emphasis on the autonomy of the individual thus liberating the person from the oppressive forces of the "Victorian" epoch have always been of concern to various religious traditions.

Yet, psychoanalysis has received much credence, first and foremost because it was the first systematic form of psychotherapy. Because of this, its theories and therapeutic techniques were rapidly embraced in countries all over the world, and particularly in the United States, where at the beginning of the twentieth century there was not yet a strong tradition in the field of medical psychiatry, as there was in Europe. This led to a strong dominance of psychoanalysis in psychiatry in the 1950s and 1960s until the arrival of systematic alternative psychological treatments based on either the humanistic movement in psychotherapy or behavioral and cognitive psychology.

Simultaneously, the hegemony of psychoanalysis was further decreased by the rise of biological psychiatry.

Psychoanalytic ideas have also left their mark in the world of art. Writers such as Arthur Schnitzler, Elfride Jelinek, Philip Roth, Erica Jong, Virginia Woolf, Italo Svevo, and Jean-Paul Sartre, to name only a few, embraced psychoanalytic ideas and used them in their work. Likewise, movie directors became increasingly intrigued by psychoanalytic ideas, using concepts such as trauma, repression, and the unconscious and early childhood memories in their plots. Well-known examples include *Citizen Kane* by Orson Welles (1941), *Spellbound* by Alfred Hitchcock (1945), and *Another Woman* by Woody Allen (1988). Others, such as the famous movie director Ingmar Bergman (Sweden), used psychoanalytic ideas more indirectly, as is expressed in movies like *The Silence* (1963), *Persona* (1966), *Cries and Whispers* (1973), and *Autumn Sonata* (1978). All this artistic attention has contributed a great deal to the popularization of psychoanalytic ideas, as is also expressed in the fact that psychoanalytic concepts have permeated our daily language. Who does not use from time to time terms like “repression,” “lost memories,” or speaks of a “Freudian slip?” Psychoanalysis has, so to speak, become part of our self-understanding, at least in the Western world.

Today, psychoanalysis or psychodynamic psychology encompasses a variety of theoretical and therapeutic approaches that have developed as a result of confrontation with different types of patients and problems, and a constant dialogue with neighboring fields and sciences. Hence, contrary to what is often believed, there is no such thing as “psychoanalysis” as a monolithic school or a dogmatic set of assumptions. This diversity of “psychoanalytic psychologies” within psychoanalysis demonstrates its liveliness and its potential for growth in the future.

Historically, four such “psychologies” within psychoanalysis can be distinguished (Pine 1988):

Drive psychology is the oldest approach in psychoanalysis and was first developed by Freud. The emphasis in this approach is on trying to understand human development and behavior in terms of a continuous conflict between internal drives – or

wishes in more experiential terms – and the moral standards of the individual. The main focus in drive psychology is on psychosexuality and aggression and their role in normal and pathological development. Apart from Freud, Jacques Lacan, a famous French psychoanalyst, has played a central role in developing the drive perspective. Influenced by the French structuralistic approach that dominated the human sciences during the 1950s until the 1970s, he argued for the importance of language and of social structures as symbolic systems that always precede and determine psychological development. The work of Lacan still is very influential in the areas of philosophy, literary criticism, and qualitative sociological research. Within psychoanalysis, he has caused a refreshing “retour” to Freud and remains influential particularly in France, Belgium, and various Latin-American countries.

Within *ego psychology*, the focus is less on the drive aspect in human functioning, but rather on how the person’s ego develops defense and coping mechanisms in an attempt to deal with drives as well as with the demands of the social environment. The central focus is on how the individual can adapt to the “average expectable environment.” Therefore ego psychology does not ignore the role of drives and inner conflicts, but focuses on the adaptive possibilities of the individual. Not surprisingly, therefore, ego psychology has been influential in the fields of diagnostic assessment, educational theory, child psychotherapy, and developmental psychology (e.g., David Rapaport, Erik Erikson, Anna Freud) and has played an important role in the popularity of psychoanalysis in the USA (Heinz Hartmann, Ernst Kris, Rudolf Loewenstein, Charles Brenner, Ralph Greenson). Margareth Mahler extended ego psychology into a global theory of normal and abnormal characteristics of ego development.

Object relations theory originated in the UK through the works of psychoanalysts such as Melanie Klein, Ronald Fairbairn, Harry Guntrip, Donald Winnicott, and Wilfred Bion. This branch of the psychoanalytic family mainly focuses on the development of relationships to others (i.e., “objects”) and how these relationships are increasingly being internalized as representations of self and others or cognitive-affective schema that

influence perception and behavior throughout life in increasingly complex ways. As Winnicott noted, in the first months of human life, the basic unit is not the individual, but the individual in its relational environment (Winnicott 1952). Object relations theory played a vital role in fostering more integrative trends in current psychoanalytic thought and research, as is expressed, for instance, in the work of Otto Kernberg (1980), John Clarkin et al. (1998), and Sidney Blatt (Auerbach et al. 2005). Finally, object relations theory also paved the way for John Bowlby's (1969/1973/1980) approach to early relationships with caregivers, the well-known attachment theory.

Self-psychology focuses on the subjective experience of the self and identity and how disruptions in the development of the self may give rise to so-called pathology of the self, which includes, but is not limited to, narcissistic and borderline personality disordered features. Heinz Kohut, for instance, noted the importance of age-appropriate mirroring by primary caregivers of the child's narcissistic needs and how disruptions in this process may give rise to a vulnerable and insecure self. His emphasis on the need of empathic support by the therapist made him the author of preference for psychotherapeutic authors of the school of client-centered psychotherapy (founded by Carl Rogers).

Currently, there is a growing dialogue and integration among these "four psychologies" and with neighboring fields such as cognitive psychology, developmental psychology, and developmental psychopathology, including attachment research, social psychology, and the neurosciences (Fonagy and Target 2003; Kandel 1999; Luyten et al. 2006). This has also led to a growing body of empirical research documenting the validity of psychoanalytic hypotheses and the efficacy and effectiveness of various treatments based on psychodynamic principles (Leichsenring and Rabung 2008).

Self-identification

Science

Psychoanalysis has considered itself a scientific enterprise from its beginnings in the works of

Freud until today, although, like any other psychological treatment, it is also in part an "art."

In contrast to the psychologists of his time, Freud's approach to psychological phenomena (psychopathological symptoms in hysteria and other neuroses) was very empirical. Trained in the natural sciences as a medical doctor (mainly in neurology), he adopted what can be called a hypothetico-deductive style of research. Confronted with inexplicable psychological symptoms in his patients, as well as in disturbances in everyday life (the Freudian slips) and in everybody's dream life – the so-called "normal" pathologies – he refused to merely speculate about the likely causes, but instead tried to arrive at theoretical assumptions about the psychological mechanisms behind these symptoms in order to make these phenomena understandable from a rational point of view. This was done by careful clinical observation and particularly by a technique that he slowly developed, partly instigated by his patients, called free association. In a back-and-forth way, he checked these constructs with further observations. Eventually, this brought him to an abstract theoretical model of the mind, with different systems (unconscious vs. conscious), later replaced by a more complex model (ego, id, superego). But these constructs were only *Hilfsvorstellungen*, that is, theoretical models which could be replaced at any time by alternative models in view of new data and insights. Freud did his empirical research in the style of his time (end of nineteenth century and first decades of the twentieth): he did not possess the methodological and statistical knowledge and possibilities that only became available later. Yet, unfortunately, psychoanalysis for a long time continued to rely almost exclusively on methods that became clearly outdated and showed many methodological flaws. It was only in the second half of the 1980s that more mainstream methods were adopted by psychoanalytic researchers.

In addition to the criticisms of Freud and psychoanalysis summarized above, there were many critiques of his scientific approach. The philosophical (epistemological) opposition to psychoanalysis was most precisely phrased by Karl Popper. For him, real science is characterized by a falsifying approach, that is, science is not

an accumulation of an endless series of observations leading to a general law (inductivism), but is the continuous process of challenging theoretical (i.e., general) assertions with well-selected empirical observations. Basically, one can say that Freud originally worked along these lines. But, because psychoanalysis became such a vast theoretical enterprise without unity and definite structure and because psychoanalysts always have shifting and different possible interpretations of their empirical facts (i.e., their observations during psychoanalytic sessions), psychoanalysis positioned itself as irrefutable and, thus, is not a science in Popper's opinion. This criticism has been and is a real challenge for psychoanalysis.

About the current status of scientific research in psychoanalysis, we highlight two points. (1) We must say a word about the tension within the psychoanalytic community between those who promote the new alliance with mainstream research in psychology and medicine versus those who nostalgically defend the case study method in Freud's style. In this controversy, we argue for a strategic scientific choice between methods (see Luyten et al. 2006): that is, depending on the nature of the research question and the accessibility of the phenomenon under scrutiny, either a nomothetic or a qualitative in-depth approach (via case study, interview, text analysis) can be chosen, or if possible, both approaches complementing each other should be used. (2) We draw the attention to the growing body of mainstream empirical research that challenges many aspects of psychoanalytic theorizing and that makes obvious the evidence-basedness of psychoanalytic psychotherapy (see Leichsenring and Rabung 2008; Piper et al. 2002).

Finally, we must highlight that psychoanalysis has been very influential in many different human sciences, as well as in the realms of art, literature, cultural criticism, and philosophy.

Characteristics

Compared with other branches of ► [psychology](#), the following characteristics of psychoanalysis

must be made clear. Psychoanalysis, by the nature of its original observational basis (i.e., the psychoanalytic cure, which is a very intimate interpersonal dialogue), stresses much more than mainstream psychology, the importance of inner life, mental processes, and the representational world of the person. Thus, in psychoanalytic research, the attention goes primarily to the experience of the person and to his/her narratives about this experience and not to externally observable behavior. As a theory, psychoanalysis is humanistic and holistic.

In relation to ► [psychiatry](#), the following should be emphasized. Until the 1960s, psychoanalysis was very influential in the world of psychiatry. It was the only accepted general theory for understanding psychopathology, and it formed the basis of nearly all descriptions of mental diseases. This hegemony is illustrated by the dominance of psychoanalysis in the first internationally available handbooks of psychiatry, like the *American Handbook of Psychiatry*, edited in 1960 by the psychiatrist-psychoanalyst Silvano Arieti. This is also illustrated by the earliest versions (until the end of the 1970s) of the worldwide-accepted *Diagnostic and Statistical Manual of Mental Disorders*, a major tool in research in medical psychiatry. There has been much criticism of this dominance. Also, this criticism, which was in the beginning mostly ideology driven and not research based, became increasingly research based, and thus the decision was made to make this manual as theory-neutral as possible in using only diagnostic categories that can be defined by objectively observable behavior characteristics. Today, the psychoanalytic framework is almost absent from the mainstream terminology in psychiatric research, although it can play a substantial role in this research. The psychoanalytic approach is valued in the study of the latent personality structures underlying psychiatric illnesses, and it plays an important role in the study of the inner world of meaning and subjective experience of the patients that are studied in medico-psychiatric investigations of the interplay of psychiatric symptoms and biomedical markers.

Relevance to Science and Religion

Psychoanalysis is not fundamentally linked to the actual debate that is known under the title “Science and Religion.” Nevertheless, it must be underlined that there is a constant flow of psychoanalytic publications about topics related to religion, (personal) religiosity, and spirituality. In that sense, the topic remains a constant issue of discussion throughout the history of psychoanalysis.

It must be remembered that the “depth psychologies” (i.e., Freudian psychoanalysis, Jungian analytic psychology, and Adlerian individual psychology) played, in the first half of the twentieth century, an important role in what one can call the secularization movement in the Western world. Freud, born in a more or less orthodox Jewish family, considered himself an atheist. As a rationalistic enlightenment thinker, he believed that religion would automatically disappear in the course of the further evolution of mankind toward societies governed by reason. Similarly, he thought that individual religious belief was the neurotic remnant of infantile desires for protection by an almighty father. However, he did not impose his vision on his patients. In his psychotherapeutic work, he was absolutely respectful of the personal values and beliefs of his patients.

Freud’s application of elements of his psychoanalytic theory to cultural phenomena such as religion has been very influential in the emancipation and liberation movements in different Christian denominations. It is important that religious scholars are well informed about this historical context.

The psychoanalytic approach remains important in the practical field of psychotherapy. Psychoanalytic teachings prescribe a very strict neutrality for the therapist vis-à-vis the religious and moral values of the patients. This is in line with Freud’s absolute respect for the personal values and religious choices of the patient as fundamental in the attitude of the therapist. In the ongoing discussions of today in the world of other psychotherapeutic schools and in religious institutes about the possible integration of religion into psychotherapy, this prescription is

a clear statement. Although religion is proven to be, in some circumstances, salutary for (mental) health, this does not permit the merging of these two worlds: the world of religious belief, conviction, and prayer on the one hand and the human science-based and more technical world of psychotherapy on the other.

Finally, psychoanalytic theory and psychodynamic psychology can be of great theoretical and clinical help in conceiving and designing research in the psychology of religion. Recent examples are investigations about the psychological basis of the human relationship with God that can be found in object relations theory and more precisely in attachment theory. Also, religious and mystical experiences can be understood in reference to psychoanalytic theory.

Sources of Authority

For the discipline of psychoanalysis, we must refer to the foundational works of several great researchers and clinicians. First, the 20 volumes of Freud’s complete works must be mentioned. Second, the studies of leading scholars in the “four” schools of psychoanalytic psychology. In drive psychology, besides Sigmund Freud, the main authors are the French psychoanalysts Jacques Lacan, Jean Laplanche, and Jean-Bertrand Pontalis (see Laplanche and Pontalis 1985). In ego psychology, first, there is the work of Anna Freud and then of the founding trio, Ernst Kris, Heinz Hartmann, and Rudolf Loewenstein. Later authors in this line are Erik Erikson, Margareth Mahler, Charles Brenner, and Ralph Greenson. In self-psychology, the main author is Heinz Kohut, and later contributors are Paul Ornstein and Ernest Wolf. In object relation psychology, many names must be mentioned from this school. First, there are the founding authors: Melanie Klein, Ronald Fairbairn, Donald Winnicott, Harry Guntrip, and Winfred Bion. Later very important authors are John Bowlby (attachment theory), Otto Kernberg, John Clarkin, James Grotstein, Thomas Ogden, Sidney Blatt (research on mood disorders and

psychotherapy outcome), Peter Fonagy (attachment and therapy research) Glen Gabbard (psychiatry), and Ivan Boszormenyi-Nagy (founder of a trend in family therapy). Robert Wallerstein and Fred Pine are American psychoanalysts that have underlined the “common ground” in the different psychoanalytic psychologies.

Ethical Principles

As a therapeutic undertaking, it puts the freedom of the individual and an absolute respect for the values, the moral and religious views, and the life choices of the person in the center of the therapist’s attitude toward the patient. Psychoanalysis is not interventionist; it is centered on the self-discovery of the person and on his personal growth (see section [Key Values](#)).

Key Values

Various values are at stake in the large field of psychoanalysis. The entire enterprise is based upon fundamental values that are inspired by enlightenment thinking (Freud): freedom of the individual, personal value of the individual, society as a community that organizes the “commerce” between free individuals and gives him/her protection and respect, critical respect for laws and regulations (critical means possibility is open for proposals of negotiated amendments), and the value of rational thinking and reasoning amid individual and social irrationality. Consequently, psychotherapy is not based on the knowledge or preconceived thoughts of the therapist, but on the ethics that follow from the respect for these values: psychotherapy is not “learning” or transmitting of knowledge, but self-discovery and recovery of personal freedom; it stimulates personal thinking and freeing of the person of imposed values and “truths”, it aims at greater personal freedom and self-esteem, in full respect of the personal history of the person.

Conceptualization

Nature/World

For psychoanalysis, there are two major challenges for the human being in its confrontation with “the world”: (1) uncultivated outside nature (the dangerous and threatening natural forces) against which the unprotected human being has to seek protection and (2) the innocent individual facing the social world. In civilized societies, this world is well ordered, but due to basic aspects of human nature this order and regulation are only superficial. Beneath this organization, there is human aggressiveness, irrationality, and self-centeredness.

In explaining individual psychological life, psychoanalysis is not one-sided. Although not its core business, psychoanalysis takes into account the biological nature of the human being. From a causality perspective, the psychoanalytic approach should be characterized as interactionistic. The psyche is always in interaction with the biological and with the social environment. In current psychodynamic research, increasing attention is given to this complex interplay. Therefore, this research is becoming more interdisciplinary. Intensive collaboration is needed between psychodynamic personality theory, social psychological attention to environmental details such as current life events, social support, and biogenetic approaches. The psychic life is more than an epi-phenomenon of biological life and biology is more than the passive substrate of psychological mechanisms.

Human Being

Psychoanalysis does not speculate about the origin of mankind. The human being is there as an observable given and many perspectives are possible for observing and studying it. Therefore, the training program of the psychoanalyst is always multidisciplinary: it deserves a biopsychosocial basis and makes use of the contributions of the different branches of human sciences. Although psychoanalysis mainly focuses the inner life of the individual, it always approaches this interiority in its dialectical relationship with “the other.” The individual is not on its own; it only becomes

a personal interiority as the result of a permanent interaction process with the environment: the family, the broader society, and the culture that structures family life and social order. Being human is *becoming* human by integrating the relational structures and models of the family and the basic representations and mental models of the culture (and language) that structures his familial group in his/her own inner history.

Another point that must be stressed is that psychoanalysis illuminates both sides of being human: its *grandeur* as well as its vulnerability. It is not fortuitous that Freud studied mental illness in order to find a cure for human psychological weaknesses and that he also tried to understand the greatness of cultural achievements: works of art, religion, philosophy, science, and (world) politics. Fundamentally, psychoanalysis considers culture as a victory over the ever threatening natural forces and the threatening chaos of living in a group, and it considers being human as a continuous fight against the inner threatening chaos of unconscious desires and drives by participating in the work of culture (sublimation).

Life and Death

In psychoanalysis, there is no theory about the origins of life. There is no reference to the belief in creation or to another explanation of the beginning of life. For Freud, as for a biologist, life is a bare given. It can be studied on the basis of observation, but it cannot be explained in terms of its origins. The same has to be said about death: it is a tragic given that must simply be accepted. Freud himself was very stoical in the face of his death. As a psychological theory, psychoanalysis does not claim any belief in an afterlife. For Freud, this was linked to his atheism; for the psychoanalyst in general, this is a matter of correct epistemological use of psychoanalysis as a psychological (and not spiritual or religious) theory.

Reality

Although one could say that from an ontological point of view, psychoanalysis adopts a (Kantian) critical realistic standpoint (there is a real world there outside, although I cannot know it directly

and without the mediation of my perception and cognitive processes), in its practice (the psychotherapy) and in its theorizing, it is essentially interested in the permanent intrapsychic, that is, subjective construction of “the” world: “my” world. Freud therefore introduced the term “psychic reality.” This psychic reality is subjective and does not necessarily correspond to the so-called “objective” (socially sanctioned) reality or the historical “truth.” The human being is essentially a meaning-making creature (see, e.g., Crystal Park). Memory research concerning testimonies about earlier events (e.g., Elisabeth Loftus) has shown that there are great divergences between subjective and so-called objective reality and truth. But from an individual standpoint, at least in the context of psychotherapy, this makes the “psychic reality” not less real. It has a traceable “objective” quality for the person; it determines the way in which a person is experiencing him- or herself, his/her family “reality,” and the social environment.

Knowledge

Consistent with the (Kantian) critical realistic standpoint, knowledge is the result of the interaction between critical thinking, cognitive capacities, and empirical observation. In a probabilistic way, we can progressively approach a “better” knowledge of our world. Nevertheless, there are tendencies in the big psychoanalytic family that are more inclined to adopt constructivist and deconstructionist approaches (see Lacan and Derrida).

Truth

Consistent with our comments under “reality” and “knowledge,” it is clear that concerning “truth,” a distinction must be made between the psychoanalytic concept of truth in the context of its scientific research task and the concept of truth in the context of its psychotherapeutic task. There is no speculative nor dogmatic truth from which psychoanalysis starts its endeavor. Scientifically, psychoanalysis is hypothetico-deductive: starting from a curious fact, a continuous back-and-forth process is started between empirical (the patient’s discourse in therapy, or the data from (quasi-) experimental research) observation and theory

building. The building of “truth” is a permanently provisory pathway. The findings are hypothetical truths. And each next step in research is done in the service of falsification of existing “truths” and in the expectation of finding a better approach to the “truth.”

In the context of psychotherapy (psychoanalytic cure), the term “truth” refers not to preexisting knowledge or dogma, nor to a so-called objective historical truth, but to the process of finding personal truth through the narrative process of psychoanalytic treatment.

Perception

Perception is conceived in psychoanalysis in a direct link with consciousness (being conscious). “The theory of psychoanalysis emerged from a refusal to define the psychical field in terms of consciousness.” But, of course, consciousness is an essential phenomenon, although it represents only a small part of the entire psychic activity, which is mainly unconscious. Perception can be called the sense organ of our consciousness. It is the antenna to the outside world through the function of all our (physical) sensory organs, as well as to the inside world. It is the internal “perception” of thought processes (reasoning as well as revival of memories) that makes possible the consciousness of psychical phenomena. In this becoming conscious of inner psychic data, the function of language plays a crucial role. “The bringing of thought-processes to consciousness depends on the association of these processes with ‘verbal residues’” (Laplanche and Pontalis 1985).

Time

Time and temporality are important topics in psychoanalysis. Actual behavior (acts, feelings, motivations, ideation) can only be understood if one takes into account the past and the future. The past refers to “my” personal history and the history of my family. These form the background and the building blocks of my current state of mind and of my way of behaving. They remain largely unconscious and can only be approached by the narrative effort that characterizes the therapy – the therapy as a continuously digging out of personal and familial

memories. They form, so to speak, my personal psychic archive. This archive is to be considered the basis of psychic causality: it “causes” my basic mood as well as the disturbances in my behavior. These disturbances are the consequence of personal or familial conflicts that have not been well digested or elaborated (worked through). It is this narrative conception of man’s conflictual past, that is, the background of Jacques Lacan’s (French psychoanalyst, 1901–1981) conception of the unconscious as a constantly flowing series of “signifiers,” a concatenation of affectively laden “words” or narratives.

Not only the past but also the future time dimension is of great importance. Although technically, most therapy effort is devoted to revealing forgotten and repressed memories, the therapeutic progress requires also unraveling the person’s intentions and plans for the future.

For both reasons (reworking past conflicts and fighting for a new future), psychoanalysis is called a dynamic psychology: a psychology that takes into account the conflicting forces in the human mind. Therefore, the term “psychodynamic psychology” is frequently used.

Consciousness

For psychoanalysis, it is fundamental to consider consciousness side by side with the unconscious. The most important (in terms of quantity and of influence on human behavior) domain in human mental life is unconscious. Quantitatively, most of the psychological processes are descriptively unconscious. They influence fundamentally, more than one likes to admit, the conscious psychic life. In many cases, the unconscious dynamics are the causal background of psychopathology (the so-called structural unconscious and the repressed unconscious). It is in this sense that psychoanalysis as a therapy is directed toward making conscious what hinders normal functioning from inside the unconscious (elements that were not well registered or that have not been consciously accepted).

Rationality/Reason

To put it in terms of the historical periods of Western culture, one could say that

psychoanalysis is the paradoxical combination of the enlightenment and of Romanticism: the enlightenment because of the central role of reason in psychoanalysis and Romanticism because of the central role of irrationality, emotion, and affectivity in its scrutiny of the human psyche. In opposition to the beginning rationalistic psychology of the end of the nineteenth century, Freud did not accept the idea that the seemingly irrational aspects of human behavior were not open to rational, scientific investigation. This was for him “the” challenge for psychology: to find the “ratio” in the irrationality. This characterizes Freud as a rational and rationalistic scientist. At the same time, just like the romantics, he believed that the “deeper truth” of the human soul is to be found in its irrational undergrounds.

Mystery

This term is not explicitly defined in psychoanalysis. Indirectly, the term is relevant in that psychoanalysis considers itself and is considered by other scholars as a “demystifying” enterprise. In therapy, it helps the person unravel the mysteries of his or her disturbing past. As a theory, psychoanalysis aims at finding rational explanations for all aspects of human behavior, even the most perplexing, surprising, and hidden ones.

Relevant Themes

- *Jungian analytic psychology*: Carl Gustav Jung was an early disciple of Freud, later a “dissident,” partly because of his mystical tendencies. Has had great influence in Christian religious circles of his time; this continues today.
- *Cultural anthropology*: As in other matters, Freud, the medical doctor and psychologist, made use of “helping” human sciences to understand certain phenomena; for his study of religion, he relied on the then existing ethnographic anthropology; more recent psychoanalytic authors rely on structuralist cultural anthropology, like that of Claude Lévi-Strauss.
- *Psychology of religion*: Besides other types of psychological study of religious behavior, the psychoanalytic or psychodynamic approach to religious phenomena has a long tradition inside psychology of religion. Main authors are Paul Pruyser, Ana Maria Rizzuto, James W. Jones, William W. Meissner and, in Europe, Julia Kristeva, Denis Vasse, Jacques Lemaître, Michel de Certeau, Louis Beirnaert, and Antoine Vergote.

Cross-References

- [Clinical Psychology](#)
- [Cognitive Science of Religion](#)
- [Consciousness, the Problem of](#)
- [Developmental Psychology](#)
- [Emotion](#)
- [Judaic Studies](#)
- [Psychiatry in America](#)
- [Psychiatry in Europe](#)

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Psychoanalytic Psychology

► Psychoanalysis/Depth Psychology

Psychobiography

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Description

Psychobiography is the largest and best-known subfield of psychohistory, which is oftentimes even confused with psychohistory as a whole. It can be defined as the systematic use of contemporary scientific psychology in research on the biography of a (usually deceased) individual. As insights produced by scientific psychology is usually not universally valid, the bulk of psychobiographical research has been conducted on persons

from a not too remote past, although daring efforts have been made to go back even as far as to the times of Jesus Christ (Capps 2000). The type of psychology most commonly employed in psychobiographical research has been psychoanalysis, although the number of studies in which an attempt is made to use also other kinds of psychology is growing (Belzen 2004; Belzen and Geels 2008; Bucher 2004; Schultz 2005). Often misunderstood as being reductionistic (i.e., explaining “everything” from a psychological perspective or bringing only a psychological perspective to bear on the data available), psychobiography, correctly performed, is the careful attempt to recognize the individual intertwining of an instinct-driven body and the symbolic order. A good psychobiography requires triple-entry bookkeeping. The individual under study needs to be understood on three complementary levels: (1) the body and all that constitutionally comes with it; (2) the ego as idiosyncratic synthesis of experience; and (3) the social structures within which the individual life history is realized and whose ethos and mythos shape the subject and, in the case of exceptional individuals, is shaped by the subject.

Self-identification

Science

Psychobiography self-identifies as a scientific enterprise, in which psychology is applied in biographical research of historical individuals.

Characteristics

Psychohistory is distinct in its employment of contemporary scientific psychology in research on individuals from the past.

Relevance to Science and Religion

Psychobiography has no specific interest in or contribution to make to any “science and religion” dialogue, which is usually seen as

a branch of systematic theology or of religious studies. Psychobiography may and has been quite often performed on religiously significant historical persons, however (Erikson 1958; Meissner 1992). Articulation and elaboration of the consequences of such research for any “science and religion” area is left to others.

Sources of Authority

The same sources as in psychological and historical research are authoritative for psychobiography.

Ethical Principles

The same ethical principle as with psychology and history guide psychobiography.

Key Values

Psychobiography endorses the same values as the disciplines of psychology and history.

Conceptualization

Nature and world, human being, life and death, reality, knowledge, truth, time, rationality/reason, and mystery are no concepts specific to psychology or biographical research; therefore, psychobiography does not define them in any way of its own. Perception and consciousness being concepts specific to psychology, psychobiographers follow contemporary psychological theories in their conceptualization of these; they do not offer new or specific definitions.

Cross-References

- [Religiosity](#)
- [Religious Experience](#)
- [Self](#)

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Psychobiology

- [Biological Psychology](#)

Psychodynamic Psychology

- [Psychoanalysis/Depth Psychology](#)

Psychogerontology

- [Aging, Psychology of](#)

Psychohistory

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Description

As signaled already by the very designation, psychohistory is a field constituted by an overlap of the

academic disciplines of psychology and history (each of which is heterogeneous itself). It is a field plagued by misperceptions. Psychohistory is not to be confused with other overlaps between psychology and history: it is not “history of psychology,” which is part of the history of science, dealing with psychologies from the past and their fate; psychohistory is not “historical psychology,” which focuses on the way how psychic functions – e.g., memory (Danziger 2008) – and processes developed, manifested themselves and functioned in the past; psychohistory is not “psychological history,” which refers to historical scholarship focusing on aspects of the daily private life of ordinary people in former days (e.g., on smell, anxiety, hate), instigated by the French *Annales* school in the 1920s (this branch of historical scholarship is also often referred to as “history of mentalities”). Neither is psychohistory a “psychology of history,” attempting to provide psychological explanations for historical processes at large (although there have been authors offering “explanations” of the “behavior” of entire states or continents; usually such “explanations” present quite speculative reasoning, employing poorly understood psychoanalytic concepts, something Freud condemned as “wild analysis”); nor does psychohistory start from the assumption that much of culture is shaped by the psychodynamics of the individual psyche.

Very generally formulated, then, psychohistory is an interdisciplinary field of research in which aspects of conduct and experiences of individuals, groups, and/or other cultural entities are investigated by means of modern psychological instruments (like theories, concepts, and skills).

Although the lion’s share of psychohistorical production is still made up of biographical and psychoanalytical studies, psychohistory in no way needs to limit itself to the genre of biography and to the utilization of psychoanalysis (cf., e.g., Runyan 1982). These are additional misunderstandings which need to be rejected. It does have to be recognized, however, that psychoanalysis in its reflection on the interpretive process in therapy offers a valuable tool for helping in the analysis of the interpretive work of the historian (Röckelein 1993).

In two ways, heuristically as well as hermeneutically, one can also employ, e.g., personality theory, social or developmental psychology, in historical investigation. The views developed in these branches of psychology can draw the attention of historians to certain themes, which would probably otherwise remain un- or underexposed; psychology in this case urges to search for further sources. In the second place, psychological theories or viewpoints may furnish additional possibilities for the interpretation of sources. Although the results of psychological research are hardly ever universally valid, such research nevertheless has produced some knowledge of, e.g., motivation and emotion, social interaction, decision behavior, human development, and personal life stories, which, for all their limitations, exceeds the level of common sense. These and many other psychologically namable processes have played a role in the lives of past individuals, groups, organizations, and institutions (Belzen 2001). Pursued as the systematic and reflected use of scientific psychology in historical investigation, the psychohistorical *modus operandi* offers important advantages: for one who turns to the past always uses one or another psychology and certainly when doing research on themes relevant to this field. Instead of doing this altogether uncritically, and instead of naively applying the homegrown common sense one happens to have become acquainted with, psychohistory attempts to follow a carefully thought-out procedure. Though not a guarantee of infallibility, such a considered attempt is nevertheless preferable over unreasoned psychological dilettantism. In the same way that disciplines such as sociology or economics can be integrated with historiography and yield an additional perspective, this can likewise be done with psychology (Belzen 2004).

Self-identification

Science

Being a combination of psychology and history, psychohistory is a branch of science or of scholarship in the same way as these two mother disciplines are sciences. Stronger than is the case with

history, psychology belongs to several different types of sciences, to both the natural sciences and to the humanities or the cultural sciences (“Geisteswissenschaften” as classically defined by a.o. Dilthey). Psychohistory typically ranges on the cultural side of psychology, as it acknowledges that psychic phenomena are different at different times and places and that they are culturally constituted (Belzen 2010). Inevitably drawing on modern scientific knowledge, psychohistorians try to employ contemporary psychological instruments to explore past state of affairs, which puts them in tension with historical psychologists who stress the different character of past psychic phenomena, and who sometimes go so far as to deny that any contemporary psychology can be employed in researching the past.

Religion

Numerous religious states of affairs may and have been investigated from psychological, historical, and psychohistorical perspectives however.

Characteristics

It is the typical combination of psychological and historical scholarship (empirical historical research guided and interpreted by psychological insights) that makes psychohistory distinctive.

Relevance to Science and Religion

Just like psychology and history, psychohistory may be relevant on a theoretical level to any dialogue between science and religion, but like its mother disciplines, it is more likely to be applied to religious phenomena and states of affairs rather than to contribute to a dialogue with any religion (in what way ever understood). Psychohistory does research on religious phenomena; in fact, quite a number of classic studies in psychohistory also count as classics in the psychology of religion (e.g., Carroll 1986;

Freud 1923/1961; Erikson 1958; Festinger et al. 1956). But again (see section “Description”), not all combinations of psychology and history in the psychology of religion can count as psychohistory: Acknowledging that psychological phenomena are developing products of historico-cultural constitution is something else and something more than combining psychology with an interest in religious phenomena from other times and places (as, e.g., with Jung who – quite the opposite of cultural psychology – searched for the same psychological archetypes in various places). It is also different from carrying an anthropological interest into the study of the history of religions, as with great authors such as Otto, Van der Leeuw, or Eliade.

Sources of Authority

The same sources as for psychology and history are authoritative for psychohistory.

Ethical Principles

The same ethical principle as with psychology and history guide psychohistory.

Key Values

Psychohistory endorses the same values as the disciplines of psychology and history.

Conceptualization

Nature and world, human being, life and death, reality, knowledge, truth, time, rationality/reason, and mystery are no concepts specific to psychology or history; therefore, psychohistory does not define them in any way of its own. Perception and consciousness being concepts specific to psychology, psychohistorians follow contemporary psychological theories in their conceptualization of these; they do not offer new or specific definitions.

Relevant Themes

An important issue that psychologists have largely lost sight of is the origin and development of culture including religions. Whether psychology has anything to offer with respect to these issues to historical research is a question still to be settled. (At present, so-called cognitive scientists of religion, usually trained in “religious studies,” seem to be more optimistic in this regard than both psychologists and historians.) Yet in the light of the many new developments in fields like biology, neurology, and evolutionary theory, psychologists need to address anew the nature of the knowledge they produce and reflect whether new forms of psychohistory, as interdisciplinary area between psychology and history, might be developed.

Cross-References

- [Psychobiography](#)
- [Psychology of Religion](#)
- [Religiosity](#)
- [Religious Experience](#)
- [Self](#)

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Psycholinguistics

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Related Terms

[Language](#); [Psycholinguistics](#); [Psychology of language](#)

Description

Psycholinguistics is the scientific study of the psychological processes involved in language. Psycholinguistics investigates how humans produce, understand, and store language, and is therefore concerned with processes such as speaking, listening, writing, and reading. Therefore, of necessity the representation and storage of language and meaning are of fundamental interest to researchers in the area. Psycholinguists also investigate how children acquire language and how aging changes language skills. The subject is also concerned with the relation between language and the brain, and some researchers construct models of how different types of brain damage affect language. The scope of the subject also includes language in exceptional circumstances, such as the effects of linguistic deprivation, developmental disorders of language, and language in other modalities (particularly sign language).

In addition to progressing our understanding of these processes using experimental techniques standard in much of cognitive psychology, over

the last decade or so, psycholinguistics has made notable advances along four new fronts.

First, recent developments in brain imaging, particularly ► **fMRI** (functional magnetic resonance imaging), have enabled us to map how has enabled us the brain processes language in real time. Although there is still some way to go in terms of the quality of resolution of the data generated by these techniques, we now have an advanced understanding of which part of the brain does what, how the parts are functionally related together, and how the parts interact in real time. In addition to aiding our understanding of normal processing, these advances have enhanced our understanding of how the brain can go wrong, both in terms of developmental and acquired disorders.

Second, advances in genetic mapping have led to the very beginning of an understanding of the genetic basis of language. Specific language impairment (► **SLI**) is a deficit of producing sounds and grammar that runs in families. Genes have been identified that might be related to the language disorders playing a central role in ► **SLI**, although the precise way in which they manifest themselves is controversial. The **FOXP2** gene, which has been called the “speech and language” gene, has been suggested to play a central role in language acquisition and evolution.

Third, anthropological evidence has been related to the mutation of the **FOXP2** gene to give greater understanding of the evolution of language. Language and speech must have been present at the start of the cultural flowering of 50,000 BC, although it might have been present some time earlier. Archaeological finds that suggest that Neanderthals played musical instruments, along with genetic evidence, suggest that the Neanderthal branch of the hominid tree was also capable of language. One plausible idea is that spoken language evolved out of manual gestures, with the mutation in the **FOXP2** gene allowing greater control over the tongue and lips, so that the symbol system could be transferred to the mouth, freeing the hands for the use of tools simultaneous with communicating.

Fourth, computational modeling over the last couple of decades has greatly increased our understanding of the microprocesses involved in language. Connectionist modeling shows how complex processes can emerge from the interaction of many simple “► **neuron-like**” units. Another advantage of this type of model is that it emphasizes the role of learning in behavior. The models have been most successfully applied to word recognition, particularly reading, and word production.

Connectionist models emphasize the importance of statistical regularities in the linguistic input rather than the operation of formal linguistic rules, and this has led to a general acknowledgment of the role of statistical processes in language. For example, in reading, many argue that a word’s pronunciation is influenced by the sum of the total influences of similar words; in language acquisition, infants may learn to segment language by detecting statistical regularities in the input. The extent to which language processing is statistical or based in rules and the extent to which we are born with innate language-specific knowledge rather than acquire language using general-purpose cognitive mechanisms are two of the great current controversies in psycholinguistics.

Self-identification

Psycholinguistics is most definitely a science. It uses the scientific method, using experiments and other data to formulate and test hypotheses and distinguish between competing theories. The discipline does not self-identify as a religion in any way.

Characteristics

Psycholinguistics is distinguished by the scope of its material: It is concerned with the intersection of language and psychology and asks the question: What are the processes involved in doing language? In this respect, it needs to be distinguished most from linguistics, the study of language in itself. The distinction originally made by

Noam Chomsky between linguistic competence (idealized linguistic knowledge) and performance (language as it is actually produced and understood, subject to our many cognitive limitations, such as limited memory resources) is still relevant. Psycholinguistics is best conceptualized as an arm of cognitive psychology. Nevertheless, although it has a distinct identity, it is an interdisciplinary subject, and knowledge of linguistics, anthropology, cognitive psychology, social psychology, artificial intelligence, philosophy, and now genetics and evolution stands researchers in good stead.

Relevance to Science and Religion

Although psycholinguistics is not directly interested in “science and religion,” it does have some implications for the topic. First, language is uniquely human. Although some animals have rich communication systems, they all lack the creativity of human language that enables us to express any thought. And although there have been several attempts to teach language to animals, particularly chimpanzees, none has been equivocally successful. Language sets us apart. Second, it casts light on the relation between language and thought and the origins of culture, cognition, and thought. Indeed, it is likely that origin of religious beliefs dates to soon after the origin of language. It is impossible to conceive of religions without language.

Sources of Authority

Although we can discern a few early attempts at understanding language with an approach that is undeniably modern, the history of psycholinguistics is a relatively modern one. Psycholinguistics emerged from a postwar synthesis of psychology, information theory, and linguistics. Many trace its origin to a conference held in the summer of 1951 in Cornell, USA; its first printed use was in the title of the book by Osgood and Sebeok (1954) reporting that conference.

The first great authority in the subject, and still one of the most cited authorities in the area, was the American linguist, Noam Chomsky, whose review of Skinner’s book *Verbal Behavior* created the landscape of the early subject. Chomsky’s early work on transformational grammar was seized upon by psychologists, particularly George Miller, as a model of how the mind might process knowledge, in addition to a representation of our knowledge of language. The early experiments that showed some relation between psycholinguistic processing and linguistic theory were followed by disillusion, and since the late 1960s, psycholinguistics and linguistics have gone separate ways, in a way that mirrors Chomsky’s performance-competence distinction.

Psycholinguistics is a broad and fast-changing area, and there has been no single authority since its earliest days. Now authority is defined by accomplishment, as measured by publication in a peer-reviewed journal. It might be added that like much of cognitive psychology, it is a subject area riven by disagreement over the fundamentals: Is processing interactive or modular? Do we use rules or statistical knowledge? Do we have innate language-specific knowledge, or do we learn language using general-purpose learning mechanisms? The answer you get will depend on which authority you are speaking on which authority to whom you are speaking.

There are two recent handbooks that cover the area, Gaskell’s *Oxford Handbook of Psycholinguistics* (Gaskell 2007) and Traxler and Gernsbacher’s *Handbook of Psycholinguistics*, now in its second edition (Traxler and Gernsbacher 2006). There are also a number of texts, including Harley (2008, 2010) and well-known popular books (Pinker 1994, 1999).

Ethical Principles

Psycholinguistic research is guided by the same ethical principles that govern other sorts of psychological research. The primary rule is that the participant must normally give informed consent, unless there are very good reasons for doing so

(e.g., the person is unable through age or illness), in which case other appropriate consent should be sought. Researchers typically abide by the ethical guidelines of institutions such as the American or British Psychological Associations. However, because of the nature of the subject matter and experimental techniques used, ethically controversial studies are rare. Participants are not subjected to pain, humiliation, or danger. Occasionally, participants may be deceived to a small degree of deception about the purpose of the experiment (e.g., they might be told that the experiment is about memory when in fact it is about word recognition), but this deception is typically very minor and usually considered trivial.

Key Values

The key value is adherence to the scientific method: experimental rigor. Psycholinguistics is a subdiscipline of cognitive psychology and depends for its integrity upon the rigorous application of the scientific method: the collection of experimental and observational data, statistical analysis, and the formation and rejection of hypotheses on the basis of those data.

Conceptualization

Nature/World

Humans are part of nature and use language to describe and study their world. In addition, studies of semantics suggest that all languages share a number of universal features, at the levels of the types of grammatical rules used and, perhaps even more revealing, in the types of semantic representations used, suggesting that all languages reflect a similar “deep” cognitive structure that derives from the way human brains interact with the world, mediated by our senses.

Human Being

Psycholinguistic research investigates topics central to the question of what does it mean to be human. Language is one of the most important cognitive achievements that separates us from

animals: It is probably the single most important distinguishing cognitive difference. Animals communicate; humans talk or sign. It also seems that there is a human drive to develop a language, even in the most difficult of circumstances. Even when situations deprive children of language, they develop some version of it. For example, for some time, deaf children in Nicaragua were kept in isolation; nevertheless, the children developed their own sign language to communicate with each other, with the language having its own grammar. Children who grow up exposed to pidgins (mixed languages used to communicate readily in mixed linguistic communications) effortlessly convert pidgins to creoles, which are rich languages with their own full grammars.

Life and Death

Psycholinguistics does not really have anything directly to say about the origins of life and death. Different cultures express their attitudes to life and death in different ways, but this topic is more strictly in the domain of anthropology and linguistics rather than psycholinguistics.

Reality

One of the key issues in psycholinguistics is the relation between language and thought. One influential idea has been the Sapir-Whorf hypothesis, the idea that the way in which we perceive and categorize the world is determined by the form of our language. Although this hypothesis is almost certainly incorrect, elements of it are supported by data: To some extent, the way in which we conceptualize the world is facilitated or affected by aspects of our language, and differences between languages might lead to differences in how we conceptualize aspects of reality. However, most psycholinguists think that the way in which we perceive the world is mostly determined by a combination of our biology and pressure from the environment; that is, reality constrains the way in which we think about reality.

Knowledge

Again, the relation between language and thought is important here. We describe our knowledge linguistically and use language to devise and

report studies to analyze knowledge. Knowledge is transmitted horizontally (from person to person) and vertically (from generation to generation) by language.

Truth

Yet again, the relation between language and thought is important here. Certainly, we are constrained by our language to some extent about how we can describe the external world and therefore what we believe to be “true” and “false.” Psycholinguists will adopt different individual viewpoints on the philosophical aspects of science. And of course, some things are a matter of faith alone.

Perception

As mentioned above, although language might influence aspects of perception (it is easier to remember something if we have a name for it), perception is mainly determined in the first instance by our biology. There are two caveats to this conclusion: First, we tend to perceive auditory stimuli in discrete categories (a phenomenon known as categorical perception); second, many argue that there are top-down influences on perception, so, for example, we find it easier to identify a sound in a word context than a nonword context.

Time

Once more, the relation between language and thought is important here.

Consciousness

We describe the contents of our consciousness linguistically. Introspection shows that language plays an important role in human consciousness; our “stream of consciousness” is made up out of inner speech. It is unlikely that language is essential for consciousness (it would take a very brave person to say that a chimpanzee has no consciousness of any sort), but it clearly plays an important role in shaping its contents.

Rationality/Reason

We use language to describe reasoning. Indeed, formal logic is a form of language, but having

language does not mean that we necessarily always – or even usually – reason logically. We are subject to several types of bias. Language can even lead our reasoning astray, leading us to irrational conclusions. In particular, it has been shown many times that the way in which we phrase a problem can affect the conclusions we draw. People are also reluctant to move away from the meaning conferred by a verbal label to think of novel uses for objects (an effect known as functional fixedness).

Mystery

There are plenty of mysteries left in psycholinguistics! And as Nabokov said, “the deeper one’s science, the deeper one’s sense of mystery.”

Relevant Themes

There are no critical concepts, but:

1. Language is what makes us human and is responsible for what defines us as apart from other higher primates (Diamond 1992).
2. It is inconceivable that sophisticated culture and any form of religion could have developed without language.
3. Complex thought and symbolic representation are intimately involved with language.

Cross-References

► [Psycholinguistics](#)

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Psychology

- ▶ [Cognitive Science of Religion](#)
- ▶ [Cognitive Science Psychology](#)
- ▶ [Ecclesiology](#)
- ▶ [Functionalism](#)
- ▶ [Science and Kabbalah](#)
- ▶ [Theoretical Psychology](#)

Psychology in Buddhism

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Related Terms

[Dharma/dhamma psychology](#); [NeoZen](#); [New Buddhist Psychology](#); [Psychology of Relational Buddhism](#); [Relational Buddhism](#); [Relational Dharma](#)

Description

Born a prince some 100 generations ago in the clan of the Shakyas (kindness), the Buddha (awakened one), named Siddhartha (having all worldly wishes fulfilled) Gautama (most victorious on earth) before his awakening, was a fallible human being who lived at the foothills of the Himalayas in the Iron Age. Living comfortably, like many urban citizens nowadays, Siddhartha was eager to uncover life's meaning after observing *duhkha*: suffering due the predicament of

birth, illness, aging, and death. Historically, his teaching (Dharma, Sanskrit) countered Brahmanism by contending “neither theism nor atheism.” The Buddha's way was explained down the ages as a religious quest, metaphysics, ethics, and recently as a psychology. This is possible due to the principle of *upaya*, the “skillful method” enabling the Dharma to adjust to various cultures and times.

The term “Buddhist psychology” (BP) was coined by C. Rhys Davids in her 1900 *Buddhist Manual of Psychological Ethics*. She dealt with the Theravada (Elders') three baskets transmitted orally during four centuries and subsequently written down in Pali on palm leaves in the first century before Common Era (BCE). The first basket is about rules for *bhikkhus*, Buddhist scholars; the second is about the Buddha's discourses; and the third contains abstractions of the discourses, made until the fifth century BCE. The size of these scriptures is about ten times the bible. The size of the Mahayana (Great Vehicle) Sanskrit scriptures, written during the first century BCE until the twelfth/thirteenth century, is about 50 times the bible. BP reflects a confluence of Buddhist scriptures and western psychological science. While psychology refers to the study of mind and behavior marked by the start of Wundt's laboratory (1879), the term “psychology” did not exist in the languages through which Dharma is rendered. In BP, the mind is not located in the head but in-between people's hearts. In first instance, BP aims at experiencing “emptiness,” comparable to the universe's black hole dissolving everything and nothing. Emptiness is not a goal in itself but a reset point for prosocial behavior. Meditation awakens to Dependent Origination-arising-peaking-sub-siding-ceasing of experience, the Buddhist insight *par excellence*.

The Buddhist quest is to end *duhkha* by improving interpersonal conduct. Based on the enlightening view that “to be means to inter-be,” a meaningful life is pursued through the Immeasurables, social meditations of loving-kindness, empathic compassion, and shared joy, filling in the emptiness. These are serene actions to antidote the Poisons of greed

(causing economic crises), hatred (causing global terrorism), and ignorance (causing daily misery). The most recent development is that BP concurs in many respects with social construction, a psychology emphasizing human interconnectedness by proposing “relational being” (Gergen 2009), by contending that “transcendental truths” are nonfoundational (empty), and by asserting that psychological processes are not so much under the skin as they are in-between people. Do individuals come together to form relationships or is it out of relational process that the idea of “independent agency” is derived? (This chapter is largely based on Kwee, 2010)

Self-identification

Science

BP identifies itself as a human science. C. Rhys Davids’ (1857–1942) pioneering endeavors might be considered as the first generation of BP studies founding a basis for two subsequent generations after WWII. Building on this “old” BP, a second generation is endowed by Padmasiri de Silva’s *An Introduction to Buddhist Psychology* (1979, 4th revision: 2005) and David Kalupahana’s *The Principles of Buddhist Psychology* (1987). The second generation was also landmarked by Mahayana authors like Daisetz Teitaru Suzuki (1870–1966), Chögyam Trungpa (1939–1987), and Alan Watts (1915–1973). Psychology’s “grand old men” who embraced the Dharma were William James (1842–1910), Carl Jung (1875–1961), Abraham Maslow (1908–1970), and Erich Fromm (1900–1980). The “psychobiologist” Francisco Varela (1946–2001) may be added to this list.

The third generation is primarily gathered since 1987 in the Dalai Lama’s “Mind & Life Institute” <www.mindandlife.org> which promotes a science of mind. To its inner core belongs Allan Wallace, Daniel Goleman, Richard Davidson, Paul Ekman, and Jon Kabat-Zinn. The latter devised an outpatient training “Mindfulness-Based Stress Reduction” which sparked “mindfulness-based cognitive therapy” and a number of kindred programs

<<http://marc.ucla.edu>>. Other cognitive-behavioral approaches have also included mindfulness, e.g., Dialectical Behavior Therapy and Acceptance and Commitment Therapy. Whether these mindfulness meditation-inspired approaches deserve the predicate Buddhist is questionable because they conceive mindfulness as a universal method and conceal its Buddhist origins for their patients (Shapiro and Carlson 2009). A less known group, the Transcultural Society for Clinical Meditation, founded by Yutaka Haruki, is particularly committed to advance BP <http://transcultural.meditation.googlepages.com>. Promoting a “new” BP, this society integrates evidence-based data connecting the Dharma with psychology in order to arrive at a “social-constructionist-clinical-neuro-Buddhist psychology” (Kwee et al. 2006; Kwee 2010).

The *psychology of social construction* offers a metaperspective asserting that truth, reality, knowledge, and facts are community-based; that meaning, values, morality, and ethics are a cultural consensus; that objectivity is a relational achievement – *verstehen* is more important than *erklaeren* – and that language is a pragmatic tool to constitute nonfoundational “truths.” *Clinical psychology* prescribes an evidence-based approach of outcome research. Belonging to the most effective and efficient, the cognitive-behavioral approach gets on well with most of the Pan-Buddhist tenets. This accordance was explored by pioneers in the 1970s and 1980s, particularly by William Mikulas, Padmal de Silva, and Maurits Kwee (Kwee 1990). As a *neuropsychology*, BP is on the lookout for neuroscientific correlates of Buddhist concepts and practices. Initiated in the 1950s by neurophysiologists A. Kasamatsu, T. Hirai, and Y. Akishige, BP seeks, among others, for brain-based evidence of the Buddha’s 6th sense (mind’s eye) capable to perceive *dharma*s (the smallest units of experience) during meditation (Austin 2009).

Religion

Buddhist classical thought evolved from the Buddha’s pristine discourses as extant in the

Theravada *suttas*’ onto the Mahayana *sutras* which criticize the early traditions as not prosocial enough. All scriptures were written from the first century BCE until the seventh century by anonymous authors. The *sutras* can be subdivided in the *Perfection of Wisdom sutras* and the *Buddha-womb sutras* which include loose texts called *tantras*. Nagarjuna, also known as the second Buddha, commented on the wisdom *sutras* through his Madhyamaka school (second century) and expounded “emptiness only” to attain by a “via negativa.” This school alludes to an intermediate phase in an evolution that moved from the Buddha to the last innovation of Yogacara “meditation only” school (fourth century) championed by Asanga and Vasubandhu who commented on the Buddha-womb *sutras* and complemented Nagarjuna’s “emptiness of emptiness” which they regard as a *horror vacuum*. Their “via positiva” containing metaphysical flirtations, deemed to be merely cognitive representations against the backdrop of emptiness, eventually grew exponentially. A Mahayana subcurrent, called Vajrayana (Adamantine Vehicle), foremost practiced in the Himalayas, evolved from Yogacara’s metaphor of deified Buddha-natures. Thus, an extensive cosmology developed; see [Table 1](#) for a sample of categories. By having the teachings resemble a theistic religion, the *upaya* campaign succeeded in luring the meek into a declining Dharma.

Characteristics

BP is to be distinguished from Dharma interpreted as a religion. As a clinical and neuropsychology, it bears strong resemblance with the stimulus-organism-response paradigm widely used in cognitive-behavioral psychology. Dharma as social construction applies a family of redefined terms. This is in accord with Wittgenstein’s observation that meanings of words are constructed, while they are actively used by a community in service of its particular needs. Thus, a Dharma qua religion applies a “language game” of religion, while a Dharma qua psychology applies a “language

game” of psychology. A social constructionist idiom of ten keywords is submitted in the following vocabulary:

1. Instead of Buddhism: *Dharma*. Translated as Buddh-“ism” which came to denote religion, philosophy, metaphysics, or ethics, Dharma refers to a way of life for which there is no western equivalent. Nonetheless, Buddhism can be used as a container term like in “Relational Buddhism.” With a capital D, it is differentiated from *dharma* with a simple *d*: perceivables, conceivables, imaginables, knowables, memorables, dreams, illusions, and delusions; manifesting in protean versatility, they all continuously change qua form and content.
2. Instead of the four Noble Truths: 4-Ennobling Realities. Truth smells of transcendence, while *sacca* from which truth is derived might also mean real. Ennobling is preferred because one will not become a nobleman by walking the Buddhist talk. A similar rationale applies to the 8-Fold Balancing Practice.
3. Instead of “right”: *balancing* (for *samma*) to denote eight factors entwined in a transforming practice: view-understanding, intention-thought, speech-communication, action-behavior, living-habitude, effort-commitment, attention-concentration, and awareness-introspection. Obviously, right means not wrong. Because these are dualistic terms, nondual balancing reflects the process of the “Middle Way.” BP offers a practical guide toward awakening to *Dependent Origination*, emptiness/► [Not-self](#), and interbeing while balancing in life’s journey. Balancing implies a spirit of equanimity/serenity. NB: dogma and sin are anathema in the Buddhist Dharma.
4. Instead of suffering: *duhkha* which refers to life’s nonsatisfactoriness, hence the adjective “existential” is applicable. Due to existential impermanence, imperfection, and gnawing imbalances, *duhkha* is not a punishment or sacrifice but a disquieting “dis-ease” to be endured with regard to what the next moment will bring. This gives rise to agony due to

Psychology in Buddhism, Table 1 Vajrayana divine cosmology against a backdrop of emptiness[©]: a sample

Buddha-nature	Vairocana	Akshobhya	Ratnasambhava	Amitabha	Amoghasiddhi
Meaning:	Illuminating	Imperturbable	Jewel-born	Infinite light	Invincible
Color:	White	Blue	Yellow	Red	Green
Location:	Center	East	South	West	North
Element:	Void	Water	Earth	Fire	Wind
Consciousness (cs):	Buddha cs	Memory cs	Self cs	6th sense cs	5 Senses cs
Awareness:	Emptying	Mirroring	Harmonizing	Discriminating	Accomplishing
Affliction:	Ignorance	Hatred	Pride	Greed	Envy
Interbeing:	Loving-kindness	Joy	Equanimity	Compassion	Friendliness

angst, anguish, aversion, despair, discomfort, frustration, lamentation, misery, pain, sorrow, and stress. Enduring *duhkha* becomes cyclical through “rebirths” of emotional episodes.

5. Instead of a paradise in the beyond, Nirvana as a state/trait of mental coolness, i.e., the result of extinction of ignorance-craving and its affective-behavioral ramifications (greed-grasping/hatred-clinging). While greed hides anxiety (fear of shortage) and sadness (grief of loss), hatred hides anger (other-blame) and depression (self-blame). It may also refer to happiness amidst adversity, smiling contentment, and silent emptiness.
6. Instead of reward/punishment or fate, ► **Karma** as self-chosen intentional interaction (*Kamma Sutta*). The Buddhist *Karma* is not a “bank account” of demeanor like in the following mind-boggling teaching anecdote (*koan*). Once in 521, Bodhidharma visited the Emperor Wu, a great patron of the Dharma. Having built many priories, he asked what merit his generosity had earned. “No merit” was the answer. Flabbergasted, he asked what the supreme essence of Dharma is. “Vast emptiness, nothing holy,” was the reply. Finally, he asked, “Who are you?” “Don’t know,” said Bodhidharma alluding to “*Not-self*.”
7. *Skandhas*: behavior, affect, sensation, imagery/cognition, and awareness, these BASIC modalities, move in a flux, are anchored in biological processes and in social interactions. Constituting the “provisional self,” they are subject to habits of clinging/

attachment. Ultimately, this self is empty which is obvious if its reified and abstract nature is understood. BASIC’s emptiness implies that there is no ghost in the machine or a soul to identify with, a notion discarding reincarnation. The *Skandhas* are the Buddhist down-to-earth-all-and-everything dismissing metaphysics and a psychological cornerstone of interbeing.

8. Instead of the Eurocentric term “enlightenment,” “awakening” which is the pristine meaning of *bodhi*. The root *budh* means “to be wakeful and aware of,” i.e., not to be illusioned by a self/soul or delusioned by a god. As from the Age of Enlightenment (eighteenth century), scientists believe in “timeless truths” and declared the supremacy of rational-empirical/logical-positivistic science. Dharma illuminates by means of heart-felt interpersonal understanding rather than through the calculating mind.
9. *Mara*: a projection of inner states. The seducing demon Mara symbolizes inner foes, i.e., fears of death, illusions of self/soul, delusions of celestial beings, and the six realms. The realms are bliss-pride (gods), envy-struggle (demigods), greed-ignorance (animals), hate-anger (hell fires), craving-grasping (hungry ghosts), and doubting-clinging on the one hand and awakening-*Nirvana* on the other hand (humans).
10. Because the Dharma does not acknowledge sinners and saints, the *arahant* is not a saint but someone who has overcome her/his proverbial inner enemies.

Relevance to Science and Religion

BP moves away from Dharma viewed as a religion toward becoming a psychology of transformational dialogue. Although *upaya* permits presenting a “sky-god religion,” Dharma is not a religion as commonly viewed. BP will not satisfy seekers of eternalism or annihilationism. Instead, a “neither all nor nothing” is proposed which cancels out the existence of a god as well as the nonexistence of god, leaving us behind with “nontheistic emptiness.” Nontheistic means neither gnostic/theistic nor agnostic/atheistic and even not something in the middle: god is a nonissue. Instead, BP promotes mind’s emptiness as a reset point from where to cultivate prosocial feeling-thinking-interacting. Its sole aim is to end *dukkha* by an experiential/experimental understanding how the mind works. Not conducive to inner freedom, metaphysics, dogma, creed, belief, omniscience, and miracles are viewed as impossible to confirm or deny nonsense. Never claiming to be a godly authority, the Buddha never assigned people to worship him. Notwithstanding, he is usually listed alongside Moses, Jesus, and Mohammed. The Buddha does not belong to this Abrahamic company because at bottom his Dharma considers godheads as delusional. Rather than god created man, the adage “first man created god and then god created man” is endorsed. Later adherents of the Chan/Zen denomination even admonished to kill the Buddha and advised to urinate on Buddha statues or to clean ass with scriptures, thus clarifying that concepts are empty. Phenotypical similarities mask genotypical differences: vodka and water taste differently.

Sources of Authority

James, founding father of American psychology, embraced Dharma as a psychology. He not only recognized its psychology, he also agreed on the notion of *Karma* (the interplay of intentional meaning and relational action), acknowledged that we “normally” are only half awake, drew

on Dharma when framing concepts, e.g., the “stream of consciousness” and “pure” experience, and addressed the value of mindfulness on the wandering mind.

Ethical Principles

Robin Hood’s morality is different from the sheriff’s. By the same token, BP is a morality without ethics which concurs with the social constructionist “nonfoundational morality of collaborative practice” (Gergen 2009). Ethics are rooted in differing interpersonal values and variegated communal conduct. Because absolutisms are anathema, BP’s morality is based on relational motives. The focus is on the relational process itself in reflective negotiation and transformational dialogue as exemplified in the *Jataka* allegories wherein the Buddha lied and killed. Thus, Dharma is not a theory of ethics but a psychology of *Not-self* and interbeing. Avoiding karmic nonvirtues of *body* (killing, stealing, misconduct), *speech* (lying, divisive, harsh, idle talk), and *mind* (envy, harmful intent, erroneous views), BP cultivates responsibility in relationships through generosity, virtue, renunciation, insight, effort, forbearance, honesty, resolution, kindness, and equanimity.

BP and social construction view morality as a collaborative practice that goes beyond moral absolutism and relativism. It offers a morality continuum ranging from a rigid to a tolerant sense of “right.” Meaning on what one cares about in life is generated in togetherness and provides value in relationships. However, there are multiple voices within one community. What is acceptable in one relationship is not necessarily acceptable in another relationship. Various relationships generate various moralities. On the other hand, congealing moralities create a space of “them” and “badness.” If one group considers itself as morally just, others are bound to be wrong. The Buddhist stand is practical and submits that a morality that claims to be “transcendental truth” is inimical to human well-being. Because BP is not a set of rules, the

moralistic terms evil and good are avoided in favor of un/wholesomeness.

Key Values

Although BP is not an ethical system, this does not imply that the Buddhist roadmap does not advance values. The Buddhist way of life embodies wholesomeness by cultivating virtue versus greed-hatred and savvy-wisdom versus ignorance. Known as the root *Poisons*, greed, hatred, and ignorance are to be eradicated for the sake of relational harmony; ignorance refers to unawareness of the mind's functioning. Continuously lured by illusions and delusions, the mind, once awakened from enticing dreams, is ready to cultivate the core virtues of the *Immeasurables*. These are relational stances to be multiplied through contemplation, visualization, and walking the talk. Teaching social meditations to as many people as possible is the Buddhist practice to make love go round in the world.

Conceptualization

Nature/World

BP deals with the world out there as well as with the internal world which comes about by personal history in a cultural context and through a multitude of other social influences. Dealing with a relationally generated mind, the *4-Ennobling Realities* is an interpersonal psychology, there is *dukkha* which originates and ceases in codependence, and the remedy is an *8-Fold Balancing Practice*. The nature of existence is determined by relational processes, implying a view that the individual is an exponent of relationship and of the 3-Empirical Marks of Existence. Due to the world's impermanence-imperfection, *dukkha* comes about: craving for permanence, grasping to perfection, and clinging on an abiding self. BP deconstructs erroneous views on self/I-me-mine. Although we need provisional tools in daily life, quasi self-identifications like a name, ultimately, there is

no self. Whatever one says about self, it cannot be the same in the next moment of the flux.

Human Being

Human being as “biochemical-sensing-moving-thinking-emoting-relational being” is accountable for intentional interaction. In *Karma* lies the opportunity for a turnaround despite an unfortunate past. According to a review, intentional activity determines sustainable happiness for 40%, circumstances account for 10%, and genetic endowment explains 50% (Lyubomirsky 2008). We are relational beings because we “inter-be” (*Avatamsaka Sutra*), as (1) bodies conceived in sexual interaction, (2) interactive speech from the cradle to the grave, and (3) mind viewed as extended in between people rather than as self-contained. Change comes about as effect in body/speech/mind. The body subsumes movements (*B*) and feelings (*A*, *S*), the mind subsumes visualizing (*I*) and conceptualizing (*C*), and speech subsumes interrelationships. Thus, the *BASIC-I* of interbeing is constructed. Body/speech/mind concurs with the bio-psycho-social paradigm of self-organizing living systems operating through feedback and feedforward loops in self-perpetuating cyclical processes (Kwee 2010). Body/speech/mind is thus a subsystem of an interpersonal metasystem called interbeing (*Heart Sutra*), which is equivalent to relational being that exists in interaction rather than behind the eyeballs (Gergen 2009). Relational being implies the emptiness of solitary selves, the Buddhist proposition *par excellence*. Focusing on interactions, “you-me” binaries crumble; viewing persons as manifestations of relationships, individuals are empty of the private. Even thoughts cannot be solipsistic as they emerge from a history of language and relations. “Relational Interbeing” does not discard psychobiology but completes our humane nature.

Life and Death

BP's *raison d'être* is to end *dukkha*; thus, metaphysical questions remain unanswered (*Cula-Malunkyovada Sutta*). Instead of questioning – e.g., “Is the world eternal or not, or

both, or neither?" – a simile is told on a man shot by a poison arrow to emphasize action. The man would die if rather than treating him, one quizzes the archer's name, caste, appearance, home, the arrow's type, etc. Awakening does not require being a scientist or knowledge on the origin of life.

Once, the Buddha explained that he is a peerless *arahant* who had conquered his inner enemies, i.e., quenched his inner fires. Having attained *Nirvana*, he was going to beat the drum of "deathlessness" in a blind world (*Ariyapariyesana Sutta*). Deathless refers to liberation due to nonattachment – noncraving/nongrasping/nonclinging – to what is born and dies. Deathlessness is attained by uncovering the unborn, like in the Zen question: how does my face look like before I was born? Such is not a task of reconstruction; nothing can be done but to detach and "dissolve" the question. *Nirvana* is featureless, colorless, tasteless, and formless and has been around like space, before realizing it is here. Deathless is a state/trait free from conditioning/conditionality from the concepts of birth and death by terminating the habit of attachment.

Notions of life after death and reincarnation are atavisms, indigenous cultural beliefs, which have become part of a local Dharma. There is nothing to transmigrate across lives without a soul. BP's rebirth is a cyclical emotional episode recurring as relational scenarios of depression, fear, anger, sadness, joy, love, or serenity. Other worldly vagaries on rebirth are to be eschewed.

Reality

Reality of the unawakened is determined by the *sensorium* of the visible, hearable, smellable, tastable, and touchable. Reality of the meditator is determined by the mind's eye able to perceive *dhammas*. BP hypothesizes that the neuroplastic brain functions as a sixth sense organ with the capacity to perceive the mind, its activities, and its contents. Meditation enables to see "things as they really become" and to discover that *dhammas* move in *Dependent Origination* (codependence, interdependence, or nonindependence). Reality may be "true" in one community but "false" in

another one. Beyond community, there is thundering silence. Like the self, reality is provisional, linguistically coconstructed, and arranged in a dance of meanings. Even if unveiled by science, data are man-made, intersubjective, relative, and inextricably space-time-culture bound. Conceived as narratives, they are amenable to amendment and to be replaced by more functional social constructions going forward. Actually, this is happening in the present transition of the Dharma from a religion toward a "Psychology of Relational Buddhism".

Knowledge

The Buddhist community is studious. BP appreciates qualitative and quantitative research as provisional knowledge on three levels of inquiry: objective (third person neuropsychology), intersubjective (second person social psychology), and subjective (first person clinical psychology and meditation). Although objectivity is fictitious, it would be unwise to neglect statistical indexes, e.g., of the weather. BP endeavors to gain insight in the genesis of experience and in the nature of knowledge. Sensory data, even if neutrally observed, are biased by inference conditioned by cultural beliefs. Even objective validation of subjective experience by sophisticated brain imaging machines is guesswork and communal construction. Resorting to neuroscience seems to be another cultural conviction rather than a final revelation of mental states. Real for those who work within the tradition, it is questionable whether such mapping is *the* reflection of the world that should be privileged or is just another site of speculation. If no reality claim is privileged, there is no need to eradicate anything but to listen instead to the different voices of strange bedfellows which intersecting could spawn creative outcomes. Recognizing the pragmatics of knowledge in realizing awakening, BP advises not to carry a raft around once arrived at the other shore.

Truth

The concept of "transcendental truth" is anathema in BP which aims at experiencing emptiness

Psychology in Buddhism, Table 2 Quadrant of mindfulness meditation[©]

Mindfulness: remember to keep a balanced mind in order to be able to dissolve <i>existential suffering</i>	Bare attention: perception of <i>dhammas</i> via the six senses (knowledge by description), in <i>verbal speech</i>	Choiceless awareness: 6th sense <i>dhammas'</i> apperception (wisdom by acquaintance): non-verbal/no speech, in <i>clear comprehension</i>
Relaxed/gentle/focused concentration on object or process with zeal and diligence (<i>dhyana</i>)	1. Samatha (body/mind) calm/composure/tranquility/equanimity: <i>Quiescence</i>	2. Samadhi (body/mind) receptive absorption/flow-stabilization through flame extinction: <i>Nirvana</i>
Vigilant deep introspection/reflection discerning un/wholesome Karma (<i>watchfulness</i>)	3. Vipassana (mind/body) insight in the psychological causation of feel/think/do in <i>Dependent Origination</i>	4. Sunyata (mind/body), the highest wisdom of emptiness, suchness, or zeroness as a reset point: <i>Not-self</i>

via a dialectics of negation (“neither this nor that”). We live in a provisional reality of meaning and values emerging from culture and history constructed in relationships and concatenated to action. Relationships create meaning which motivates action abandoning the invaluable while participating in new relational endeavors ever making new realities and ways of life possible. This understanding of truth and reality does not constitute a belief as it is not conclusive. Dharmic “truth,” if any, is nondual: neither true nor false.

Perception

Perception is relevant in the unwholesomeness uprooting Buddhist meditations alluded to in the *8-Fold Balancing Practice*. The first step is to tame the restless mind by *dhyana* which is the cultivation of concentration by using the breath as an anchor. It works at one pointedness, contentment, equanimity, and stillness (see Table 2).

Mindfulness aims at illuminating consciousness and consists of attention-concentration/awareness-introspection. *Dhyana* is a run-up to mindfulness, encompassing Samatha meditation leading to Samadhi (stabilization) and Vipassana meditation leading to Sunyata (emptiness). While Samatha-Samadhi, comprising means and goals, operates like a metonym (there is no way to mindfulness, mindfulness is the way), Vipassana-Sunyata is purposeful by intending to further wise reflection. The quadrant clarifies that mindfulness starts by cultivating composure, tranquility, and equanimity of body/mind

(including inner speech) due to relaxed concentration and bare attention by neutrally observing perceptual stimuli. Practice shifts this quiescence into a nonsuppressing state of stable flow in absorption due to gentle concentration on occurring *dhammas* in full presence and clear comprehension resulting in the extinction of emotional arousal (*Nirvana*). Having thus healed afflictions, one progresses onto cultivating mind/body (including inner speech) by cleansing the doors of perception in order to be able to see in a “special way,” i.e., perceive “things as they really become” (in *Dependent Origination*). This insight comes about by remembering attentiveness and by being vigilantly watchful in discerning un/wholesome *Karma*. By staying heedful in wise introspection and in unclouded luminosity of clear comprehension and discernment, the mind gradually shifts and/or suddenly drops toward a bottomless emptiness/selflessness, also called luminous “suchness” or liberating “zeroness.”

The slightly overlapping categories track a process of *social deconstruction* in order to start a process of *social reconstruction* through the *Immeasurables*. *Sabbasava Sutta* advises to implement mindfulness “rightly” by introspecting karmic intentions/actions wisely, i.e., with a beginner’s mind. Note that “choiceless awareness” implies that there is no prejudice, sympathy, or antipathy for what occurs in the spaces of body/speech/mind while observing *dhammas*. “Apperception” is a preconceptual perception in the absence of preconceived ideas.

Thus, telescoping our inner galaxies and using body/speech/mind as a laboratory, we encounter *dhammas* which are empty on the ultimate level but full of affect on the provisional level. Inner speech, self-dialogue, or self-talk occurs during the entire process up to the point of emptiness. The mindfulness-based approaches mentioned in section “[Self-Identification](#)”, i.e., the awareness arising by “paying nonjudgmental attention on purpose and in the present moment,” are limited to the first two quadrants and are not the pristine mindfulness by excluding BP (Davidson and Kabat-Zinn 2004) and its notions indispensable for understanding Dharma, like *Dependent Origination*, emptiness/*Not-self*, and *Karma*.

Time

Time is socially constructed, thus an illusion. Although based on consensus, time is within us rather than out there. It is on agreement that we live in 2012 because most people follow the Christian calendar. Based on the year of the Buddha's death (in 483 BCE), Buddhists contend that we live in 2495 (i.e., 2012 + 483).

Consciousness

Consciousness is like life itself enigmatic. Comparable to electricity, we cannot see consciousness, but nonetheless we know it exists through its working like by our capacity to respond. Awareness is a function of consciousness which ranges from deep sleep to full alertness. Clarity of mind can be enhanced by cultivating mindfulness. *Mahāsātipaṭṭhāna Sutta* refers to cultivating mindful awareness within four frames of reference: the body and its activities (feelings: sensations and emotions) and the mind and its activities (thoughts: visualizations and conceptions). Mindfulness is the general factor of subsequent practices comprising *12-Meditations*, i.e., (on the body's breathing, behaviors, organs, elements, decomposing, and feelings, and on the mind's hindrances, modalities, senses, awakening factors), the *4-Ennobling Realities*, and the *8-Fold Balancing Practice*.

Rationality/Reason

Mind usually functions at the prerational, irrational, and rational levels, seldom at the postrational or wisdom level. Rationality renders the view that freedom of choice prevails in determining *Karma* or psychological fate. BP concurs with cognitive-behavior therapy, particularly rational emotive behavior therapy (Kwee and Ellis 1998) and cognitive therapy (Kwee et al. 2006; Kwee 2010). Both endorse the view that though we cannot control birds flying over our heads, we can prevent them from building nests in our minds. *Sallatha Sutta* points at rationality as an outcome of meditation: hit by an arrow the unskilled mind grieves and laments, while the skilled mind is not distraught; it grieves and laments not. While the trained mind only feels bodily pain, the untrained mind feels bodily and mental pain as if hit by two arrows.

Mystery

Based on *suttas* (Rahula 1997), BP demystifies by emphasizing meditation and interpreting *suttas* in a nonmetaphysical way. Although Mahayana with its more than 12 denominations including Zen is mysteriously exotic, the Vajrayana schools of Tibet with its many magical rituals are conspicuously secretive. Wisdom is hermeneutically locked in puzzling teachings; unlocking requires guru worship.

Relevant Themes

The concept of *Karma* carries religious and secular meanings causing a plethora of misunderstandings. In Brahmanism, it is a law of cause and effect stretching across reincarnated lifetimes toward rejoining Brahman. A judicial account of retribution, this *Karma* determines fate, like one's caste. The Buddhist *Karma* renders a completely different meaning. The Buddhist pristine interpretation is psychological, not metaphysical. Action is a function of intention (seed) and conducive to its fruit: feeling/affect/emotion. In BP, bad things happen to good people and

good things happen to bad people. “Evil” can be done without any purposeful intention. Without a god banking merit or demerit, BP is a psychological system of *Karma* transformation and collaborative practice. Commemorating that the Buddha was a “karmavadin,” a craftsman who dealt with *Karma* and who analyzed (vibhajjavada) the motivating cause (hetuvada) of un/wholesomeness (*Hetu Sutta*), the twenty-first century clinician/coach/activist might want to walk in his footsteps to alleviate *dukkha* and promote contentment for all. Hopefully, the present psychology of Relational Buddhism is helpful to this end.

Cross-References

► [Abhidhamma, Southern](#)

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Psychology in Judaism

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Related Terms

[Jewish science and psychology](#); [Psychology in Jewish religion](#)

The Ancient Near Eastern picture of what it means to be a human being in relationship to God and the rest of the world underwent significant change as a result of the impact of Platonic and Aristotelian conceptions of psychology after the Judean state was conquered first by Greeks and then by Romans. What these changes most impacted in terms of rabbinic systems of core beliefs was the doctrine of the nature of humanity in relationship to God and the world. Once absorbed, the new rabbinic understanding of humanity was further, possibly more radically, modified by the influence of medieval Jewish philosophers into what in modern times would be recognized as the traditional or Orthodox doctrine of human nature. At the core of what emerges as Jewish dogma in this area is a synthesis of Platonic and Aristotelian psychology in the light of medieval commentaries, both philosophical and kabbalistic. However, no sooner formalized as foundational doctrine, modern scientific conceptions of the human radically undercut and thereby challenged contemporary belief in human nature in particular, but other traditional rabbinic so-called dogmas as well.

The most serious challenges have arisen from two quite different approaches to modern psychology – Freudian and Darwinian. The biblical identification of the life force in a living thing with breath is transformed by the medieval philosophers and Kabbalists into a platonic conception of a soul. Souls are nonphysical, distinct

entities that have an identity of their own, independent from their related physical bodies. These souls are the immediate causal agents of all animal (including human) volitional behavior. Hence, they are the ultimate component in human identity that has moral responsibility and the source of the moral responsibility is God, the creator. Freud reversed this connection between body, soul, and creator. Rather than God creating the soul that orders morally the physical human, it is the mind of the physical human who is the real creator of both God and morality. For Freud, mind is a function of the body and both God and morality are mentally created fictions. In the case of Darwinianism, the separation from traditional rabbinic psychology is even more extreme. In this instance, not only are God and morality human creations, but the mind that creates them is itself ultimately something physical, viz., a brain, where the category “mental” is to be understood as a fiction that somehow enhances physical human beings’ opportunities to survive in their natural environment.

More challenging than either Freudian or Darwinian interpretations of the role and identity of the human in the universe are the doctrines of contemporary historians of both the Ancient Near East and the Hellenistic Asia Minor for whom the focus becomes studies of the anthropological origins of the Jewish people. Presupposed in the central notion of divine authority for the commandments that define what human beings are and how they are to be judged is a story of how those commandments were given to a prophet named Moses as an eternal covenant between God and the Jewish people. However, based on more than a century of archeology in the land of Israel, the strongest evidence suggests that the professed event is a fiction. Now how much of a fiction is a matter of speculation, but, on most interpretations, it is unlikely that the events reported in the opening historical narratives ever actually occurred in the explicit way the texts say they occurred, from the creation of the world through the theophany at Sinai through even the dynasty of David as King of Judea. Of course, answers can and have been given by Jewish theologians to all of these questions, and different

thinkers will make different evaluations of the different answers. What all of them do is force in some significant sense a rethinking of what it means to be a human and, more specifically, to be a Jew. The issues can be classified under two headings, psychology and ethics.

Jewish theology affirms that the human body belongs to God, that its moral worth is that it reflects the image of God, that a human being is an integrated whole that is created morally neutral but potentially good, and the major duty by which a human life is to be valued is by fulfilling the duty of sanctifying God’s name. At least six scientific claims call into question each of these four affirmations about human nature.

First, cosmogony teaches us that our universe is too old and human existence too brief for humanity to provide the reason for the existence of the universe, for the universe is a little more than 13 billion years old and humans (or, more specifically, hominids) have dwelt in it a mere 2 million plus years. Given these dates, it is almost totally unfathomable to think that God created the universe as the place in which human beings can fulfill the commandments that define human value. However, if we give up this humanist assumption, viz., that the human species provides the *raison d’être* for the existence of the universe, how can we understand why God created the universe? If humanity is not central to its purpose for being, what is its purpose? Critical to Jewish faith is at least the assumption that there is one, and different theologians offer a variety of different answers.

Second, the term in biblical Hebrew (*nefesh*) that came to mean “soul” need not be understood in a Platonic sense. Whatever the authority of the biblical text itself for fashioning the details of biblical faith, the pagan Greek Plato as such has no authority. Rather, the term was given a platonic interpretation because the medieval Jewish natural philosophers believed that the platonic description of the soul was true. Hence, since the source of our interpretation is itself not authoritative, modern scientifically informed, religiously traditional Jewish thinkers are relatively free to reinterpret what a “nefesh” is. And many different interpretations have been given,

ranging from an account of the human soul as some form of energy that is not a substantial entity but is to be understood strictly as a function, to arguing that a soul is something like DNA, viz., information for the body minimally analogous to (and maximally identical with) the information that a computer program transmits through the physical computer. As the information of the computer is a distinct kind of entity from both computer hardware and computer software, so this human information is ontologically distinct from both mind and matter.

In general, there is a need in Jewish thinking about science to move beyond mere physicalist accounts of human nature in general (and not just the soul in particular) to something compatible with contemporary dominant trends in psychology and the other human sciences that can provide a basis for affirming that in this material world, there is an objective basis for moral judgment, and that beyond the present, there is something to be interpreted as “redemption” in the distant future.

Third, the process of rethinking what it means to be a human requires rethinking just what there is about the human life-form that is distinctive, if anything. In general, what does it mean to be human when becoming a living thing is reducible to purely chemical reactions? In physicalist terms, there is very little difference in every respect between chimpanzees and humans and very little difference between human beings and all other life-forms with respect to the DNA that informs all of us. The human cell is composed of 23 pairs of chromosomes and each chromosome consists of a single DNA molecule that forms part of a sequence with other molecules that are wrapped around a core of protein. It is these sequences that do the work of the souls of medieval philosophy (Jewish as well as Christian) to order both human nature and human responses to nature, and there is relatively little difference between the molecules of one species and another. In this context, the question of what it means to be human is reduced to two related questions: When do chemical reactions become living things and when do living things become human beings?

This analysis of humanity’s physical bases has in itself a number of consequences for a Jewish understanding of what it means to be human. First, chimpanzees no less than humans exhibit moral behavior, which would suggest that being a moral agent is itself not a distinguishing human trait. Second, if it is not, divine moral codes ought not to be restricted to humans. Third, as moral beings, humans are morally obligated to other animal species no less than to humanity.

Finally, the above distinctively physical questions about being human raise a number of distinctive moral questions. One, when does life begin and end? Two, when does a human being become human if we no longer affirm a distinct, non-physicalist element like a soul? Three, the fuzziness of life and death suggests that they can no longer be treated as absolutes. The purpose of life cannot be just to live or to avoid death. Life must have some end beyond itself that makes it a virtue and death a vice. Of course, the traditional Jewish answer is that life is progress toward, and death is regression from, the service of worshipping God, and the end of divine worship is of value no matter what is the life-form.

Cross-References

- ▶ [Astronomy in Judaism](#)
- ▶ [Creation in Judaism](#)
- ▶ [Kabbalah in Judaism](#)
- ▶ [Historical Theology](#)
- ▶ [Judaism: An Overview](#)
- ▶ [Philosophy in Judaism](#)
- ▶ [Redemption in Judaism](#)
- ▶ [Theology in Judaism](#)

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Psychology and Law

- [Forensic Psychology](#)

Psychology in Jewish Religion

- [Psychology in Judaism](#)

Psychology of Language

- [Psycholinguistics](#)

Psychology of Positive Human Functioning

- [Positive Psychology](#)

Psychology of Relational Buddhism

- [Psychology in Buddhism](#)

Psychology of Religion

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Related Terms

[Cognitive science of religion](#); [Cultural psychology of religion](#); [Neuroscience of religion and spirituality](#); [Psychoanalysis of religion](#); [Psychology of spirituality](#); [Scientific study of religion](#); [Social scientific study of religion](#)

Description

The psychology of religion is that area within general scientific psychology whose goal is the understanding of the processes that mediate human religiousness in all its variations. The topics within its orbit range from the micro (e.g., the brain processes involved in experiences that a person may deem religious, spiritual, or sacred) to the macro (e.g., the psychological factors involved in complicated individual and group religious social behaviors), with all of the standard areas of psychology that reflect multiple levels of analysis in between – e.g., learning, developmental, personality, cognitive, perceptual, motivational, emotional, and social psychological processes must all be taken into account. It tries to understand both why people are religious and what effect their religion has on other aspects of life.

Some psychologists see the psychology of religion as an area of research that focuses on the religious instance of behavior in general, and others see it as an area of research on more or less unique aspects of human functioning, that is, aspects found in religiousness, but not found elsewhere. The question of the uniqueness of religiousness as a human psychological phenomenon undergoes examination and debate from time to time (Baumeister 2002). Like its parent discipline of psychology, the psychology of religion is a subdiscipline under

theoretical and methodological development. There is little doubt that psychology comes from a fragmented past methodologically and theoretically. Scholars disagree over the degree to which the field is fragmented or is instead moving toward gradual integration or synthesis in its ideas, approaches, and knowledge base (Belzen 2010; Paloutzian and Park 2005a, 2013; Pargament et al. 2013a,b). As is often the case in the development of a science, the truth is probably somewhere in the middle.

There is no doubt, however, about the richness and vast scope of the phenomena within the orbit of the psychology of religion. The scope of topics within this subdiscipline is as expansive as it is in general psychology. Topics include but are not limited to issues of religious development; cognition; motivations for religions and motivations that derive from them; religions and mental and physical health and illness; emotional expressions of one's religion and emotions that foster them; experiences deemed religious, supernatural, or sacred; social influence processes mediating religiousness; attribution of religious or sacred meanings; religions and cultures; religiousness and coping; change within, toward, and away from religions; and spiritual transformation, conversion, and deconversion. The reader is referred to the above-cited handbooks and to other recent comprehensive books that summarize the many lines of research in this area (Miller 2012; Hood et al. 2009; Wulff 1997; Beit-Hallahmi and Argyle 1997).

Recent developments during the past quarter century have occurred at an amazing pace (Emmons and Paloutzian 2003). Since 1980, the field has gone from having no textbooks to having several of them, including those now in third and fourth editions. The field saw its first research handbook in 2005 and now has three of them. Its international journal was first published in 1991, and its American Psychological Association counterpart appeared in 2009, in addition to the longer presence of other journals that include psychological research on religiousness and the increase in publications on psychology of religion topics in other standard psychology journals. Briefly said, as assessed by the number of research publications, books, and conference

presentations devoted to topics in the psychology of religion and spirituality, the field has grown on a steep curve in the past quarter century.

Science

The discipline of psychology including psychology of religion defines itself as a science (i.e., a crossover field that is a blend of both social science and natural science aspects) and does not define itself as a religion. The same rules of logic and evidence apply to psychology as to any other science. Most researchers in the American Psychological Association Division 36 (Society for the Psychology of Religion and Spirituality) and the International Association for the Psychology of Religion (both nonsectarian with membership and presidents across the board religiously) apply accepted rules of logic and evidence to how they answer their research questions. And although this topic is potent with great bias potential, the researchers' policy, due to their own integrity, commitment to the scientific process, wanting of honest knowledge, and procedures like blind peer review of journal publications, open competition for research grants, and public evaluation of one's research – all foster research conduct in accord with benign neutrality toward religion in general or any specific religion in the conduct of research and interpretation of data. Psychologists normally receive extensive training in experimental design, measurement, data analysis and interpretation, and principles based on evidence and argument that connects and sustains them.

Religion

Just as psychology is not a religion, neither is the psychology of religion a religion. As a field of scholarly inquiry, it takes no position on the truth claims of any particular religion, but instead treats human religiousness as an aspect of human functioning to understand, just as we aim to understand all other human functioning.

Characteristics

The psychology of religion is that subfield within psychology that focuses on the processes that

mediate human religiousness in all its forms, process that reflect the religious instances of general psychological processes but also those that reflect processes that may be unique to religion – a point about which scholars in the field disagree (Baumeister 2002; Paloutzian and Park 2005b). No other discipline or subdiscipline does this.

Relevance to Science and Religion

The psychology of religion can be seen as the centerpiece of the so-called science-religion discourse. This is because the core issues, when repeatedly examined and as the dialogue evolves, eventually become matters of meaning to humans. These are manifested through psychological constructive and meaning appraisal processes, and because in all sciences, when questions are posed upon questions, they eventually feed and arrive at the same central issues, those having to do with what it means for and to humans.

Sources of Authority

In the psychology of religion, there are two kinds of legitimate sources of authority and one kind of pseudosource, from a psychology research point of view.

The two kinds of legitimate sources of authority are interconnected and interdependent. They are (1) the highly esteemed, peer-reviewed, and well-edited research and scholarly books and journals in the field. They are the depository or archives that document the progress in research in the field, and the handbooks and research-based textbooks summarize this research in authoritative ways. None of these constitutes absolute authority due to the nature of scientific research, evidence, argument, and inquiry. But all are authoritative in the sense that they contain well-examined presentations of the research in the psychology of religion as of the time they were written (2). The evidence and argument founded on data well collected, properly analyzed, and keenly interpreted. There is no single authority

in the sense of it being one person, one book, or one idea. But there is a general authoritative body of material made up of the above-mentioned sources and based on the correctly applied rules of scientific procedure and deriving from conclusions based on evidence.

The pseudosource of authority comes from so-called religious psychology, not scientific psychology of religion. Religious psychology is not psychology of religion. There is a smaller subset of scholars who claim that their work falls under the psychology of religion umbrella whose final authority for whether to accept a research conclusion differs from the standards noted above. Such persons do religious psychology, not psychology of religion. There are Christian, Islamic, and other expressions of this approach, but at bottom, those who do scholarship of this type place their preheld belief above the findings from their research, if the two appear to conflict. Within such scholarship, research findings must support the preheld beliefs. There is great possibility of disagreement between those who endorse scientific psychology of religion (an open system) and those who endorse a particular religious psychology (a closed system). As an example of how these two approaches differ, see a dialogue published on the first anniversary of 9/11 between a psychologist who presupposes a secular Western epistemology and another who presupposes a Muslim religion-based epistemology (See dialogue between Professors Murken and Shah in the following two articles: Kahlili et al. 2002; Murken and Shah 2002). The epistemological assumptions differ in the extreme: they are incompatible. In the secular mind, religion is an aspect of culture similar to other aspects. In the strict religious mind, religion defines the culture so that all other aspects of it, including the knowledge from and conduct of science, are subsumed within the religion. Similar examples can be found that reflect particular Christian and other religious points of view. So-called creation science is an example of this in a nonpsychology field. In general, in this approach, a conclusion is held logically prior to and independent of an examination of publicly accessible scientific data. Thus, when data are examined, they are attributed to a process that

conforms to the preheld view. No other conclusion is acceptable. The religious psychology approach is not consistent with the normally understood science of psychology of religion as part of general psychology. In scientific psychology of religion, truth claims are subject to test based on evidence and are not self-authenticating.

Ethical Principles

The American Psychological Association and the Department of Health and Human Services, National Institutes of Health, and National Institute of Mental Health (USA) have published ethical guidelines for research with human and animal subjects, and these apply to research on human religiousness. The standard rules of research (e.g., a participant in a research project should leave the laboratory in the same condition that he or she came to the laboratory, or subject anonymity is protected) apply straightforwardly to studies on psychology of religion. But there are some unique instances in which, in order to test a psychology of religion hypothesis, the researcher may need to bump up closely to the ethical standard, and in such cases, the researcher is obligated to protect the welfare of the subject. For example, a researcher may wish to test a hypothesis about how a person responds when confronted with information contrary to deeply held beliefs. To do this, the researcher may recruit and screen subjects who have the requisite degree of belief and then, using deception, expose them to contrary but fictitious information. Such procedures are controversial and not often used. If or when they are used, the subject is debriefed and given education about the research with the intent that he or she leaves the laboratory enriched by having participated. Similarly, if an investigator needs to use interview methods, sometimes it may be necessary to ask the research participant questions that might make the person feel uncomfortable. In all cases, the researcher is responsible to protect the person's confidentiality and to take delicate care to use procedures that insure, first and foremost, the well-being of the research participant.

Key Values

In addition to the general values that guide good quality scientific research and the application of psychological knowledge, the psychologists of religion must pay special attention to being neutral with respect to religion in general or the truth claims of any particular religion. Thus, the emphasis must be on free, open, and objective inquiry to religiousness as one domain of human mental processes and behavior and has nothing to do with any particular belief about, commitment to or against, or favor or disfavor with respect to, things in general or in particular that are deemed religious, spiritual, or sacred.

Conceptualization

Nature/World

Psychology of religion studies human religiousness as a natural process in the same sense that any science studies its phenomena. The methodology of the field assumes that principles of nature actually work and that these are either knowable or at least that we can create theories as attempts to summarize what we think they might be.

Human Being

A member of the species *Homo sapiens*.

Life and Death

The object of study in psychology is the mental and behavioral processes in living human beings. We generally leave precise scientific definitions of life and death to biology and medicine. So in psychology of religion, we study human mental and behavioral processes with unique attention to those through which religiousness in all its manifestations – belief, knowledge, practice, feeling, effects, to use a common summary of its dimensions – is regulated. Psychology of religion *is* concerned with people's beliefs about life and death, but what actually happens to a human after he or she dies is not known and not accessible to the research methods we have. But the beliefs, behaviors, practices, purported

experiences, etc., of living people with respect to it are so accessible and are researched.

Biologists and clinicians debate scientific definitions of life and death just as scholars of religion debate definitions of religion. That should not bother those who do psychology of religion research, however, because, for example, physicists cannot define light very well, but they can do a lot with it. The “essential” nature of light, like the “essential” nature of religion and life and death, is a mystery. The open-endedness of the scientific process with its insistence that a proposition be testable and falsifiable based on evidence leads us to enjoy doing our research with that mystery. Trying to solve new mysteries on the horizon is what keeps science going. In the end, psychologically speaking, truth may be in the meaning system of the beholder.

Reality

As is the case with the rest of psychology, the psychology of religion does one of two things with respect to the concept of reality. Either (1) it assumes that there is one and we proceed to study it or our perception of it, or (2) it assumes nothing either way about its ontological existence and instead takes mental reality as the only reality to be concerned with. Psychology of religion makes no formal pronouncements about meta-physical concerns. It instead attempts to study its part of the real world that we live in.

Knowledge

The area of knowledge about which the psychology of religion is concerned focuses on the processes that mediate human religiousness in its myriad variations. Such knowledge is not regarded as absolute or binding for all peoples in all religions at all times, but is instead, as is the case with all scientific knowledge, tentative, probabilistic, and subject to modification based on new evidence. Some things that are known may stand the test of time and culture, and some may not; this reflects the nature of scientific understandings of the world and is expected in a topic of seemingly infinite variation such as human religiousness. Thus, it can be said that research in the psychology of religion strives for

the hypothetical ideal of universal knowledge while being aware that this is an ideal goal and not an actuality.

The kind of knowledge at issue is that which is based on evidence and is subject to tests that can lead to confirmation or falsification of the knowledge claim. Thus, empirical evidence subject to public examination, whether derived from quantitative or qualitative methods, is a necessary part of the process. The data may come in *emic* or *etic* points of view. The data that can be accumulated can range from those that assess subjective states to those that assess objectively observable events, and they are subject to analysis and interpretation by standard psychological methods.

Truth

Psychology of religion takes no position on whether or not there is an absolute “truth.” Truths in psychology of religion are scientific truths, therefore always tentative, probabilistic, and subject to change based upon further evidence.

Perception

Psychology of religion is to a great extent concerned with human perception, in particular with the emphasis on “religious experience” such as claims of having heard God’s voice; apparitions of Jesus, Mary, of other religious figures; to have seen Satan; and other nonnormal purported experiences and perceptions (Taves 2009). Although we cannot “see” someone else’s purported experience, we can record and measure people’s accounts of them and can use standard psychological methods to learn about the processes that mediate them and the contexts in which they occur.

Time

Because human religiousness, like other aspects of human functioning, occurs across time, time perception and accounting for variation across time is inherent in the conduct of work in the field. In addition to studying religiousness in real time *in vivo*, all other ways of studying it automatically involve a time dimension, whether implicit or explicit. This includes but is not limited to studying commitments made in the past and their effects on present and future decision

making or functioning, reports of past mental and other experiences, and memories of one's childhood religious upbringing – all such questions and methods available to address them inherently assume operations and continuity over time. One can hardly imagine “religion” or any particular religion as existing without it.

Consciousness

Consciousness as an area of psychological study is important because with the reintroduction of the study of consciousness to psychology came the reintroduction of the study of religious consciousness, mysticism, experiences deemed religious or spiritual, and such things as religious or spiritual manifestations of seeing visions, hearing voices, and having dreams. Some have proposed that the study of “religious experience,” especially from a phenomenological perspective, is the central core and task of the psychology of religion (James 1902/1958).

Rationality/Reason

The psychology of religion sees rationality and reason as human capabilities that are more or less invoked as means of regulating other aspects of human functioning such as decision making. These processes can be applied to greater or lesser degrees to one's religiousness in a manner similar to any other aspect of one's functioning. The limits of rationality or reason as a guide and regulator of behavior is examined, however; thus, it is well known that other a-rational or non-rational factors also influence how someone feels, thinks, and acts in major ways. The holding or not holding of explicitly religious beliefs may not be based upon rationality alone.

Mystery

One could say that part of the core of the psychology of religion concerns mystery. This is because of its topic of study – religion or religiousness. Religions seem to be among the things that humans have and do as a way of dealing with, and living within, the big and unanswered (and perhaps unanswerable) questions about life, death, and why we are here. These are, among other things, some of the most timeless and

endless psychological questions that people have asked, within and across disciplinary boundaries. The psychological way of dealing with them is to treat them as the mysteries that they are and try to learn how and why humans think about, understand, process, and respond to them.

Cross-References

- [Biology of Religion](#)
- [Cognitive Science of Religion](#)
- [Conversion](#)
- [Islamic Religious Psychology](#)
- [Methodology in Psychology](#)
- [Philosophy of Religion](#)
- [Religion, Sociology of](#)
- [Religion, Theory of](#)
- [Religious Experience](#)
- [Religious Studies](#)

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Psychology of Religion China/Asia

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Related Terms

[Chinese psychology of religion](#)

Description

In mainland China, psychology of religion is a branch of the science of religion and a special field in applied psychology. As an interdisciplinary field of study exploring the mental activity in the religious affairs of humans, it tries to reveal the characteristics and laws of the formation and development of religious mentality and serves the building of harmonious society by making use of

research results in psychology of religion. Before the reform and open policy, there were few scholars who did research in the psychology of religion in mainland China because of historical reasons. However, since the 1980s, the achievements of Chinese psychology of religion have increased gradually. First, some famous works on psychology of religion from abroad have been translated and introduced to mainland China in quick succession. These include A. M. Ugrinovic's *Psychology of Religion* translated by Shen Jipeng in 1989, M. J. Meadow and R. D. Kahoe's *Psychology of Religion: Religion in Individual Lives* translated by Linshu Chen et al. in 1990 (Meadow and Kahoe 1990), L. B. Bulang's *Psychology of Religion* translated by Dingyuan Jin and Xigu Wang in 1992 (Bulang 1992), K. M. Loewenthal's *The Psychology of Religion: A Short Introduction* translated by Yuejun Luo in 2002 (Loewenthal 2002), M. Argyle's *Psychology of Religion: An Introduction* translated by Biao Chen in 2005 (Argyle 2005), and others. Second, the discussions of theory are concentrated on the origins, characters, and functions of human religious mentality (e.g., explore works by Boyue Li 1996; Yinchuan Yuan 1996; Guangwen Song 1996; Yiyin Yang 1996; Shuqin Yang 2004; and Yingguang Luo 2004). Third, the ideas of representative writers in western psychology of religion are researched systematically (e.g., see Biao Chen 2003, 2007; Yongsheng Chen and Yang Shen 2007). Fourth, questionnaires are used to reveal the features of Chinese religious mentality and the relations between Chinese religious mentality and mental health (Sheng et al. 1996; Hong et al. 1998; Liang 2004; Li et al. 2004) (also see examples by Liqing Lu 2006 and by Henghao Liang 2006). Fifth, research on making scales to assess ► [religiosity](#) and ► [spirituality](#) with Chinese samples has gotten attention (Shen 2007; Liu 2007).

In September 2007 and March 2008, small international seminars on the psychology of religion were held in Zhejiang Normal University, Jinhua, Zhejiang Province, and in Beijing. The conveners were Prof. Alvin Dueck from Graduate School of Psychology, Fuller Theological Seminary, in America, and Prof. Han Buxin from Institute of Psychology, Chinese Academy

of Sciences. These two seminars have exerted positive effects on promoting exchange and cooperation between mainland China and USA in psychology of religion research.

Self-identification

Science

Multidisciplinary and diverse approaches to research are maintained in psychology of religion, but defining the right question, putting forward the correct hypothesis, and testing that hypothesis with objective data are at the basis of research in psychology of religion. So psychology of religion is a science, according to its research methods.

Religion

Psychology of religion explores the mental activity in human religious affairs. To psychology of religion, theoretical research or practical application cannot be done apart from the concrete religious practice of human beings. So psychology of religion, as a science, related to religion in the sense that religion is its object of study.

Characteristics

The most distinct characteristic of psychology of religion is that it not only focuses on systematic research into religious believers' special mental processes and personality characteristics (belief in divinity, experience of mystery, pursuit of value, and institutional participation or open participation) but also attaches great importance to principles of psychology being applied concretely in special ways to religious life. This distinguishes psychology of religion from other subjects in the science of religion (philosophy of religion, anthropology of religion, sociology of religion) as well as other subjects in psychology.

Relevance to Science and Religion

Psychology of religion has achieved independent status in many interlaced research fields

because of its interests in science and religion. Psychology of religion stresses revealing the laws of psychology in religious life through scientific methods and stands for guiding the religious believers' daily life with knowledge gained from scientific methods. Thus, it can help integrate scientific findings with religious beliefs and practices and helps psychology of religion to be an interdisciplinary subject which not only has the strict attributes of science but also has a special relationship to religious life.

Sources of Authority

Chinese psychologists of religion hold that in more than 100 years, a wealth of literature accumulated by western psychology of religion is the foundation for promoting the development of psychology of religion in mainland China. So Chinese psychologists of religion are favorably disposed toward some classic works like W. James's *The Varieties of Religious Experience*, 1902; W. Wundt's *Mythus und Religion*, Vols. 4–6 of *Völkerpsychologie*, 1905–1909; S. Freud's *Totem and Taboo*, 1913, *The Future of an Illusion*, 1927, and *Moses and Monotheism*, 1939; C. G. Jung's *Psychology and Religion*, 1938, *The Psychology of Eastern Meditation*, 1943, and *Psychology and Alchemy*, 1944, 1952; E. Fromm's *Psychoanalysis and Religion*, 1950; E. H. Erikson's *Gandhi's Truth: On the Origins of Militant Nonviolence*, 1969; V. Frankl's *Man's Search for Meaning: An Introduction to Logotherapy*, 1962, and *The Unconscious God: Psychotherapy and Theology*, 1975; G. W. Allport's *The Individual and His Religion*, 1950; A. H. Maslow's *Religion, Values, and Peak-Experiences*, 1964; and A. W. Watts's *The Way of Zen*, 1957, *The Two Hands of God*, 1969, and *Tao: The Watercourse Way*, 1975.

For thousands of years, thoughts relevant to psychology of religion contained in western and eastern works of philosophy, as well as the classic doctrines in Christianity, Catholicism, Buddhism, Mohammedanism, Taoism, the minority religions, and newly flourished religions, have also attracted attention from Chinese psychologists of religion. In mainland China, *Studies In World Religions* and

Acta Psychologica Sinica are authority academic journals that publish psychology of religion research results. Chinese research results in psychology of religion that are published in related international journals in psychology of religion are becoming the target of endeavor for Chinese scholars. *Psychology of Religion in China*, written by Yongsheng Chen, Henghao Liang and Liqing Lu from Zhejiang Normal University, published in *The International Journal for the Psychology of Religion* in 2006, is not only a positive result subsidized by the Chinese Social Science Fund but also a sign of the above endeavors of Chinese scholars.

Ethical Principles

In research in psychology of religion, Chinese scholars have followed strictly the international popular moral principles when using persons as subjects for scientific research, in order to fully respect and effectively protect the legal rights of religious believers. For example, when religious believers are invited to take part in research in psychology of religion, the voluntary principle must be adhered to; the subjects from different religious background should be treated equally; the personal privacy matters of subjects with religious belief should be kept strictly confidential.

Key Values

Chinese scholars' values embodied in psychology of religion are reflected in two ways. First, there is value in exploring the characteristics and laws of religious mental phenomena in the religious activities of human beings by various methods and techniques in order to offer scientific explanations and illustrations from a psychological point of view. Second, there is value in serving religious believers by using the existing achievements of psychology of religion (principles, methods, techniques, etc.) in order to improve religious believers' level of mental health and overall quality of life and to help religious believers show positive effects in efficiently building a harmonious society.

Conceptualization

Nature/World

There are two understandings of the concept of nature. In a narrow sense, nature means the inorganic and organic sphere as understood in the research of natural science. However, in a general sense, nature means the objective material world, which is independent of human consciousness. "World" is the totality of all things involved in nature and human society, which not only includes the objective material world but also includes the subjective spirit world. Obviously, "world" is a term which has more fertile connotations and broader extensions than "nature."

Human Being

A human being is a kind of higher animal that can make and use tools. Human beings include not only the primitive peoples who are in the developmental process but also the more developed peoples who live in modern civilization societies. The special meaning of this concept should be grasped in accord with the unique purposes for which it is being used.

Life and Death

Life is regarded as the active capacity inherent in organisms and a mode of being of proteins. The origin of life is a process of changes about substance from simple to complex, which means originally formed from inorganic substance to organic substance. For a person, life is embodied in the whole process from birth to death. When a person's life processes are over (death), the mental activities that are part of the life process stop as well. From the angle of psychology of religion, the individual life is over, but the spiritual wealth created in the life can still be transmitted and carried on in the life of the next generation, so it can contribute to the gradual improvement of human civilization. This principle can be used to help explain the positive effect that religious activities may have on future human civilization.

Reality

Reality is everything that exists objectively.

Knowledge

Cognitive achievements are acquired in practice, including empirical knowledge and theoretical knowledge. The former is the elementary stage of knowledge, and the latter is the higher stage of knowledge.

Truth

Truth refers to the correct reflection of objective reality and its laws. It is the opposite of “falsehood.” The goal of reflection on truth is to know something objectively and concretely; the sum total of innumerable relative truths approximates the so-called absolute truth.

Perception

Perception is the cognitive process which reflects an overall image in external reality and the first sensation of a stimulus from objective reality. Perception depends on sensation and is more complex and complete than sensation. Perception is a key link between sensation and thinking. The material from sensation can be processed through perceptual process in order to provide some preparation for thinking activities.

Time

Time generally refers to a kind of measure for the duration through which the motion of matter goes, as well as an instant in time during the motion of matter. Time and space constitute two basic existing forms of substance in which motion occurs. In the field of psychology of religion, the experience of time for “afterlife” and “eternity” becomes the part of experience of mystery.

Consciousness

Consciousness is the function of the human brain and the reflective ability peculiarly owned by a human being in the world. During the exploration of conscious activities by psychologists of religion, unconsciousness or subconsciousness may be regarded as the conscious activities inhibited or undetected.

Rationality/Reason

Rationality is equivalent to “rationalness”; it refers to a form of thinking, such as conception,

judgment, reasoning, etc., or thinking activities that have some evidence of reason. The psychologists of religion always maintain that the irrational matters in religious activities should be understood by a rational approach. One use of “reason” is equivalent to “result” or “conclusion”; it refers to the condition that causes some result or arouses some processes that produce whatever occurs. Reasons and results constitute important forms of thought involved in understanding general connections and interactions in objective reality, sometimes also called causal connections. Causal connections are complex and varied. For instance, one result may occur as a consequence of many reasons, or one reason may lead to many results. In psychology of religion, “karma” may be understood as a type of rationale for outcomes; i.e., in Buddhism, it embodies sayings such as “good results come from good acts, bad results come from bad acts.”

Mystery

Mystery generally refers to matters that cannot be firmly understood and are enigmatic. Religious activities sometimes are covered with the mysterious veil, and the religious believers always claim that they have an “experience of mystery.” However, psychologists of religion hold that the so-called “indescribable” experience of mystery can be explained by some psychological means, such as analysis of dreaming, conjecture of metaphor and symbolization, or use of technology like brain imaging. Of course, the explanations and illustrations from psychology of religion are still limited at present. With the advance of science and technology, especially for the development of psychology of religion, the level of explanation and illustration in the psychology of religion for “experience of mystery” will gradually improve.

Relevant Themes

In the eyes of Chinese psychologists of religion, some terms like belief in divinity, experience of mystery, pursuit of value, and institutional participation or open institutional are core elements

for people to comprehend in order to understand basic concepts in psychology of religion like ► [religiosity](#), ► [spirituality](#), or folk belief. Whether for the development of the tools of psychological measurement or for the exploration of possible consequences of one of these variables on another is all interconnected and understood to be psychologically closely related. These terms and basic concepts erect a bridge for communication between scientific methods and the mental life of religious believers and provide academic support for in-depth discussion of the topics of science and religion.

Cross-References

- [Aging, Psychology of](#)
- [Christianity](#)
- [Clinical Psychology](#)
- [Counseling Psychology USA/Europe](#)
- [Developmental Psychology](#)
- [Mysticism](#)
- [Personality Psychology](#)
- [Psychiatry in America](#)
- [Psychiatry in Europe](#)
- [Psychology in Buddhism](#)
- [Religion, History of](#)
- [Religion, Theory of](#)
- [Religiosity](#)
- [Religious Experiences](#)
- [Religious Studies](#)
- [Secularization, Secularity, Secularism](#)
- [Self](#)
- [Self, from a Psychological Perspective](#)
- [Social Psychology](#)
- [Spirituality and Christian Theology](#)

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Psychology of Spirituality

► [Psychology of Religion](#)

Psychopathology

► [Clinical Psychology](#)

Psychotherapy

► [Clinical Psychology](#)

Psychotherapy in Africa

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Psychotherapy in Africa is an umbrella term which points to the existence and evolution of a variety of psychological therapies in the modern African context: some indigenous to Africa, others influenced by our professional contact with the modern West (Madu et al. 1996; Nwoye 2010). The above observation means that while all therapeutic practices in modern Africa come under the umbrella term, psychotherapy in Africa, not all therapeutic practices in

modern Africa are informed by the principles and worldview of African psychotherapy.

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Pueblo Indian Religions

► [Hopi Religion and Anthropology](#)

Pulmonary

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Related Terms

[Respiratory medicine](#); [Respirology](#)

Description

Pulmonary is a subspecialty of internal medicine focused on the diagnosis, treatment, and prevention of diseases involving the airways and lung. Commonly treated diseases include asthma, chronic obstructive pulmonary disease, interstitial lung diseases, occupational lung diseases, infectious diseases of the lung, and acute or chronic respiratory failure. In North America, pulmonary became a subdiscipline in the middle of the twentieth century. The polio epidemics of this era underscored the need to further our

knowledge of respiratory physiology and served as a catalyst to train specialists who could better understand the pathogenesis and treatment of respiratory failure. Recently, diseases characterized by sleep-disordered breathing such as sleep apnea have become areas of interest. The most recent advances in clinical pulmonary medicine center on a renewed interest in the pathogenesis and treatment of chronic obstructive pulmonary disease and asthma. The most recent advances in pulmonary related to basic science include a better understanding of the molecular and genetic bases of diseases affecting the airways and lung parenchyma and a better understanding of mechanisms of cellular injury and of mediators involved in inflammatory, interstitial, and granulomatous lung diseases.

Self-identification

Science

Pulmonary identifies itself as a science focused on investigating all aspects of airway and lung function. As science is an intellectual activity designed to discover information about the natural world, pulmonary is an intellectual discipline, committed to the discovery of new information regarding breathing and disorders affecting breathing. In the pulmonary discipline, this discovery of new information is based on observation and the development of testable hypotheses. Observations on breathing date back to the ancient Greeks when they recognized the importance of the diaphragm in breathing and with Hippocrates description of periodic breathing. Major progress in understanding the physiology of breathing, however, did not occur until the beginning of the twentieth century. At that time, Bohr and others such as Krogh furthered our understanding of gas exchange by demonstrating that diffusion of oxygen and carbon dioxide across the alveolar-capillary membrane accounted for the transfer of carbon dioxide out of and oxygen into the pulmonary capillaries. During this era, Haldane and Priestley described the chemical regulation of respiration. Insight into the mechanical properties of the respiratory

system (forces that promote inspiration and expiration) was achieved by Rohr in the early 1900s. He characterized the elastic properties of the lungs and chest wall by providing descriptions of their static pressure-volume characteristics. He and others applied principles of physics to the respiratory system to calculate airway resistance and the work of breathing. In the 1940s, Fenn, Rahn, and Otis refined our understanding of respiratory mechanics and applied this knowledge to the advancement of aviation medicine and to diseases affecting the respiratory system. The polio epidemics of the 1940s and 1950s highlighted the need for coupling our emerging understanding of respiratory mechanics and gas exchange with the treatment of thousands of individuals who were dying from respiratory failure. Subsequently, methods were developed to provide artificial ventilation, first with negative pressure (iron lung) and then with positive pressure. With the advent of microelectrode technology in the 1960s, the measurement of partial pressures of oxygen and carbon dioxide in arterial blood became a powerful tool to assess lung function. This advance allowed clinicians to identify the presence of acute and chronic respiratory failure involving a host of pulmonary disorders unrelated to polio. Along with advances in respiratory physiology came remarkable progress in the treatment of tuberculosis in the latter half of the twentieth century. The use of isoniazid in the early 1950s revolutionized the treatment of TB and heralded the transition of treatment from sanitariums and surgery to effective chemotherapy. With the development of clinical pulmonary function testing in the mid-1960s, the advent of fiber-optic bronchoscopy, refinement in radiologic techniques, and a better understanding of the pathology of lung disease, the need to train physicians with expertise in applying this new knowledge and technology to the diagnosis and management of lung disease emerged. Training programs in pulmonary disease evolved to meet the growing demand for respiratory physicians. The first board exams for pulmonary and cardiology were administered in 1941 and those for critical care medicine in 1987. Commonly, physicians will combine

training in pulmonary and critical care medicine as the treatment and diagnosis of respiratory failure is common ground for the two subspecialties.

Presently, there are a number of tools employed by pulmonologists to diagnosis and treat diseases of airways, lung, and chest wall. These include the analysis of arterial blood gases and the measurement of respiratory mechanics with spirometry and body plethysmography. Radiologic techniques such as chest radiographs, CT scanning, MRI, and positron emission tomography (PET scan) are employed to evaluate malignant and inflammatory pulmonary parenchymal processes. Fiber-optic bronchoscopy is performed to directly visualize the airways and obtain tissue biopsies in the diagnosis of malignancies, infectious diseases, and interstitial parenchymal diseases. The use of interventional bronchoscopy is in its infancy with studies ongoing accessing the utility of placement of one-way valves in the airways for emphysema surgery as well as the placement of stents to alleviate obstruction due to endobronchial lesions.

Characteristics

Pulmonary requires a sound knowledge of respiratory physiology and of diseases that affect the respiratory system. It is distinctive from other medical subdisciplines as the pulmonologist must have expertise in other organ systems which are indirectly involved with respiration. Systems which intersect with the respiratory system include the central nervous system, musculoskeletal system, and cardiovascular system. For example, the “pacemaker” for breathing is located in the medulla and generates the drive to breathe. This neural traffic is transmitted to the respiratory muscles via the spinal cord and peripheral nerves. The diaphragm, the major inspiratory muscle, is then activated and provides the requisite force to expand the chest wall. Mechanical factors determine how the inhaled volume is distributed in the lung, and gases diffuse across the alveolar-capillary membrane. Cardiovascular determinants of blood flow

within the lung importantly influence the effectiveness of gas exchange. Acid-base homeostasis, in turn, is a function of alveolar ventilation and CO₂ removal. Disorders of any of these disparate organ systems can negatively impact breathing. Examples include neurologic and musculoskeletal disorders such as spinal cord injury, muscular dystrophy, kyphoscoliosis and obesity which limit the ability of the respiratory muscles to deliver air to the alveolus. Diseases of the pulmonary parenchyma, such as occupational exposures or infectious or inflammatory disorders involving the lung or airway can profoundly affect gas exchange. Similarly, pulmonary vascular diseases can negatively affect gas exchange. Finally, sleep can affect the regulation of breathing and several pulmonary problems may be exacerbated during sleep. In treating and diagnosing patients with lung disease, the pulmonologist needs to have an understanding of infectious diseases that affects the lung and the ability to interpret chest radiographs, CT scans, and PET scans of the chest. Thus, the discipline of pulmonary medicine overlaps with the disciplines of neurology, cardiology, renal, rheumatology, infectious disease, oncology, and radiology (see [Fig. 1](#)).

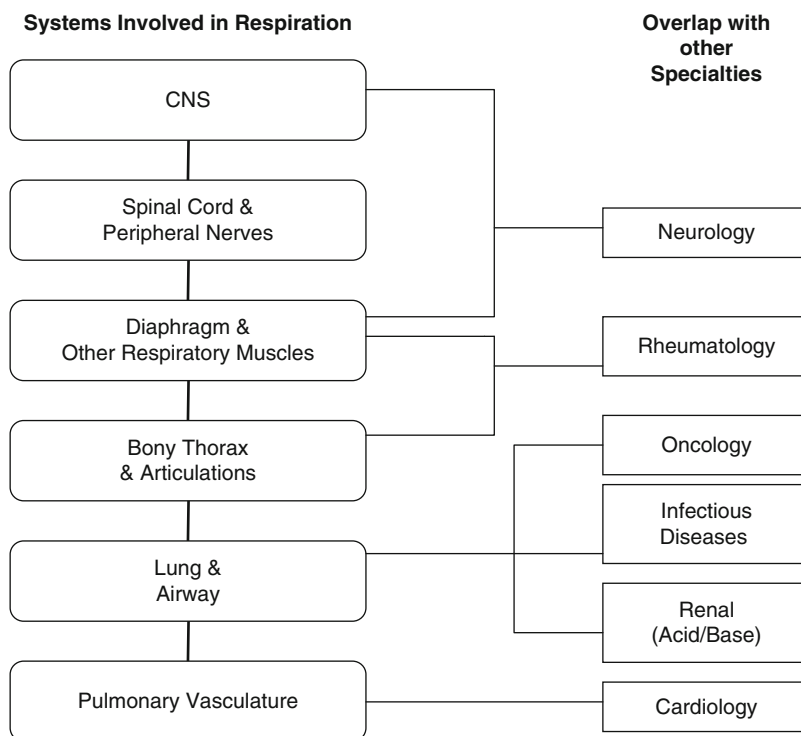
Relevance to Science and Religion

Generally, there is very little overlap between pulmonary medicine and religion. However, when patients are critically ill or have a very poor prognosis, end-of-life issues are often discussed. In this instance, families and patients often have questions with religious overtones which are addressed to the pulmonologist. In addition, the pulmonologist may have interactions with clergy or representatives from different religious sects when the end of life is near.

Sources of Authority

There are a number of professional organizations that are dedicated to fostering clinical and research careers in pulmonary medicine.

Pulmonary, Fig. 1



The American Thoracic Society, European Thoracic Society, and American College of Chest Physicians often develop consensus statements regarding the management and diagnoses of varied respiratory diseases. In addition, each one of these organizations supports innovative research in a range of lung diseases. The National Institute of Health, Heart, Lung, and Blood Division is also an extremely important source of funding for investigators. Major textbooks in respiratory medicine include Murray and Nadel's Textbook of Pulmonary Medicine (1) and Fishman's Pulmonary Diseases and Disorders textbook (2). Finally, there are a number of journals which are considered authoritative and include the *American Journal of Respiratory and Critical Care Medicine* which is published by the American Thoracic Society; *Chest*, which is published by the American College of Chest Physicians; *Thorax*, which is published by the British Medical Association; and *European Respiratory Journal*, which is published by the European Respiratory Society, as well as a number of

independent journals without society affiliations such as *LUNG*.

Ethical Principles

In general, pulmonary is guided by the oath and law of the ancient Greek physician Hippocrates and an ethical imperative to deliver pulmonary care to those in need regardless of socioeconomic factors. In addition, the ethical rules incorporated in the Declaration of Helsinki of 1971 serve to guide those involved with research.

Key Values

The key values are to improve quality of life and alleviate human suffering. The pulmonologist achieves these goals through a better understanding of the pathogenesis and mechanisms leading to diseases of the respiratory system and implementation of appropriate therapies.

Conceptualization

Nature/World?

Nature consists of all that can be experienced by all our senses in our environment.

Human Being

The human being is the most highly developed form of life that is found in nature. The human being has the greatest intellect and a superior ability to communicate using speech. The ability to think abstractly, exhibit creativity, and adapt to environmental and social change contributes to the unique capacities of humans.

Life and Death

Life in humans can be defined by the composite function of different organ systems. Humans have the ability to support metabolism by delivering oxygen to tissues and by removing the waste products of metabolism. The interruption of this process leads to hypoxia, anoxia, and death, that is, the cessation of metabolism.

Reality

Reality consists of comprehensible and incomprehensible observations or the physical world around us.

Knowledge

Knowledge consists of a combination of information, experiences, and insights which can be transferred from one human to another.

Truth

Truth is knowledge that is in agreement with reality.

Perception

Perception is the act of utilizing the senses to become aware of objects in nature or utilizing our intellect to become aware of concepts.

Time

Time is a fundamental concept of measurement used to distinguish among events or describe a sequence of events.

Consciousness

Consciousness is a process in which one is aware of their surroundings.

Rationality/Reason

Rationality is a process of responsible human behavior employing reasoning and characterized by a systematic application of the intellect.

Mystery

Mystery is a phenomenon that science has yet to explain either due to the lack of tools needed to assess the phenomenon or to a lack of the proper theoretical construct.

Relevant Themes

Pulmonologists encounter patients with a myriad of religious backgrounds. Greater knowledge of religion, and varied religious beliefs, would prove to be an asset in caring for patients and their families in times of crisis, especially with regard to end-of-life decisions.

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Punishment

- [Sin \(Vice, Human Limits, Negativity\)](#)

Purpose

- [Divine Action](#)

Q

Qualia

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In philosophy of mind, qualia refer to the phenomenal contents of consciousness, particularly referring to perceptions such as the redness of a rose or its particular smell. Critics of physicalist accounts of mind, particularly those relying on information processing models, have argued that computers can at best simulate human cognition. Although I see the redness of the rose, there is no corresponding red patch that occurs in the brain, and no amount of neuroscientific explanation of the operations of the brain can give the neuroscientist an understanding of what it is like to see someone else's perceptions or feel someone else's emotions. Critics argue that information processing models thus leave an explanatory gap, although advocates of information processing models suggest that such criticisms are misguided, relying on dualist intuitions that are no longer plausible.

Quantum Chemistry

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Related Terms

[Computational chemistry](#); [Molecular modeling](#); [Quantum mechanics](#); [Quantum physics](#); [Theoretical chemistry](#)

Quantum Chemistry is a branch of Theoretical Physical Chemistry whose primary focus is the application of quantum mechanics in biological and chemical systems. The main goal of Quantum Chemistry is the interpretation and prediction of molecular structure and chemical reactivity from quantum mechanics. To achieve this aim it has been developed mathematical approximations and technology that allowed to engage it with more and more quantitative precision systems of increasing complexity.

In 1926, Erwin Schrödinger solved the electronic structure for the hydrogen atom with his famous equation: $H\Psi = E\Psi$ (Schrödinger 1926). Other systems bigger cannot be treated as a whole with quantum chemical methods. Thus, an exact solution for the Schrödinger equation can only be obtained for the hydrogen atom or for one-electron systems. So, since all other atomic or molecular systems involve the motions of three or more particles, their Schrödinger equations cannot be solved exactly and then approximate solutions must be sought (Levine 1991).

The study of electronic structure of chemical systems and their properties can only be engaged with models that perform the real system in a more or less adequate way. The use of these models necessarily implies limitations in the quantum chemical description of the system.

The foundation of quantum chemistry is the wave model, in which the atom is a small, dense, positively charged nucleus surrounded by electrons. The first applications of quantum mechanics for the study of chemical bond, with Valence-Bond Theory and Molecular Orbital Theory, were quite simultaneous. In the former method, attention is primarily devoted to the pairwise interactions between atoms, and this method therefore correlates closely with classical chemists' drawings of bonds. In the latter one, electrons are described by mathematical functions delocalized over an entire molecule (Szabo and Ostlund 1996). This approach is the conceptual basis of the Hartree–Fock method.

In 1930, Hartree (1928) and Fock (1930) proposed the Self-Consistent Field method (SCF), or Hartree–Fock method (HF), which is the starting point of ab initio methods (i.e., from first principles of quantum mechanics). However, it did not become operative until the introduction of linear combination of atomic orbitals' method. Introduction of a set of basis functions, transforming the big numerical problems to linear algebra problems, allowed to try another kind of systems, only limited by technical store data possibilities and speed of algorithms for solving algebraic equations.

In the 1990s, technical advances in Computer Science greatly contributed to the development of computational methods based on quantum chemistry, which allow to predict structure and properties

of medium-sized molecules (about 50 atoms) in their electronic ground state in a quantitative way.

Theoretical predictions often precede experiment in small molecule chemistry, and quantum chemical methods play an ever greater role in biochemical and other larger systems. For this reason quantum chemists increasingly divide their efforts along three fronts: high-level accuracy for small molecules, medium-level accuracy for medium molecules, and lower-level accuracy for large molecules (Barden and Schaefer 2000).

Thus, Quantum Chemistry is the field of Chemistry in which solutions to the Schrödinger equation are used to predict the properties of molecules and solve chemical and biochemical problems.

Cross-References

► [Molecular Modeling](#)

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Quantum Computing

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Related Terms

[Computer quantum](#); [Computer science](#);
[Computing quantum](#)

Description

Quantum computing is a discipline crossing quantum mechanics and theoretical computer science, as well as mathematics used in both areas. It is possible to describe quantum computing as the theory of information processing with the traditional (classical) information replaced with *quantum information*. Quantum information differs essentially from its classical counterpart. For instance, *superposition* and *entanglement* are features belonging especially to quantum information. Moreover, cloning of quantum information is generally impossible, and observation usually disturbs a quantum system irreversibly. A consequence of the special nature of quantum information is that for some computational tasks, *quantum algorithms* appear more effective than the classical ones. Another consequence important from the applicability point of view is the design of *quantum cryptographic protocols* that are theoretically absolutely secure.

As some of the most significant achievements in quantum computing, one can mention Shor's algorithm for factoring integers in polynomial time (Shor 1994), a task believed impossible for classical computing. An important consequence of Shor's algorithm is that widely used encryption methods based on the *RSA protocol* would become vulnerable – if a large-scale quantum computer could be engineered. Another notable milestone is Grover's quantum algorithm for unordered database search (Grover 1996) and BB84 protocol for quantum cryptography (Bennett and Brassard 1984). It should be emphasized that the speedup provided by quantum computers for some computational tasks is not due to high clock frequency of quantum computers but rather to computational shortcuts possible for quantum information.

The theory of quantum computing is developed far beyond the practice. As of 2008, only 12-bit quantum computers with universal quantum bit control were possible, whereas an encryption-breaking application would require a control of 1,000–2,000 quantum bits. It is by no means exaggerated to claim that building a large-scale quantum computer is one of the most challenging

technological tasks ever. On the other hand, some applications requiring no simultaneous processing of multiple quantum bits, such as cryptographic protocol BB84 (Bennett and Brassard 1984), are already commercially available.

Self-Identification

Science

Quantum computing can be seen as a part of theoretical computer science and a part of quantum physics. Both subjects have firmly established scientific traditions from the beginning of the twentieth century. Hence, the methods of obtaining new knowledge in quantum computing are those of physics and mathematics: experimental research and logical deduction.

Early theoretical studies on quantum information were conducted by mathematician John von Neumann (1903–1957), who defined a useful notion of quantum entropy. Albert Einstein (1879–1955) together with coauthors published a study (Einstein et al. 1935) on quantum entanglement, arguing that quantum mechanics is an incomplete theory. The discussion raised by article (Einstein et al. 1935) was very important for the development of the theory of entanglement, and the paradoxical conclusion of (Einstein et al. 1935) was not solved until 1964 by the work of John Bell (1928–1990). Bell's work implies that *local realism* and quantum mechanics are in fact contradictory notions, but the experimental tests for concluding which to reject had to wait until 1981 when the work of Alain Aspect (1947–) spoke for quantum mechanics and nonlocal world, but some notable criticisms against that conclusion still exist.

In 1982, a Nobel Prize winner Richard Feynman (1918–1988) argued in his seminal article (Richard 1982) that it may be impossible to simulate a quantum system with an ordinary computer without an exponential slowdown. Feynman also suggested that the slowdown could be avoided by using a computer built on quantum-mechanical system, a *quantum computer*. Feynman thus implicitly suggested that a quantum computer may be exponentially more

powerful in some computational tasks than its classical counterparts.

In 1985, David Deutsch (1953–) introduced a theoretical notion, *quantum Turing machine* for quantum computing, and the theory of quantum computing was subsequently developed by various authors.

Research on quantum computing is practiced worldwide in universities, but research institutes devoted mainly for quantum computing have also been established.

Religion

Research on quantum computing is solely established on methods used in physics and mathematics. Consequently, results on quantum computing are based on either inductive or deductive scientific tradition. Hence, quantum computing does not self-identify as a religion at all, but it may be emphasized that the *interpretations* of quantum mechanics leave a lot of choice for personal beliefs. To mention one, the *many-worlds interpretation* of quantum mechanics is supported by some of the pioneers of quantum computing.

Characteristics

The main object studied in quantum computing is quantum information processing. It follows that quantum computing has an interdisciplinary nature. Especially, quantum computing has features from both quantum physics and theoretical computer science, whose research tradition has a strongly mathematical nature. From quantum physics, quantum computing differs by the intention to describe and explain computational processes, and from the traditional theory of computing, quantum computing is distinguished by the involvement of quantum information.

Relevance to Science and Religion

Quantum computers, if someday realized in a large scale, will have a tremendous impact on modern data communications: Many current

protocols designed for private communication would expire, more computational power would be available for many algorithmic tasks, and more secure level of communication privacy could be achieved. Research on quantum computing also introduces potential experiments and new views on old results, thus improving the testability of quantum physics. The importance of quantum computing is stressed also from a very fundamental point of view: Studying quantum computing helps to understand the limits for computational processes set by nature itself.

Sources of Authority

Sources in quantum computing can become authoritative only if their validity can be tested by experiments or verified by logical deduction. It is worth mentioning particularly authoritative sources (Bennett and Brassard 1984; Richard 1982; Grover 1996; Shor 1994; Einstein et al. 1935), whose importance emerges from their pioneering nature.

Ethical Principles

The ethical principles guiding quantum computing coincide with those of any physical or mathematical research. Especially this means that the research results must be verified by a thorough and careful procedure, and all the results, including those contradicting the pre-assumptions of the researcher, must be published and thus subjected to public discussion. The research results should not depend on the values, political interests, personal opinions, and such of the researcher.

Key Values

The main target of quantum computing is to develop knowledge on the limitations and potential of quantum information processing, compare it to classical computing, and discover ways to utilize the research results to benefit information processing.

Conceptualization

Nature/World

It is understood that the existence of the physical world is independent of any observer. The most accurate currently provided by quantum physics. As a consequence, the *causality principle* and *realism* cannot be accepted in their naïve form. Also, *quantum entanglement* can provide nonlocal correlations violating *Bell inequalities* and is hence not explainable within any classical local theory.

Human Being

Quantum computing refers to human beings only via chemical and physical processes in the human body.

Life and Death

Quantum computing does not directly refer to life, its origins, or to death. However, as quantum physics is understood as a highly faithful description of the physical world, it may be possible that quantum computing could be used to explain accurately the physical, chemical, and indirectly also biological processes which have allowed life to evolve (Schrödinger 1994).

Reality

Reality according to quantum physics is nonlocal and noncausal in the sense that an outcome of an individual experiment cannot be predicted; quantum physics predicts only the *probability distribution* of the potential outcomes.

Knowledge

According to widely accepted point of view, it is possible to obtain accurate knowledge of by experiments and logical deduction.

Truth

Truth in quantum computing is as in the general philosophy of natural sciences and mathematics: Upon questions where applicable, the truth exists and is independent of the observer. The truth can be approached by scientific methods, but it is not generally possible to tell how close to the truth a particular explanation is. The general theory of computing shows also that there are relatively simple claims whose truth-value cannot be determined.

Perception

Perception is a projection of the reality on a human being or living organism. Perception can be a result of sensory activity with or without accessories (such as microscope). Perceptions may not generally be faithful images of reality, but combined with logical deduction, it may be possible to approach truth based on perceptions via accessories.

Time

Time is a general reference frame organizing events into a transitive order. Quantum computing can be described either in *classical time*, where the order of events is total, or in *relativistic time*, containing the possibility of events whose order cannot be defined. As a computational term, the *computing time* does not refer to the measured time elapsed from the beginning of the computation until the end of it but to the duration, usually measured by the number of *elementary computational steps* needed for the computation.

Consciousness

It is possible that the human brain activity arousing the consciousness cannot be explained by classical physics only, but a quantum explanation is needed to describe the entire brain system.

Rationality/Reason

Rational reasoning is the only way to obtain reliable information of the universe. In research, rational reasoning includes devising appropriate experimental setup, systematic data analysis, and logical deduction.

Mystery

Unsolved questions in quantum computing are sometimes said to be mysterious, but in general, mystery is not a notion referred to in quantum computing usually.

Relevant Themes

Themes closely related to quantum computing are *quantum information theory* (sometimes seen as an area separate from quantum computing), *quantum physics*, and *Classical theory of computing*.

Cross-References

- [Algorithms, Computer](#)
- [Information Security](#)
- [Mathematics, Formal and Contemporary](#)
- [Mathematics, Modern](#)
- [Particle Physics](#)
- [Physics](#)
- [Quantum Theory](#)

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Quantum Mechanics

- [Quantum Chemistry](#)
- [Quantum Theory](#)

Quantum Physics

- [Classical and Quantum Realism](#)
- [Energy in Physics](#)
- [Molecular Modeling](#)
- [Quantum Chemistry](#)
- [Physics in Buddhism](#)
- [Quantum Theory](#)

Quantum Physics Interpretation

- [Quantum Theory](#)

Quantum Theory

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Related Terms

[Quantum mechanics](#); [Quantum physics](#); [Quantum physics interpretation](#)

Description

Quantum theory is the fundamental theory that governs the behavior of the physical world. It emerged at the beginning of the twentieth century in response to problems that could not be solved within the otherwise spectacularly successful classical physical theories associated with the names of Newton (1643–1727) and Maxwell (1831–1879). Over the years, quantum theory has been highly successful in predicting the statistical regularities of the observed behavior of the physical world with great precision and has led to many technological advances without which the particular world we inhabit in the twenty-first century could not exist. But from the very start, the way the theory was to be understood was not at all clear, and even over 80 years later, although physicists know very well how to use quantum theory, its foundations remain controversial and shrouded in mystery. In particular, the problem of giving a coherent account of a well-defined, independent, and intuitive reality that gives rise to the observed statistical predictions, or even whether such a concept makes sense, remains unresolved. For many physicists, the brilliant predictive success of the theory is

all that counts. Some actively adopt a general philosophical position that regards all theories as nothing but predictive schemes anyway, while others see problems of interpretation of the theory as distractions, preferably to be left to sort themselves out eventually, or otherwise best ignored or forgotten. Others have not been contented with such “tranquilizing philosophies” and have continued to struggle to provide an understanding of the quantum theory in terms of a single and consistent conceptual scheme.

Classical Physics Background

Classical physics is built on an ontology of extended fields and of localized point particles evolving against the backdrop of absolute space and universal time. The fundamental entities in the theory are exclusively either fields or particles. Matter is held to be composed of particles which follow well-defined trajectories under the influence of forces which are mediated by fields. The state of a particle system is completely specified by the positions and momenta of all the particles it contains. The well-defined motion of individual particles and their interactions through fields is the basis on which everything else is to be explained. Classical physics theory is based on the natural attitude that there is a clear conceptual difference between the observer and the observed or between subject and object. Accordingly, in classical physics, the observation of the world is an essentially passive affair; the world is held to exist independently of observation and of human consciousness, and any influence of the observer on the observed object can always, in principle at least, be excluded or taken into account in a straightforward manner.

The Way to the Quantum or the Quantum Way

At the end of the nineteenth century, it became apparent that, in spite of its great success, classical physics was beginning to face grave difficulties. Anomalies, such as the incorrect prediction of the observed values of specific heats, the inability to predict the correct energy distribution for the radiation emitted from hot

bodies, the exchange of energy between matter and radiation in the photoelectric effect, and the very stability of the atom, were never accounted for within classical physics, and we now know that classical physics has only a limited domain of approximate applicability. However, the limitation of classical physics does not just concern the inability to predict the behavior of certain systems with precision. Rather, as it later transpired, the whole classical conceptualization of the world was problematic, and we now know that the behavior of fields and matter at the fundamental level (and of space and time) is governed by different laws. Phenomena involving the exchange of energy between light and matter were explained at the beginning of the quantum era using the assumption that when interacting with matter, radiation exhibits a particle-like behavior. Radiation exchanges energy with matter, not in a continuous steady stream (as in classical field theory) but in the form of indivisible, discrete quantum of energy now known as photons. The energy E of a photon of frequency ν is given by

$$E = h\nu \quad (1)$$

where h is Planck's constant. This particle-like exchange of energy between field and matter was first proposed by Planck to produce the correct distribution for the emission of radiation from hot material objects where classical conceptions had failed. Particle-like behavior of radiation is also seen in the emission and absorption of radiation by atoms. Such behavior has led to the informal picture of light as a stream of particles, but we know that light also exhibits wavelike properties such as interference and diffraction which cannot be comprehended within a simple particle picture.

Even the very stability of the atom was problematic in classical physics. In classical physics, the atom resembles a tiny solar system and one imagines the electrons orbiting the nucleus. According to this picture, the electron's energy varies continuously as the form and size of its orbit changes. The major problem with this picture, from the point of view of classical

physics, is that as the electron is accelerated around the nucleus it must, according to Maxwell's equations for the electromagnetic field, radiate electromagnetic energy. The energy radiated slows the electron, which rather quickly must spiral into the nucleus collapsing the atom.

In 1913, Bohr proposed a new theory of the atom in order to account for its stability. He asserted that only certain electron orbits within the atom could be stable and that when an electron changes its orbit from one stable orbit to another, there is an emission of radiation of frequency ν related to the change in the atom's energy by Einstein's relation: Eq. 1 Mathematically, the basis of the idea was a quantization condition (later known as the Bohr-Sommerfeld quantization condition):

$$\oint p dq = nh \quad (2)$$

where p is the particle's momentum, q its position, n is an integer, and h is Planck's constant. The left-hand side of the equation represents a quantity known as the action which, as the equation states, can only take on certain discrete values equal to an integer multiple of Planck's constant. The quantization condition Eq. 2 selects particular classical orbits as allowed, and stable orbits, orbits not satisfying the condition, were forbidden. The quantization condition achieved considerable success when extended to further variables. The developments based on this early work are known as the old quantum theory (ter Haar 1967).

In his PhD thesis of 1924, de Broglie proposed a physical explanation for the old quantum theory and for the quantization of radiation. Extending the work of Max Planck and Albert Einstein on radiation quanta, de Broglie proposed that material particles should also reveal such a dual nature and that there should be associated with every material particle an accompanying "phase" wave whose propagation vector is proportional to the momentum of the particle and which must beat in time with the internal frequency of oscillation associated with the particle's energy according to Eq. 1. Particle orbits for which the latter condition was

fulfilled would be stable allowed orbits. The Bohr-Sommerfeld stable atomic orbits were thus provided with a physical explanation. Furthermore, it followed from de Broglie's ideas that interference and diffraction effects should also be observable, under the right conditions, in the behavior of particles. Faced with the need to unify the disparate classical theories of the mechanics of particles and of wave motion of fields, de Broglie turned to their formulation in terms of variational principles. The synthesis he sought was produced by identifying the variational principle that Maupertuis had developed to describe classical particle motion with the variational principle that Fermat had produced to describe optics. De Broglie sought to replace the Newtonian mechanics of particle motion with a new mechanics in which the path of a free particle was not rectilinear as Newton had proposed but determined instead by the rays of the particle's associated phase wave. As a result of this fundamental analysis, de Broglie proposed that the wavelength, λ , of the wave that he had associated with material particles (now known as the de Broglie wave) should be related to the particle's momentum p through the equation

$$\lambda = \frac{h}{p} = \frac{h}{mv} \quad (3)$$

where h is Planck's constant ($6.626 \times 10^{-34} \text{ Js}$) and p is the particle's momentum, m its mass, and v its velocity.

The application of de Broglie's theory to the atom was extraordinarily successful. The atom's discrete energy levels and the consequent line spectra in the emission of radiation could now be explained. With Pauli's exclusion principle, the structure of the periodic table, the bonding of atoms in molecules, and much more could now be explained within the emerging quantum theory. Using de Broglie's wave representation of the electron, the intensity distribution (i.e., in particle terms, the relative number of electrons arriving at a given location), in interference and diffraction experiments, for example, could also be predicted correctly. If the experiments are carried out with a sufficiently low-intensity beam, such that, on average, electrons travel alone between source

and detecting screen, the wavelike interference pattern appears nonetheless over a sufficiently long period of time. Individual spots appear on the screen where the electrons arrive, signaling their particle-like nature, but the distribution of spots is like the intensity distribution produced by a wave. So in some way, individual particles must interact with themselves to produce such effects. In trying to understand the behavior of light, and of matter, it seems to be necessary to somehow combine the concepts, mutually exclusive in classical physics, of wave and particle; this is the basis of the wave-particle duality that still perplexes many physicists.

Modern Quantum Theory

Modern quantum theory emerged from the old quantum theory in the period following 1925, but its development proceeded along two very different lines. In 1926, Schrödinger developed the propagation equation for de Broglie's matter waves producing the theory that became known as wave mechanics:

$$i\hbar \frac{\partial \Psi(\vec{x}_c, t)}{\partial t} = H\Psi(\vec{x}_c, t) \quad (4)$$

where $\Psi(\vec{x}_c, t)$ is the system's wave function and $\hbar$ is Planck's constant. The wave function is a function of the configuration of the particles $\vec{x}_c$ and is represented in a $3N$ -dimensional configuration space. The configuration space, rather than the three dimensions of our perceptions, forms the natural arena for the evolution of the system. This is so despite the fact that the very notion of configuration space is predicated on the existence of definite particle coordinates which are denied in common quantum theory. The configuration-space wave function is not a preassigned function of the individual particle coordinates (e.g., the configuration-space potential energy of interaction is in classical mechanics).

H is the system's Hamiltonian operator

$$H = -\frac{\hbar^2}{2m} \sum_{i=1}^n \nabla_i^2 + eV(\vec{x}_c) \quad (5)$$

for n particles of equal mass m and equal charge e subject to the external electrostatic potential V .

The wave function itself cannot be directly observed or measured, as can, say, an electric field which can be measured by gauging its action on electrical test charges. However, the wave function is connected with observations through Born's rule, given in Eq. 6 which interprets the magnitude squared of the normalized wave function as the configuration probability density:

$$P(\vec{x}_c, t) = |\Psi(\vec{x}_c, t)|^2. \quad (6)$$

Since there is no definite configuration of the system, this is the only connection with observations and prediction in quantum systems is limited to statistical expectation values of various quantities. One can only assign various probabilities for the particles to be found in various configurations should they be measured (The notion of probability is somewhat problematic from a foundational point of view, there being both subjective and objective interpretations, but typically, "probability" is interpreted by scientists objectively, as the limit of the relative frequency of obtaining a given result in a large number of trials is the number of trials that is increased to infinity). To solve a given problem, an initial wave function is chosen to match the particular physical circumstances that exist initially in the system of interest. Thereafter, its evolution in time, according to Eq. 4, is continuous and deterministic, the probabilities themselves changing from time to time in a continuous and deterministic manner.

At the same time as wave mechanics was developed, Born, Jordan, and Heisenberg developed what became known as matrix mechanics. The basic variables in matrix mechanics were the classical position and momentum, but they were represented as an array (matrix) of Fourier coefficients with two indices, corresponding to the initial and final states and representing all possible measurement outcomes. Initially at least, the apparently more familiar physics involved in wave mechanics lead to it being preferred to matrix mechanics by many physicists. Matrix mechanics seemed abstract and contained

mathematical descriptions that were unusual in physics at the time. Even Heisenberg had to learn the mathematics of matrices once Born had seen that they were indispensable in putting the theory on a secure formal footing.

Each approach achieved success in predicting the statistics of the quantum mechanical behavior of matter, and Schrödinger demonstrated that each version was a mathematical transcription of the other. Both approaches were shown to be special cases of the so-called transformation theory produced by Dirac and Jordan in 1927. In these “modern” formulations of quantum theory, observable physical quantities are described as operators which act on state vectors in a Hilbert space.

Although the technical success of the new theories was beyond doubt, the nature of the quanta they described was unclear. There was no consensus about how the new theories were to be interpreted. The theories provided recipes for calculations, but the basic entities in terms of which the theories were formulated were mysterious; there was no clear and distinct conceptual picture of the processes that gave rise to the observed instrument results, and no agreement between the main protagonists.

The Quantum Measurement Problem

The description of the motion of particles afforded by wave mechanics is clearly of a very different character to that provided by the classical theory. Newton’s theory can be formulated in real three-dimensional space with particles following trajectories. Schrödinger’s theory is formulated in terms of evolving complex probability amplitudes or wave functions defined in configuration space. As a simple example, consider a single, bound particle subject to a linear restoring force about some center. Solving Schrödinger’s equation shows that an arbitrary initial state will in general have a complicated evolution in time but, as is well known from classical wave theory, there are certain initial states whose motion is particularly simple. In wave mechanics, these special states (known as eigenstates) have stationary probability densities (they are analogous to the standing waves of the classical theory). These energy eigenstates have

well-defined energies, E_n (the energy levels), and the position probability density is independent of the time or stationary. The mathematical properties of the eigenstates are such that an arbitrary function Ψ can always be written as a weighted sum over the eigenstates according to

$$\Psi(x, t) = \sum_{n=1}^{n=\infty} a_n \psi_n(x, t) \quad (7)$$

where the a_n are complex coefficients such that $\sum_{n=1}^{n=\infty} |a_n|^2 = 1$.

In an arbitrary state such as Ψ , there is no definite value of the energy and the theory predicts only an expectation value for the energy given by the sum of the possible energies multiplied by their associated probability of occurrence $|a_n|^2$ according to

$$\langle E \rangle = \sum_{n=1}^{n=\infty} |a_n|^2 E_n. \quad (8)$$

However, if a measurement of the energy is carried out on a single system in a state such as Eq. 7, a definite result must be recorded and found to be one of the allowed values E_n . After such a measurement, the wave function Eq. 7 no longer correctly represents the state of the system, as the energy is now definitely just one of the E_n . The usual description is that the correct state is now the particular $\psi_n(x, t)$ eigenstate that corresponds with the energy observed. The transformation of the wave function from Ψ to one of the ψ_n is referred to as the “reduction” or “collapse” of the wave packet on measurement. The collapse process is not described by Schrödinger’s linear equation but is carried out “by hand” after the measurement result is known. As such, the reduction procedure is an ad hoc addition to wave mechanics invoked simply to ensure coherence with the fact that measurement results, which appear at the classical level, are always individual and definite. Similar considerations apply in the case of other measurements; in which case, the state Ψ is transformed by the measurement to one in which the particular measured quantity becomes definite. According to wave mechanics, the actual



result of the measurement in a given case is undetermined. This is in stark contrast to the situation in classical mechanics in which measurement simply reveals a preexisting value and plays no special role in the formulation of the theory. The ad hoc character of the collapse postulate has led to a great deal of discussion principally concerning the conditions that must exist in order for the postulate to be legitimately invoked. Schrödinger sought to expose the ridiculous nature of such superpositions through his famous cat experiment. Such is the measurement problem of quantum theory.

A clear, widely accepted, and unambiguous description of the conditions that must be met for an interaction to be capable of collapsing a superposition has never been produced. Some have suggested that collapse is a spontaneous random process that occurs regularly at the quantum level, and others, that size or interaction with a complex environment is responsible. Still, more have argued that it must be human consciousness that causes collapse. Yet, another approach is to argue that the wave function simply represents our knowledge, and so collapse is not a physical process at all; it merely represents the change in our knowledge that occurs when a measurement result is perceived.

A completely different approach to the problem is to argue that in fact collapse never occurs and that there is no need to supplement Schrödinger's equation. An example of this type of approach is the many worlds' theory, which instead of relying on collapse to account for the singular and definite results observed in measurement, asserts that all of the possible results actually occur individually, but each in a different "world." A state like that given in [Eq. 7](#) is in fact describing the situation in an infinite number of universes. The idea is consistent, but some find it rather extravagant. A different theory in which there is no collapse is provided by the original wave theory of de Broglie (later rediscovered by David Bohm). This theory does not expunge the particle's trajectory, and this alone can account for the definite results of measurement.

Quantum Nonlocality and Entanglement

Further interpretive difficulties arise in the context of superposition of wave functions when the wave function of a many-particle system is nonfactorizable or "entangled." Consider a two-particle system with the particles labeled 1 and 2 and possible individual wave functions ϕ_a and ϕ_b . The two-particle wave function is factorizable if it can be written as a simple product $\phi_a(1)\phi_b(2)$, and under such circumstances, the particles' measurement statistics are independent. However, if the wave function cannot be factorized, as in the superposed state $[\phi_a(1)\phi_b(2) - \phi_b(1)\phi_a(2)]$, then the particles' statistics show correlations. Nonfactorizable wave functions are demanded by the symmetry conditions that must be imposed on the configuration-space wave functions of identical particles, but they can also be constructed for distinguishable particles. The predicted statistical correlations are independent of the separation of the states ϕ_a and ϕ_b in space. The states may describe particles at opposite ends of the universe, but particular set measurements carried out on the particles can show correlations even though there is no possibility for any influence to travel from one to the other to establish such a correlation. Einstein was troubled by such behavior and referred the correlations as "spooky." He argued that the existence of such correlations demonstrated that quantum theory was incomplete, and with Podolsky and Rosen (1935), he proposed a thought experiment to demonstrate his argument. Later, John Bell (1964) proved a vitally important theorem that demonstrated that no local theory could account for such correlations. Distant measurements on entangled particles show correlations that cannot be explained in terms of local influences propagating between the particles. Many experiments have now made Einstein's thought experiment a reality. As a result, many are now convinced that the world must be fundamentally nonlocal, and some regard this feature as the most perplexing of all. Others avoid the issue by refusing to discuss any form of explanation of the results predicted by quantum theory; as we have seen for them, there is no quantum world.

Nonlocality sits very uneasily with relativity theory: It implies that there must be some unobservable preferred frame of reference in which the nonlocal connection is instantaneous (or in collapse theories in which the collapse is instantaneous). Unobservable preferred frames are not strictly inconsistent with relativity theory, but they certainly violate the spirit of the theory in which simultaneity is a relative concept.

Quantum theory has led to a failure of our accustomed demands regarding the understanding of natural phenomena in the atomic domain, and this has produced a range of different attempts to explain the meaning of the new theory. Underlying each such attempt is an often tacit, particular philosophical position. Some such as Einstein, Schrödinger, and de Broglie, the philosophical realists, attempted to interpret quantum theory in terms of a new ontology, while others, such as Niels Bohr and Werner Heisenberg, took an epistemological approach and claimed that what quantum theory was telling us was not so much about the way the world is in itself, as about the limitations on what it is possible for us to know. Physicists are still divided about quantum theory in much the same way, and over the years, since its inception, the debates have generated an extensive literature. However, for most of the twentieth century, the realists have been few and far between.

The “Copenhagen” Interpretation

Bohr argued that “the entire formalism is to be considered as a tool for deriving predictions, of definite or statistical character, as regards information obtainable under experimental conditions described in classical terms. . .” (1948). Description in classical terms was held by Bohr (1935) to be a necessity for the unambiguous communication of experimental results. He argued that we are inevitably bound by the classical conceptualization of the world, and it seems that classical concepts were to be thought of as Kantian forms of perception. In the quantum context, we discovered that the application of the classical concepts was subject to limitations. Such limitations found mathematical expression in the uncertainty relations

between noncommuting observables that Heisenberg had produced. For example, position and momentum were subject to an uncertainty relation such that any attempt to narrow the uncertainty concerning one of the pair necessarily produced a wider uncertainty in the other. Strictly, the uncertainty relations concern statistical measures in ensembles of systems and have no definite reference to an individual particle. Bohr developed his philosophy of complementarity to describe the interpretive problem in quantum theory. He argued that science progresses by a process of “natural generalization” in which the conditions of applicability of our necessary classical concepts are subject to limitations in new domains. Although wave and particle concepts appear to be contradictory descriptions, we are forced by quantum theory to use both, but in a complementary manner according to the conditions of the experimental apparatus. For Bohr, a quantum phenomenon was the true object of quantum description and was not defined until the whole experimental context had been specified. The whole, so defined, was hermetically sealed, and no further analysis into parts, going beyond the statistical results of measurement, was possible. In fact, he argued that the concepts of wave and particle can only be used unambiguously in the classical context. “The extreme fertility of wave pictures in accounting for the behaviour of electrons must not make us forget that there is no question of a complete analogy with ordinary wave propagation in material media. . . just as in the case of radiation quanta we have here to do with symbols helpful in the formulation of the probability laws governing the occurrence of the elementary processes which cannot be further analysed in terms of classical physical ideas” (Bohr 1931). Bohr’s pronouncements had a powerful effect in the physics community. Most believed that any further analysis of the quantum world was impossible. In fact, according to Peterson (1968), Bohr stated that “It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature.” Insofar as physicists were at all concerned about interpreting “how nature is,” the “Copenhagen interpretation” developed by Bohr and Heisenberg held sway.

Although conceptually very different, one feature that the mathematical formulations proposed by Schrödinger on the one hand and by Born, Jordan, and Heisenberg on the other had in common was that the foundation stone of the classical theory, the particle trajectory, had no place at all. As we have seen briefly above, de Broglie's own approach was very different: It was based on a new mechanics of particles and did not require the removal of the notion of particle trajectories. De Broglie formulated a theory in which the wave that he had proposed guided the particle along its trajectory following the normals to the surfaces of constant phase of the wave. This was the way in which de Broglie unified the wave and particle descriptions. Initially, however, although de Broglie's association of wave behavior with particles was experimentally confirmed, his "pilot-wave theory" did not receive a great deal of support. Following the Solvay conference in 1927, during which questions of interpretation were discussed at length, de Broglie's pilot-wave theory languished in obscurity. Insofar as questions of meaning and interpretation were considered at all, the Copenhagen interpretation of Bohr and Heisenberg dominated physics, and apart from the notable dissention of Einstein and Schrödinger, Copenhagen remained unassailable.

Alternative Interpretations

Today, the situation regarding the theory developed by de Broglie has changed somewhat. An important step forward was made by David Bohm in the early 1950s (1951, 1957) when he extended de Broglie's ideas to provide a complete account of the measurement process and produced a theory which flew in the face of von Neumann's proof that "hidden variable" completions of quantum theory were impossible. In the 1960s, J.S. Bell (1964) gave the de Broglie theory more credibility by demonstrating exactly how the contextual dependence of the results of measurements, apparent in the de Broglie-Bohm theory, foiled von Neumann's proof. Furthermore, Bell demonstrated that the nonlocality evident in the de Broglie-Bohm theory must be a general feature of any hidden variable quantum

theory, and no local theories could reproduce the correct statistics. Then, in the late 1970s and 1980s, a series of pioneering, explicit, and detailed computational models of quantum phenomena were produced, which laid bare precisely how the theory could account for all of the so-called paradoxes of quantum theory. De Broglie's original "pilot-wave" theory is now known also as the de Broglie-Bohm theory (or somewhat misleadingly as Bohmian mechanics), and it has been shown to provide the basis for a consistent interpretation of all nonrelativistic quantum phenomena.

The de Broglie-Bohm theory reinstates the definite world of individual particle trajectories, piloted by the wave function and evolving in a continuous and deterministic manner, as the basis for understanding the origin of the statistical predictions of quantum theory. The statistical predictions that quantum theory makes arise naturally from an underlying level of well-defined and deterministic individual particle motions, providing we make the following three assumptions:

1. The Ψ field satisfies the Schrödinger Eq. 4.
2. The trajectories of the particles are determined by the rays of the associated configuration space of the de Broglie wave. In terms of the wave function, the particle velocities are determined by the guidance condition

$$\frac{dx_i}{dt} = \frac{\hbar}{m} \mathbf{Im} \left(\frac{\nabla_i \Psi(x_c, t)}{\Psi(x_c, t)} \right) \quad (9)$$

where $\mathbf{Im}$ indicates that we take the imaginary part of the term in brackets.

3. That we do not control the precise location of the particles, but have, in practice, a statistical ensemble of n -particle systems with a configuration-space probability density given by the Born rule.

The three assumptions listed above are all that is needed to make quantum theory a fully deterministic theory of the behavior of individual systems, and each of the so-called paradoxes of quantum theory finds a natural resolution in the de Broglie-Bohm pilot-wave theory. The statistical predictions of the pilot-wave theory are identical to those of common quantum theory

(Theories with predictions that differ from those of the usual quantum theory can be obtained by relaxing any, or all, of the assumptions listed above). The guidance Eq. 9 determines the velocity of the particles and guarantees that the probability is conserved during the evolution of the system in time. Although the pilot-wave theory provides an intuitive picture of particles piloted by the wave function, it is important to keep in mind that the wave function of a quantum system is defined on the configuration space of the system. One must guard against simple pictures, based on our common experience with classical waves. Equation 9 shows that the particle velocity is independent of the amplitude of the wave. The particles are neither “surfing” a wave in real space nor are they “pushed around” in the way charged particles are affected by electromagnetic fields. In these latter cases, the effect of the wave on the particle is determined by the amplitude of the wave or field strength, respectively.

In pilot-wave theory, the wave function is irreducibly defined on configuration space, not real space, and so the guidance of the particle cannot be conceived in terms of the effect of a real three-space wave belonging to an individual particle at the given particle’s position. The guidance of each particle depends on the configuration of the whole system of particles through the functional form of the configuration-space wave function. So, a quantum system is described by a configuration-space wave function and a representative point in the configuration space which gives the actual configuration (all of the individual particle positions) of the system. The evolution of the wave function determines the motion of the system point in configuration space and, hence, the motion of all the particles in the system.

There are differing schools of thought concerning how the pilot-wave theory should be interpreted and, in particular, the status of assumption Eq. 3. The main difference of approach concerns whether the theory should be cast as a second-order-in-time (Newtonian) theory couched in terms of forces and accelerations or considered fundamentally as a first-order-in-time (Aristotelian) theory, in which case the

guidance Eq. 9 is asserted as a new law of motion determining the system’s velocity directly.

In the first-order form of pilot-wave theory, Eq. 9 is taken as a new fundamental law of motion. This implies a complete break with the classical Newtonian description of motion in terms of forces acting on particles to determine accelerations. Instead, one has the guidance Eq. 9 which can be thought of as an equation for the “Aristotelian” force which determines not the acceleration but the velocity. In Aristotelian physics, an object moving with a constant velocity requires a force to maintain its state of motion. The natural state is then one of absolute rest, which arises when the left-hand side of Eq. 9 vanishes and there is no Aristotelian force acting. The role of the wave function, which evolves according to Eq. 4, is to determine a velocity field according to Eq. 9 (This is the approach favored by John Bell, and Antony Valentini has developed this approach in great detail in his thesis *Pilot-Wave Theory: An Alternative Approach to Modern Physics*, Cambridge 2001).

David Bohm recasts quantum mechanics in a form that is as close as possible to Newtonian, or classical, mechanics. In his formulation, one adopts the ontology of classical mechanics, and the only difference between classical behavior and quantum mechanical behavior arises as a result of the action of a novel “quantum” force or potential and the restriction of the initial particle velocity according to Eq. 9. The form of the quantum force is determined by the wave function, and this is how the wave-particle duality is expressed in Bohm’s theory. Individual particles obey a modified Newton equation. Bohm’s original motivation was to simply show that a causal interpretation of quantum mechanics is possible, in spite of the widely held belief, at the time, that this was impossible. He also sought to bring out the essential differences of classical and quantum mechanics. It follows in Bohm’s approach that the equation of motion for the particles is a modified Newton equation:

$$F_i = m \frac{d^2 x_i}{dt^2} = -\nabla_i (V(r_c; t) + Q_i(r_c; t)). \quad (10)$$

In addition to any classical potentials, (V), there is also a “quantum potential,” (Q). From the form of the quantum potential, it is clear that in representing the interaction between particles, it is unlike known classical potentials in several important respects including:

- The functional form of the interaction is determined by the configuration-space wave function, and so the magnitude of the interaction does not depend only on the configuration of the particles. Two identical configurations of particles will experience different forces if their associated wave functions are different.
- The strength of the interaction does not necessarily decrease as the particles increase their separation; the interaction is nonlocal.
- The effect of one particle on the other cannot be represented using a field of given functional form, the source of which is the other particle.
- The wave function has no source; it is neither emitted nor absorbed.

In the second-order-theory approach, all of our accustomed classical framework for understanding mechanics can now be incorporated into quantum mechanics. One has real space motions determined by (nonlocal) forces which act in space and time.

De Broglie-Bohm theory may be extended to provide a description of quantized fields in terms of deterministic motions of well-defined fields in space and time. Hence, a complete and deterministic account can be given of the emission and absorption of radiation quanta in terms of individual field motions and particle trajectories. However, in the context of relativistic fields, there are several different approaches. Bohm preferred to make a clear distinction between bosons (zero or integral spin) and fermions (spin one-half), treating the former as extended well-defined fields and the latter as particles following trajectories. Approaches in which both bosons and fermions are treated on an equal footing either as fields or as particles also exist. Regarding the tension between nonlocality and relativistic invariance, Bohm favored the idea of an unobservable preferred frame in which the nonlocal influences are instantaneous. Others have developed relativistically covariant theories in which the incorporation

of nonlocality is achieved in a natural and observer-independent manner by formulating the theory on space-like hypersurfaces themselves determined by the dynamics of the system.

Conclusion

The unsatisfactory situation regarding the interpretation of quantum theory has persisted since its beginning because there is nothing in the formalism of the physical theories themselves, or in the evidence, to favor one view over another. The interpretation and the ontology are underdetermined by the evidence. Perhaps, the situation is inevitable and will only be resolved by the development of a new theory that goes beyond quantum theory in a similar way to that in which quantum theory replaced classical theory. The situation can be seen as an aspect of a general underdetermination problem: Not only are physical theories typically underdetermined by empirical evidence, but one's ontological commitments are typically underdetermined by physical theories one adopts.

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Quantum Theory, Generalized

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Quantum physics and its formalization in quantum theory are a prime example of scientific progress where phenomena are empirically observed which require the development of new theoretical models which in turn are tested empirically. In the case of quantum physics, our theoretical model of physical reality was enriched by a number of new principles which were absent from what thus became to be called “classical” (i.e., pre-quantum) physics. Among the most important innovations are, to name just a few, non-locality/entanglement (the fact that space-like separated events can systematically correlate even if this correlation is not explainable by causal interaction between the two events nor by the common history of the events),

complementarity (the fact that quanta require at least two mutually exclusive descriptive frameworks (e.g., wave and particle) for a complete description of their behavior), uncertainty relations (the fact that not all properties of a quantum can be defined with absolute precision at the same time), non-commutativity (the fact that the properties of a quantum depend on the sequence in which the properties are measured), and ontic probability (meaning that certain quantum events are individually absolutely (not just epistemically) unpredictable but collectively strictly obey certain probability distributions) (For more information on quantum physics see e.g., the entries on ► [Quantum Theory](#), ► [Classical and Quantum Realism](#)).

There are currently several research endeavors investigating the possibility of applying principles of quantum theory to systems other than the ones traditionally considered quantum physical ones, or, to be more precise, to such systems which are considered to be subject to decoherence and thus can be asymptotically approximated as classical systems. The motivation behind these approaches is the hope that by employing the novel principles, an increased understanding and better modeling is possible for phenomena in these other fields of research.

For example, Atmanspacher, Römer, and Walach in what they initially called “Weak Quantum Theory” (Atmanspacher et al. 2002) presented a theoretical framework which retained the fundamental axiomatic structure of quantum theory but relaxed several absolute parameters (such as Heisenberg’s constant), resulting in effect in a model that is applicable to all kinds of systems. In later publications and further developments, this hypothetical framework has been referred to by the name of “Generalized Quantum Theory” (Filk and Römer 2011). (It should be noted that the same or very similar names are also used for different, unrelated research efforts by, e.g., Collins 1970; Mielnik 1974; Hartle 1998; De Muynck 2002; Sudarshan et al. 2007).

Essentially the hypothesis of “Generalized Quantum Theory” is a system-theoretical one in

that it proposes that certain principles found in quantum physics are not in a strict sense exclusive properties of only the subatomic, atomic, and molecular realm but rather that they are the result of specific system-theoretical constellations which can theoretically be achieved in all kinds of systems, irrespective of the kind of elements the system consists of.

It predicts, for example, the occurrence on “generalized” entanglement in all such systems where a “generalized” complementarity between local and global observables occurs. Speculative applications of this principle include, for example, telepathy, precognition psychokinesis, and mental healing (von Lucadou et al. 2007; Matschuck 2011), phenomena which are frequently reported from practitioners in different mystical/spiritual traditions but resist an explanation in terms of currently generally accepted scientific models in psychology or other disciplines. Interestingly, generalized entanglement might also offer an explanation for the notorious irreproducibility of the named phenomena under controlled experimental conditions (von Lucadou et al. 2007; Walach et al. 2009; von Stillfried 2010). Generalized entanglement could be seen as a further development of the Theory of Synchronicity, which was developed by C. G. Jung and W. Pauli in order to explain, among others, the phenomenon of so-called counter-transference in psychotherapeutic settings (see e.g., “Synchronicity: An Acausal Connecting Principle” in Jung and Pauli (1955)). This strand of counter-transference research has recently been taken up by Kleinberens (2007).

A major field of application for a “generalized” complementarity principle is the so-called “hard problem of consciousness” (Chalmers 1995), also known as the mind-body- problem (See entry on: ► [Consciousness, the Problem of](#); ► [Philosophy of Mind](#); ► [Monism](#)): There is an increased understanding among philosophers of mind that any reductionist monist approach to consciousness is bound to fail because subjective experience is of a so distinct qualitative category that it cannot be derived from physical matter/energy, nor vice versa. Interestingly, quantum physics presented

a structurally isomorphic challenge to theoreticians: Here the wave and the particle nature of a quantum were the descriptive categories which are in their pure form completely mutually exclusive and cannot be derived from each other. The obvious link between these problems was probably also first formulated by Wolfgang Pauli: “*It would be most satisfactory of all if physics and psyche could be seen as complementary aspects of the same reality.*” (Jung and Pauli 1955, p. 207–208). Since then a number of authors have explored and refined this hypothesis (for an overview, see, e.g., von Stillfried 2010, p. 86–88). Since complementarity defies binary Aristotelian logic by essentially giving paradox the status of a fundamental principle of reality, its potential generalization may of course also be highly relevant to an understanding of mystical experiences which are often described as transrational and in paradoxical language. (See von Stillfried 2011 and entries on ► [Mysticism](#)).

A generalization of the complementarity principle to “classical” dynamical systems was explored by beim Graben and Atmanspacher (2006).

Another major area of transdisciplinary application of quantum-theoretical notions is the description of cognitive processes by quantum-theory-inspired probability formalisms. This field owes much to seminal work by Aerts et al. (2009) and recently deals in particular with probabilistic inference problems (Busemeyer and Trueblood 2009), lexical processes (Bruza et al. 2009; Kitto et al. 2011), judgment and decision making processes (Franco 2009), and bistable perception processes (Atmanspacher et al. 2009), as well as economical processes (Haven 2009; Cockshott 2009), and others. For an overview, see, e.g., the proceedings of the Quantum Interaction (QI) symposia of recent years.

Overall it can be said that the explicit or implicit interpretations framing all of the above-mentioned efforts of generalizing quantum theory are heterogeneous and range from more ontic (e.g., that the instances of complementarity in various kinds of systems are but manifestations

of one and the same fundamental law of nature) to more epistemic views (e.g., that even if certain cognitive dynamics may be well described by quantum probability calculus, that does not say anything about the nature of the underlying neuronal processes).

Cross-References

- [Classical and Quantum Realism](#)
- [Consciousness, the Problem of](#)
- [Monism](#)
- [Mysticism](#)
- [Philosophy of Mind](#)
- [Quantum Theory](#)

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Quarks

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Constituents of protons, neutrons, and their excited states. It takes three quarks to make one proton. A quark-antiquark pair forms a meson. There are six species of quarks and, correspondingly, six species of antiquarks. Quarks appear so far to be permanently confined to the proton or neutron. Any attempt to liberate them results in the copious production of mesons, that is, quark-antiquark pairs. The permanent confinement has caused many physicists to be slow in accepting the concept of quarks.

Quasi-Science

► [Religion and Pseudoscience](#)

Queer Theology

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Historically, “queer” was used as a derogative term for male homosexuals (its literal meaning is “transversal,” “diagonal,” “strange”). In the last decades, those labeled as “queer” have started to reclaim the term as a positive, empowering, and liberating expression. The basic assumption is that male/female, homosexual/heterosexual, and other binaries are not stable and founded in nature but are artificial distinctions used both for the execution of power and as epistemological categories. “Queer theology” emerged from queer theory and queer studies which question the heterosexual

matrix at work in sociocultural contexts. By now, this approach is used in a large variety of academic disciplines. As such, the term “queer” is increasingly used as verb to express a distinct perspective and a methodological approach to read or do something against the grain and “diagonally” with respect to traditional categories and norms.

While queer theology was predominantly concerned with a study of male homosexuality in its early stages, it refers now to issues to do with various sexual orientations, for example, lesbian, bisexual, and transgender. Queer theology takes seriously the experiences of oppressed people, people who live at or outside the social margins, as well as people who do not fit the heterosexual binary/normativity, and takes these experiences as its point of departure in theological reflection. It also includes a political impetus criticizing unjust and oppressive sociocultural and religious structures and hierarchies as well as any oppression based on race, class, age, or religion. Queer theology has contributed to a reevaluation of sexuality in the understanding of the human being, violence in all its bodily and non-bodily forms, and a rethinking of what it means to be created in the image of God. Important theologians who contributed to queer theology are, among others, Marcella Althaus-Reid, Gerard Loughlin, Elizabeth Stuart, and Graham Ward.

Quietism

► [Mysticism](#)

Qur'an

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Related Terms

[Ecology in Islam](#); [Koran](#); [Muslim scripture](#)

Description

The Qur'an (an Arabic term, meaning "recitation") is the scripture of Islam, understood by Muslims as the divine Word and the last book of a cycle of monotheistic revelation which includes, in principle, the Torah and the Gospel. The traditional Muslim account states that the Qur'an was gradually revealed in the Arabic language to the prophet of the Islamic faith, Muhammad ibn 'Abd Allah (d. 632 C.E.), between 610, when he was 40 years old, and his death. The sociohistorical context of the revelations was that of seventh century Mecca and Yathrib (now, Medina) – two major towns on the western side of the Arabian peninsula, the former with its native Arabian "pagan" (*jahili*) culture of the predominant tribe of Quraysh and the latter with a mixed population of Jewish tribal groups and pagan Arabs. Some Christian elements were also present in this environment.

The texts now constituting the codex were initially preserved in memory, as well as piecemeal on materials like vellum, palm fronds, and "shoulder blades." The form of the scripture as we now have it is mainly owed to the efforts of the early Muslim leader, 'Uthman ibn 'Affan (d. 656) who imposed a single definitive version on the various groups which made up the community, to counter the growing trend for them to disagree about whose version was more correct. What was thus recorded at this time was the bare consonantal text (*rasm*), unpunctuated and, indeed, unvowelled. The recording of vowel marks and other details was only finalized on the initiative of Hajjaj ibn Yusuf al-Thaqafi (d. 714) or even later – albeit on the basis of the recitation authorized by specialist scholars of the Qur'an.

The scripture is subdivided into 114 chapters, which differ greatly in length and comprise a remarkably multifaceted content. The range of narrative references in the Qur'an not only includes the events and personalities of the Prophet's mission but also very many allusions to the Bible. This intertextuality (which would have been obvious to the Qur'an's original

audience) was neglected and even denied in classical Muslim exegesis, partly due to a predominant Muslim view that the texts of the Bible had been distorted in their historical transmission. Yet countless Biblical names and fragments of narrative recur in the Qur'an, including Adam, Eve and the story of the Fall, Abraham and his sons Isaac and Ishmael, Lot, Jacob, Joseph, Moses, David, Solomon, John the Baptist, Jesus Christ, and the Virgin Mary.

Some of this material corresponds with extra-canonical texts of Judaism and Christianity, such as the Mishnah and apocryphal Gospels like the Protoevangelion of James. The Qur'an additionally contains references to local Arabian religious lore and history, quite outside the Biblical traditions. Examples include the foundation of the sanctuary at Mecca by Abraham (Qur'an 2: 125 ff), the fate of the corrupt society associated with the Marib dam in Yemen (Qur'an 34: 15–7), and the repeated idea of a mysterious nexus between the saltwater sea and the freshwater sea (*majma' al-bahrayn*) where eternal life is available (e.g., Qur'an 18: 60) – this last idea apparently rooted in exceedingly ancient Sumerian traditions relating to the island of Bahrain and "the abyss" (*absu*). Aside from this substantial element of Biblical and local "sacred history" in the Qur'an, the scripture contains many teachings pertaining to theology (God's unity, nature, and attributes), eschatology (apocalypse, resurrection, the judgment, paradise, and hell), and, also of course, Muslim religious law (*shari'a*).

An elaborate commentary literature on the Qur'an arose over time, principally in Arabic but also in Persian and other languages employed by Muslims. Traditionally, this literature is subdivided into three broad exegetical genres, though the historical reality is rather more complicated. Firstly, there are commentaries which piously confine themselves to discussing the text on the basis of what it says about itself or what is verifiably transmitted about it from the Prophet and his earliest followers. This genre is known as *al-tafsir bi'l-ma'thur*, "exegesis through transmitted tradition." Secondly, there are commentaries which employ a philosophical

or rationalist framework of some sort, either discussing the text on the basis of one of the great schools of Muslim theology (such as Mu'tazilism or Ash'arism) or on the basis of Arabic grammar and rhetoric. This genre is known as *al-tafsir bi'l-ra'y*, "exegesis through personal reason." The more pronounced the "rationalism" of the exegete, the greater his or her recourse to a lexical or hermeneutical method of interpretation, known in Arabic as *ta'wil* ("returning the word to its origin"). Thirdly, there are commentaries which approach the text on the basis of spirituality and mysticism of one kind or other. The genre in question, known as *al-tafsir bi'l-ishara* or "exegesis through mystical allusion," is mainly found in the Sufi tradition and freely approaches the scripture as a collection of tropes to be deciphered in relation to the mystic's spiritual life and its development, an internalization of the text known as *tatbiq* ("superposition").

Cross-References

- ▶ [Allah](#)
- ▶ [Ecology in Islam](#)
- ▶ [Humanism in Islam](#)
- ▶ [Islam: an Overview](#)
- ▶ [Mysticism in Islam](#)
- ▶ [Revelation](#)
- ▶ [Theology in Islam](#)

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R

Rabbinic Hebrew

► [Language and Literature, Hebrew](#)

Rabbinic Tradition

► [Judaic Studies](#)

Radical Orthodoxy

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Radical orthodoxy (RO) is a highly influential contemporary British academic theological movement originally set up in the late 1990s – May 1, 1997, is the official date – as a group of scholars in Cambridge mainly (but not exclusively) represented by high Church Anglicans. It developed out of a theological study group – Theory Group – related to Peterhouse College. Little St. Mary's Church, with an explicit Anglo-Catholic profile (located very close to Peterhouse in Cambridge) also played a practical role in the formation of the ecclesiological reflection of RO. The two most important defining documents are John Milbank's *Theology and Social Theory*. *Beyond Secular Reason* (1990 from now on *TST*)

and the anthology *Radical Orthodoxy. A New Theology* (1999), edited by John Milbank, Catherine Pickstock, and Graham Ward who generally are held to be the central scholars of RO.

General Characterization

During more than a decade, RO has influenced the debate on postmodern Christian theology, especially in the English-speaking world. The reason for the success of its “sensibility” is not so much a common theology in terms of substance. It is rather the movement's general approach to theology and Christianity – its critical theoretical perspective – that has been widely appreciated and much debated. RO is often counted among the most challenging and serious expressions of postmodern theology. It is characteristic of RO scholarship to be very ambitious, learned, difficult, and deeply aware both of traditional Christian sources and the most recent debates in postmodern theory. The voice of RO scholarship is usually highly unapologetic and without any ingratiating tenor. It is interesting to notice how important works of RO, such as Milbank's *TST* or Graham Ward's more recent work *Christ and Culture*, not only make this obvious in terms of theoretical content, they also use very significant stylistic and rhetorical means in order to make the reader fully aware of the fact that they have entered a theological space where no preliminary arguments or excuses for the Christian vision have to be made. Ward,

for instance, begins his work *in medias res* by a quotation from Aquinas followed by the solemn statement that “Taking our cue from this statement by Aquinas, the Christological question begins not with *who* is the Christ or *what* is the Christ; it begins with *where* is the Christ” (Ward 2005b). This example of how RO starts in the midst of a Christian problematic, taking the Christian discourse as the natural point of departure, illustrates perfectly how the unapologetic logic operates at every level of the RO discourse – *Theology stands on its own; it does not have to lean on secular reason.*

In this respect, RO and its representatives are guided by a truly proud, synthesizing Christian ambition, reminiscent of the great theologians they tend to admire most, such as Augustine and Aquinas. One could also argue that RO has become the new primary point of reference for that kind of unapologetic reflection on theology that earlier was associated with postliberal theology (a movement that originally emanated from Yale Divinity School during the 1980s followed by heated debates among the most prominent theologians in the English-speaking world). At a first glance, RO has very little to do with the so-called Yale school, but it has undoubtedly developed and differentiated the kind of reorientation of theological imagination that was initiated by Yale postliberals such as George A. Lindbeck, Hans Frei, and – somewhat later and somewhat differently – Stanley Hauerwas.

The basic assumption of RO is that the supposedly neutral and disinterested Western ► **secular** rationality has a hidden theological core. As John Milbank tries to show in *TST*, modernity (and the movement in modern society from a basically religious to a basically secular worldview) can be interpreted fundamentally as a development within theology. Through a genealogical account of modern secular sociology and philosophy, Milbank attempts to show how the modern exclusion of theology actually presupposes a theological perspective. From the orthodox Christian point of view, this “hidden” theological development within modernity can be understood both as pagan and

heretic. As such, it has no room within an authentic Christian vision. “It follows that if Christianity seeks to ‘find a place for’ secular reason, it may be perversely compromising with what, on its own terms, is either deviancy or falsehood” (*TST*, p. 23). Against this background, RO rejects the idea of dialogue as long as it works from the assumption of a neutral ground or an unproblematic meeting place for the dialogue. All these basic features throw light on the aspect of the notions “orthodoxy” and “radicalism” in the vision of RO.

Radicalism and Orthodoxy

There are at least two dimensions of the radicalism in RO. First and foremost, radical is related to orthodoxy in the sense that RO connects the radical directly to *radix* (root). The radical is someone who is “at root” or “more in tune with the sources” rather than someone who wants a clean break or a wholly new direction. However, RO is also radical in the political sense of making a clean break with the present order of things. It moves back to the sources as a possibility to challenge what they understand to be the nihilist ideology of modernity and post-modernity. As D. Stephen Long rightly has noted, RO is radical because it makes explicit the unavoidable interconnections between theology and politics, which becomes a way to “question modern politics, culture, art, science, and philosophy” (Long 2003). Christian Orthodoxy, then, becomes the source for a radical vision of a new society beyond the liberal and individualistic society of our days. As such, the radicalism of RO can be classified as a Christian socialism, although this socialism has nothing to do with the modern state solutions of communism and social democracy.

If the radicalism of RO can be deduced partly from its orthodoxy in this way, then it should be equally fair to claim that the orthodoxy of RO can be deduced partly from the notion of radicalism. As an orthodox theological movement, RO wants to make the authentic Christian tradition operative in a critical conception and challenge of the present

social and political reality. It is only a truly Christian theology – in contrast to the heretic theology that Milbank and others detect in the modern and postmodern visions of society – that can support a vision that breaks with the heretic nihilist celebration of death and violence that lurks under the surface of the secular society. It is very important to underline that this kind of orthodox judgments claims no neutrality. It is meaningless to criticize it for being biased or fideist in any general sense since the very idea of RO is to provide a comprehensive *Christian* perspective. According to RO, the very idea of a neutral secular realm is one of the most problematic and violent expressions of the hidden theology of liberal society. Through the ideal of a neutral knowledge or a neutrally established social order, the heretic theological vision of the secular becomes all the more influential. The orthodox Christian vision thus becomes the determinate alternative to this violent neutrality, and it is characterized by an ► **ontology** of love and peace.

More concretely speaking, for RO orthodox Christianity means the development from patristic times on the high Middle Ages. The idea is not to take side with any particular orthodoxy in the present, such as one form of Eastern Orthodoxy or one form of Roman Catholicism. RO understands its own orthodoxy as ecumenical in the broadest sense, although it is obvious that the characteristic emphasis on Augustine and Thomas links it closely to Roman Catholicism. The point of being orthodox in the RO sense, however, is not to be restricted by traditionalism but rather to be aware of the Augustinian possibility of a distinct Christian alternative to the worldly life, and more exactly, the possibility of an alternative to the worldly life such as it expresses itself in the contemporary situation.

This explains why RO, rather than being a regular orthodoxy, is deeply involved in the most progressive debates about the postmodern. The interlocutors of RO – although their dialogue is very often diachronic and in tune with the Bible, the fathers, and various other ancient theologians – are very often contemporary secular

critics of modern life who have put their fingers right on the problems of secular nihilism even though RO rejects their “still-nihilistic” solutions.

Works and Developments

As was stated above, RO does not represent a single theology in terms of substance or content. If Milbank’s seminal works has laid out the basic perspective of RO, Graham Ward’s and Catherine Pickstock’s works have developed this perspective in somewhat different ways. In *After Writing*, Pickstock developed Milbank’s reflection on the Christian vision in terms of liturgical praxis. The first lines of the book are telling: “This essay completes and surpasses philosophy in the direction, not of nihilism but of doxology. It shows how philosophy itself, in its Platonic guise, did not assume, as have been thought, a primacy of metaphysical presence, but rather a primacy of liturgical theory and practice” (Pickstock 1997).

Instead of being an operation against philosophy, Pickstock here understands the critical task of theology as an operation within philosophy, reinterpreting its Greek foundations in a way that opens up for a reflection on later deviations from the authentic Platonic-Christian worldview. Both Milbank and Pickstock locate this deviation, the moment of heresy, in Johannes Duns Scotus, who replaced the Thomistic idea of *analogia entis* with the idea of univocity, which paved the way for a “metaphysics of presence.” “Duns Scotus, unlike Thomas Aquinas, already distinguished metaphysics as a philosophical science concerning Being from theology as a science concerning God” (*TST*, p. 302.). For Pickstock, liturgy in its Platonic-Christian modus becomes the doxological correction of this flaw.

Graham Ward, but also Gerhard Loughlin and others, has developed a somewhat different aspect of RO. They are taking their point of departure not so much in the idea of nihilism as heresy, but rather in an unapologetic Christian reflection on postmodern life. A quote from the

introduction of Ward's book *Cities of God* is enlightening:

This book was conceived in New Orleans and brought to birth in Manchester. In between there were flirtations with Sidney, Bonn, Amsterdam, Cape Town, San Francisco, and Jerusalem. If it is only movie legend that the German film-maker Fritz Lang was inspired by the New York skyline, seen from an ocean liner, to direct Metropolis, it is a recordable fact that my first glance of New Orleans, coming over the freeway from the airport, opened my eyes to the excitement of the city. Rising from the plain, as so many American cities do, its towers of polished glass and steel shimmering with the associations of jazz, voodoo and the New Jerusalem, New Orleans posed a question I could not at that time articulate. Returning to Manchester, a city in which I grew up and which I then rejected in a teenage flight to Oxbridge, the question began to take on form: what kind of theological statement does the city make today? This book is an attempt to answer that question (Ward 2000).

On the one hand, this introductory remark underlines the general hallmark of RO, namely, that the task is to draw everything into the theological sphere, being explicit about how Christian theology can alter the vision of the secular and expose its theological presuppositions. On the other hand, it shows a somewhat more generous attitude toward the secular. Although it is not generous in the sense of welcoming secular theology as such, it is so in the sense of dwelling within the aporetic sphere of secular life. Ward's form of RO can thus be said to underline that aspect of the Augustinian theology that puts emphasis on interpretation and analogical vision as a fundamental dimension of the Christian pilgrimage in this world. This emphasis explains why Ward's texts are full of interpretations and engaged reflections on postmodern theory, postmodern art, films, etc. Against this background, it is also quite natural that Ward is the representative of RO that has moved farthest in the direction of a renewed concept of apologetic theology developed in terms of a standpoint epistemology (Ward 2005a).

Critical Assessment

RO is a deeply controversial movement in today's theology. Making the division between

the genuinely Christian and the non-Christian into the fundamental paradigm, there is a risk of a nostalgia that becomes idealistic and blind to the ambiguities and varieties not only of the secular realm but within the Christian as well. One has to admire RO for being so explicit in all of its operations but also for being so thorough and solid in scholarship. However, there is also a risk that the programmatic tenor and the solidity might stifle less self-certain attempts and establish an orthodoxy of a much less constructive kind than the one RO seems to opt for. Being focused on the need for a strong and self-confident theology is not without risks when it comes to the question of *which* theology.

RO is quite exclusively focused on the secular in terms of philosophy, social and economic theory, politics, and culture. Given these fields, the present state of RO scholarship is a quite remarkable example of how theology and science can interact and make meaningful critical conversation on a very advanced level. However, the decided point of departure in a Christian rejection of the secular makes this critical "dialogue" with other disciplines a radically different and less synthetic than other attempts to relate religion and science. When it comes to natural science, and the philosophical debate on the relationship with science and religion, RO has not contributed much. The reason for this is not difficult to understand, although it is a clear weakness that such a comprehensive perspective has little room for the debates on science as a potential ally to theology. In an unpublished paper, James K. Smith has brought up the question of the relationship between RO and the science/religion debate. He argues that RO's critique of the secular could be extended successfully also to the framework of the "hard sciences." Smith claims that RO's "participatory ontology," according to which liturgical and bodily practices are primary to abstract reflection, is the most promising entry for such a movement toward science. He might very well be right, although very little has been done in this direction so far.

Cross-References

- [Ecclesiology](#)
- [Systematic Theology](#)

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Rælian Movement

- [UFO Cults](#)

Randomized Controlled Trial

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A type of research design considered the most powerful test of the efficacy of a proposed treatment by investigators in the fields of medicine and behavioral medicine. In these studies, participants are randomly assigned to the treatment or control conditions thus all factors, known and unknown, are presumed to be balanced across groups. Because randomization attenuates the threat for bias, randomized controlled trials

offer greater confidence that differences in outcome can be causally attributed to the differing conditions or treatments.

Rate of Entropy Production

- [Chemical Thermodynamics](#)

Rational Theology

- [Natural Theology](#)

Rational Thinking in Islam

- [Logic in Islam](#)

Rationalism

- [Deism](#)

Rationality (Philosophical)

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Related Terms

[Logical](#)

Description

The concept of rationality is in dispute today, with philosophers taking up two camps. In one, for a person to be rational involves instrumental reason relative to his desires. If a subject desires

to go fishing, it may be rational for him to buy fishing equipment. This view is sometimes called internalism. According to externalism, a person's desires may themselves be rational or irrational to the extent that the person is responsive to the reasons he has for acting, thinking, and feeling. On this view, a person may lack a desire to be healthy, but he still has a reason to live in a healthy manner. Why? On most accounts of externalism, this is because it is good for him to be healthy. Sometimes philosophers will use the word "rational" to refer to instrumental reason (internalism) and use the term "reasonable" to refer to this alternative approach in which a person is responsive to reasons. Philosophers in both camps assume that, minimally, to be rational is to be logical at least in the minimal sense of not violating the law of identity (A is A) and noncontradiction (A is not non- A), though there may be thought to be some exceptions for internalism. Both positions have advantages and disadvantages, reviewed below.

Internalism Versus Externalism

Forms of internalism today are often traced back to Hume who, famously, once wrote that "reason alone can never be a motive to any action of the will" (Hume 1737, Treatise, 1.3.3). For Humeans, rationality only makes sense relative to desire. One apparent advantage of this account is that it does not leave open the question of why someone should be rational. Rationality is only operative given a person who already has the requisite desires. A person has a reason to be compassionate if and only if she has a desire to do so. One disadvantage of this account, however, is that it seems to leave one with a very counter-intuitive position with respect to the wicked. To take an extreme example, internalists seem compelled to accept the unhappy thesis that Hitler had a reason to exterminate European Jews and that he had no reason not to go (given his desires). Internalists seem to have no reason why some desire would be better than another. Derek Parfit has recently argued that internalism seems to lead one to a form of nihilism for, given any kind of crazy desire, it seems that anything goes.

Externalists tend to be moral realists; that is, they believe that there are truths about what persons ought to do, and these are not subject to or wholly constituted by what subjects happen to desire. If the entire world desired to practice slavery, an externalist could coherently claim that slavery is still wrong, and everyone has a reason not to practice slavery. Internalists claim that externalists leave us with too much mystery. What are these objective reasons for doing one thing (seeking liberty) rather than another (pursuing slavery)? Are these nonnatural properties? Platonic forms? Some philosophers have concluded that recognizing such forms is incompatible with secular, scientific naturalism, while others have proposed that moral realism is best defended on the grounds of some form of theism. It seems evident, though, that if one refuses to recognize *moral reasons* on metaphysical grounds, then one might be led to deny the existence of *epistemic reasons* (a normative view of evidence). The latter seems extreme and may even be self-defeating, for this would put a philosopher in the position of arguing that we ought to reject the view that we ought to accept beliefs only when supported by good reasons. Normativity in both ethics and in epistemology seem inextricably bound together (normative evidence appears to concern *what a person ought to believe*) and so it is problematic to extract one while leaving the other in place (Parfit 2011; Gewirth 1991).

Rationality and Impartiality

Philosophers have disagreed over the extent to which impartiality is an essential condition for rationality. What might be called epistemic impartiality seems like a secure position – the idea that one should be impartial in assessing the evidence for and against a given belief or thesis – but it is not unassailable. Some feminists have contended that rationality should be seen as something embedded in social, including gendered, contexts. The idea of rationality from some ideal, disinterested point of view (as in the ideal observer theory) has been seen as revealing a male bias (Anderson 1998).

There has also been dispute over whether a form of ethical egoism is rational. In ethical egoism, an agent may be compelled to act in favor of his or her perceived self-interest when this could be at grave expense to other persons. Moral realists who view ethical egoism as wrong would claim that a person could not have a reason to do an immoral act which would greatly improve the good of the person while violating the rights or good of others.

Rationality and Rationalism Versus Empiricism

In the history of philosophy, Descartes, Leibniz, Spinoza, and others have been identified as rationalists on the grounds that they used rationality as their key philosophical method, in contrast to those classified as empiricists such as Locke, Berkeley, Hume, and others who used sensory experience as their key philosophical method. To some extent, this distinction is overdrawn, as some empiricists seem to claim to grasp necessary truths using their reason or rationality and virtually all so-called rationalists appeal to experience (see Taliaferro 2005, Chap. 3 for detailed discussion).

Rationality and History

Some philosophers have held that what counts as rationality varies depending on culture and history. This is more common among internalists than externalists, but it is important to appreciate that most philosophers hold that what will be judged the rational course of action or belief depends upon the evidence and assumptions available. It may have been rational for us at one time to believe that light is instantaneous; there is no speed of light. But this is not rational today.

Rationality and Faith

A great deal of philosophical work has been done on the role of rationality in the formation and assessment of religious belief. There is a position called evidentialism, according to which for a person to believe that something is the case, it is essential (if the belief is to be legitimate) for her to have some evidence

sufficient to justify the belief. In modern philosophy, two of the more well-known proponents of evidentialism (though they did not use that term) are Locke and Hume. There is no consensus today on how much evidence is required for philosophical convictions to be deemed legitimate or justified. Some philosophers oppose evidentialism on the grounds of some form of reliabilism, according to which a belief is justified for a person if it is produced in a way that is likely to produce a true belief, irrespective of whether the person has evidence for the belief. A movement called Reformed Epistemology also opposes evidentialism on the grounds that we may possess a warranted belief that God exists if that belief is produced in a reliable way (perhaps due to a sense of the divine) and God exists (see Taliaferro 2005, Chaps. 8, 9).

Rationality and Machines

Some philosophers wonder whether machines can reason or exercise rationality. This is best addressed in the context of questioning whether machines can be conscious. The idea that a machine might simulate or be used to do computational functions is only philosophically interesting when it is thought that this might be done consciously or with thoughts (Hoyningen-Huene 1993).

Rationality and Emotions

Some philosophers juxtapose rationality or reason with emotion. This is more common among externalists than internalists. There is currently strong support for a cognitive theory of emotion, according to which emotions involve rational or irrational judgments. See the entry ► [Passion and Emotion, Theories of](#) (Sibley 1953).

Rationality and Responsibility

In American law, it is assumed that for a person to be properly held responsible for their action and thus held to be a proper object of praise or blame, the action must have been done through the exercise of rationality. Imagine that a person believes (irrationally) that saying the word “bat” backward

would kill an enemy; he says the word “Tab” in front of the enemy. Saying the word triggers such a deep anxiety (the enemy’s best friend who just died was nicknamed “Tab”) that the enemy has a heart attack and dies. From an ethical point of view, we might think of the person as murderous and worthy of blame, but legally the “killer” would not be held accountable because no rational person would believe that such an act would kill (Brown 1988, 1989).

Cross-References

- [Emotion](#)
- [Ethics](#)
- [Experience](#)
- [Faith and Belief](#)
- [Imagination](#)
- [Learning](#)
- [Phenomenology](#)

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Rationality of Theistic Belief

- [Epistemology, Reformed](#)

Reafference Principle

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The reafference principle offers an explanation for the fact that stimuli caused by self-initiated motions (e.g., voluntary eye movements) are not perceived and thus do not interfere with constancy. The theory suggests that, for example, with the signal s_m of the eye movement command, an efference copy s_m' is stored. This copy is subtracted from the retinal signal s_r resulting from the self-induced motion, so that its perception is

$$p = |s_r - s_m'| = 0.$$

The reafference principle serves different tasks. For example, in the common toad’s retina, the off/on units are activated by brisk darkening or illuminating the surroundings; these units do not respond if the toad itself darkens its retina by closing the eyelid.

Realism

- [Classical and Quantum Realism](#)

Realisms in Philosophy of Religion

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Introduction

In order to survive and live a good life, we need to know what is dangerous and what is good for us. We take certain things for granted, for instance,

the existence of an outer reality and other people. That there is a reality is both the practical and the logical presupposition of our conceptualizations, interactions, and reactions to what we conceive of as reality. Realism is, in a sense, presupposed in our actions even when we do not call ourselves realists. Why are we not content with that but have all these philosophical ideas on realism such as metaphysical realism, antirealism, nonmetaphysical realism, nonrealism, internal realism, and pragmatic realism? As reflecting beings, we cannot help asking what conclusions we can reasonably draw from the dual fact that although reality is always reality conceptualized by us, our conceptualizations are nevertheless conceptualizations of reality.

This entry will not be a general survey of all philosophical debates on realism. Instead, it will focus on the debate on the relation between realism and metaphysical realism and its implications for discussions on the relation between science and religion. With this focus, this entry will itself be part of the philosophical debate on realism. After tracing the origin of the labels “realism” and “metaphysical realism,” this entry will outline various themes in the debates on realism, followed by a discussion of some key points of the different perspectives and consequently some points that need to be questioned or defended. On the basis of this critical evaluation, I will present a proposal of my own.

The Issue of Terminology

In the actual debates on realism, the pair of contraries is realism and antirealism, introduced by Michael Dummett in some of his essays reprinted in *Truth and Other Enigmas* (1978). When discussing what is real, we often do so in terms of what kinds of entity exist. Either God exists or God does not exist; either the proposition that God exists is true or it is false. However, the issue of God’s existence and the issue of the truth of the proposition that God exists are not identical. This is because the logical law of the excluded middle is one thing and the semantic bivalence principle is another. The first claims that something

either is the case or is not the case, the latter that a proposition is either true or false. The question is whether a proposition is always either true or false irrespective of our knowledge of evidence or whether we have to rely on evidence in virtue of which we are justified in ascribing truth values.

According to Dummett, realism is not about objects but about the applicability of the bivalence principle to certain classes of propositions: propositions of the past, empirical propositions, or mathematical propositions. Realism means that every proposition in a certain class is determinately either true or false, irrespective of whether it is possible for us to achieve knowledge of it. A person who denies the validity of the bivalence principle for a certain class of propositions is an antirealist as far as those propositions are concerned, according to Dummett.

Dummett’s view implies that the status of propositions can differ and that what looks like a proposition may not always be one. First, there are propositions that are true and propositions that are false because we know how to check, and can actually determine, their truth value. Many propositions in everyday life and in the sciences are of this kind. Second, there are propositions that are truth apt, such as “The Roman emperor Caesar woke up on his right side on his first birthday.” The proposition has the property of being either true or false. We know in principle how to proceed, but because our possibilities of checking it are limited, there is no chance of determining whether the proposition actually is true. Finally, we have putative propositions, such as “My neighbor’s dog is looking forward to midsummer.” In this case, we cannot even understand what it would be like to determine the truth conditions of the putative proposition in question.

Realism in Philosophy of Religion

One topic in philosophy of religion has been whether or not religious utterances can express propositions and, if they can, whether these belong to the first or second group of propositions. The so-called metaphysical realists place

religious propositions in the first group, which means that the relation between science and religion becomes important. Nonmetaphysical realists, like Karin Johannesson in *God « Pro Nobis »* (2007), place religious propositions in the second group. It cannot be determined whether they are true or false, but we can identify the justification conditions under which the truth value of religious propositions can be determined. This is done, however, in relation to our conceptions of what these justification conditions are, and these conceptions can differ. For example, both the mystic and the atheist claim that God does not exist but they do so for different reasons, i.e., they point out different yet mutually intelligible justification conditions. According to the mystic, the truth claim concerning God's nonexistence can be justified by referring to the fact that the mystic's encounter with God or the divine is not an encounter with somebody or something which exists in the same sense as things or persons exist. According to the atheist, the truth claim concerning God's nonexistence can be justified by referring to the huge amount of suffering in the world, for instance. Nevertheless, in both cases, the reference to what is conceived of as justification conditions of one's truth claim is about reality and not only about our conceptualizations.

Those who deny the existence of a divine reality usually characterize religious utterances either as false propositions or as neither true nor false. According to internal realism (here understood as a kind of modified Dummettian antirealism, approaching pragmatic realism), the bivalence principle can be applied to religious propositions, but the ways in which the justification conditions of religious propositions are identified differ from the ways in which other domains and practices identify their justification conditions. The sciences, for instance, provide us with conceptualizations and knowledge of the resistance reality offers in empirical regards, whereas religions and ideologies provide us with insights into the resistance reality offers in existential regards. Here, the issue of the relation between science and religion does not pertain to their relation on the propositional level but to how we must relate to them in human life. Such an approach is rejected by the metaphysical realist.

Metaphysical Realism

The label "metaphysical realism" was introduced by Hilary Putnam in *Reason, Truth and History* (1981) as he questioned a certain idea of what realism means. He summarizes what he calls metaphysical realism in the following three theses: (1) Reality is mind and language independent with properties irrespective of how we conceptualize them. (2) These properties, irrespective of how we conceptualize them, make propositions true or false. (3) There is only one true description of reality. According to Putnam, these three theses imply a correspondence theory of truth according to which truth is defined as a correspondence relation between a certain conceptualization and reality as it is, irrespective of how we conceptualize it.

Realists falling under this description value truth and objectivity very highly, irrespective of whether they call themselves metaphysical realists. Without truth, we cannot distinguish between what we *think* is true and what actually *is* true. Objectivity is the result of neither opinion nor consensus. What is objectively true is determined by mind- and language-independent reality. Truth and reality as they are, irrespective of how we conceptualize them, are two sides of the same coin. In that sense, truth means the same irrespective of whether we are dealing with science or religion.

Every idea that is not in accordance with metaphysical realism is rejected as relativism, subjectivism, or antirealism. In relativism, "true" amounts ultimately to "true-for-me," excluding the possibility of distinguishing between what I *think* is true and what *is* true. Everything circles round what I *think* is true. It is no longer about truth and reality, and the result is the denial of a mind- and language-independent reality, which is the main thesis of metaphysical antirealism. But this does not allow for the possibility of determining what propositions of reality are true.

Obviously, there are important philosophical insights in metaphysical realism but also philosophically problematic ideas. Metaphysical realism is right in claiming that if truth is not objective, we are talking of something other than truth and that we therefore have to

distinguish between what I *think* is true and what *is* true. However, there are serious problems with metaphysical realism.

Objections to Metaphysical Realism

There are mainly three objections to metaphysical realism: It is incoherent, it implies skepticism, and there is a risk of fundamentalism (1). According to the metaphysically realist conception of truth, it is reality as such, irrespective of how we conceptualize it, which makes our propositions true or false. This means that in order to determine whether a proposition corresponds *with reality as it is, irrespective* of how we conceptualize it, we would need to know what this real reality is like. Conceiving of truth as a correspondence relation between propositions and mind- and language-independent reality therefore amounts to conceiving of reality as it is, irrespective of how we conceptualize it. Such a conception of reality, however, is incoherent since we cannot even understand what talk of such a reality could be like.

(2) Since reality, for us humans, is conceptualized reality, we have no access to reality as such; thus, we can never know whether we have made the right truth claims. Metaphysical realism therefore implies skepticism. However, skepticism is not an option for us humans to live by. Although there are things we do not know and gray zones of uncertainty, there are also clear examples of what we do know.

Despite the implication of skepticism, metaphysical realism has not been abandoned – what is the reason for this? I think part of the answer lies in the fact that our thinking is based on a fundamentally realist conception of truth. In a prereflective way, we take many things for granted. We claim that a proposition is true only if there is something in the world, according to Dummett's terminology, in virtue of which it is true. The metaphysical realist would say that a proposition is true only if there is something in the world which *makes* it true, independently of how we conceptualize it. Dummett's phrase does not exclude the relation to the world, but

when we talk of something in virtue of which a proposition is true, we do so in relation to what we conceptualize as that in virtue of which a proposition is true. The metaphysical realist rejects this relation to our epistemic abilities in order to preserve the objectivity of truth. The price, however, is skepticism.

(3) Since metaphysical realism implies skepticism, there is a risk of fundamentalism. The fact that we as individuals cannot determine what truth claims actually correspond to reality does not exclude the possibility that there is only one true description of it, some metaphysical realists may argue. Skepticism concerns only our human epistemic abilities, which does not exclude the possibility that the one and only true description of reality is revealed in some political or religious way. Some metaphysical realists may be tempted to claim to be in the possession of the truth, a possession other people are denied.

The most radical proposal aimed to rid us of the problems with metaphysical realism has been the denial of the existence of a mind- and language-independent reality. This is metaphysical antirealism.

Different Kinds of Antirealism

The reason why metaphysical realism and metaphysical antirealism can contradict each other is that they both presuppose the same thing, namely, that the idea of reality, irrespective of how we conceptualize it, is a conceptually meaningful one. If it were not conceptually meaningful, it would not be possible to maintain or deny the existence of what the idea is about.

Responsibility for what conceptualizations we use is something which the metaphysical antirealist values highly. A religious antirealist, such as Don Cupitt, denies that the existence of an independent reality is a guarantee of truth since it can be shown that what was claimed to be the truth is actually the expression of power claims or prejudices. Therefore, since there is no independent reality and consequently no independent divine reality, religious believers should not refer to religious documents or God's will as the truth. Instead, they

should take responsibility for the ideas of their traditions by critically assessing them in relation to whether they are compatible with human autonomy.

(1) Denying the existence of mind- and language-independent reality is one thing. (2) Denying the meaningfulness of the conception of reality as it is, with no relation to how we conceptualize it, is another. So, for instance, feminist philosophers of religion, such as Pamela Sue Anderson in *A Feminist Philosophy of Religion* (1998), attack the idea that there is neutral truth independent of the interests of those who raise the truth claims. Traditional descriptions of the differences between women and men are not descriptions of mind- and language-independent reality. Instead, the putative differences are social constructs based on formal accounts of our world. Nevertheless, she wants to retain a form of realism which still makes possible nonrelativist claims about truth and justice.

The idea of reality as a social construct must be seen in relation to the fear that truth claims may become tools for subordination and oppression. Thus, if it is claimed that the subject of knowledge is a detached subject, for instance, a subject not disturbed by emotions, then those who make such a claim are, by definition, incapable of realizing that they, too, are situated subjects and that their truth claims may become oppressive.

One of the important philosophical insights stemming from this critical approach to metaphysical realism is that there is something wrong with the idea of an independent reality *irrespective of how we conceptualize it*. As soon as we talk of reality, reality is conceptualized reality and we who do the talking are historically, socially, and culturally situated beings. However, the metaphysical antirealist draws the wrong conclusion by denying the existence of mind- and language-independent reality. If reality was nothing other than our conceptions of it, then we who have these conceptions would also be nothing other than conceptions. We cannot live by such an idea, and since we are part of the reality with which we interact, it is also

unreasonable to deny its existence. So, a reasonable alternative to metaphysical realism has to be some form of realism.

Nonmetaphysical Realism

Nonmetaphysical realism, as outlined by Johannesson (2007), deals with the issue of realism in relation to religious propositions. If religious propositions were only expressions of wishful thinking or expressions of how we cope with life emotionally, then not only would they cease to be propositions, but they would also cease to be religious. Without realism, there can be no religion.

Nonmetaphysical realism is realist in the sense that it maintains the applicability of the bivalence principle in religion. Although it cannot be determined whether a religious proposition such as “God is beyond comprehension” is true or false, it is nevertheless possible to spell out the conditions under which one is prepared to believe it to be true. One example of justification conditions for such a proposition, taken from Dewi Z. Phillips’ *The Concept of Prayer* (1965), could be the reference to one’s experience of not understanding life and one’s lack of control over everything in life when confessing one’s inability before someone or something that is also incomprehensible. By means of such justification conditions, religious propositions can be shown to be either true or false, although we cannot determinately decide which. However, it enables us to discuss what justification conditions make it reasonable to believe that a proposition is true.

Nonmetaphysical realism rejects metaphysical realism since this kind of realism, with its conception of truth as a correspondence relation between our propositions and reality as it is, irrespective of how we conceptualize it, does not take into account the importance of justification conditions. However, seen from our human perspective, we need access to justification conditions to be able to decide what propositions can at least be said to be truth apt. Without justification conditions, we cannot determine the meaning of propositions, and therefore we cannot

examine truth claims, something we certainly need to do in order to survive and live a good life.

Nonmetaphysical realism emphasizes the idea that truth and realism are two sides of the same coin. If they were not, it would be impossible to maintain the idea that truth is objective. But nonmetaphysical realism does not sufficiently distinguish between different ways in which truth manifests itself in different domains and practices. Although nonmetaphysical realism, unlike metaphysical realism, defends the relevance of justification conditions, it still shares with it the idea that the combination of truth and realism, i.e., alethic realism, is one and the same everywhere.

Alethic Realism

The label “alethic realism” comes from William Alston, who discusses it in *A Realist Conception of Truth* (1996) and other works. According to Alston, debates on realism are not so much about independent reality as about truth. Conceiving of truth realistically means primarily that what is true is so independently of our ideas of whether it is true. Alston maintains that alethic realism is minimal and does not involve any specific theories about truth or about the relation of language to reality. However, in Alston’s version, alethic realism is actually an example of metaphysical realism.

Advocates of alethic realism present different ideas about what the realist element consists of in alethic realism. Nevertheless, they all relate to Alfred Tarski’s definition of truth for formal languages. Tarski argues that sentences are truth-bearers, while Alston argues that propositions are truth-bearers. In Tarski’s view, the variables in the truth schema “The sentence ‘*p*’ is true if and only if *p*” stand for different things. In the complete phrase of the metalanguage “‘Snow is white’ is true if and only if snow is white,” it is spelled out under what conditions the sentence in the object-language “Snow is white” is true. In Alston’s view, the variable in “The proposition *p* is true if and only if *p*” stands for the same thing.

In the Tarski case, the focus is on the conditions under which the sentence in the object-language is

true, not on what kind of conditions they are. Nothing is said about reality. In the Alston case, the focus is on what makes the proposition true and what it refers to, namely, reality.

Nonrealism

This idea of reference is questioned in nonrealism, for instance, by Erica Appelros in *God in the Act of Reference* (2002). Her point is that a focus on metaphysical realism and its metaphysical opposite prevents one from dealing with the issue of reference in a reasonable way. In metaphysical realism, reference means that, for instance, the term “God” either refers to an independently existing being or has no reference at all. However, this conception of reference presupposes that the meanings of words are permanent. This conception of reference does not sufficiently take into account the fact that there is a difference between referring to something in the sense of pointing it out by whatever means are suitable and referring to something in the sense of conceptually identifying it. In metaphysical realism, a word is said to have meaning if it refers to something real and to have its meaning only on the basis of what reality is like, irrespective of how we conceptualize it. Questioning this conception of reference is a main objective of Wittgensteinian philosophy of religion as well.

In *Religion and Friendly Fire* (2004) and other works, Phillips criticizes the separation in philosophy of a belief and its meaning from the practices in which the belief is made. The relation between a belief and its meaning, on the one hand, and the practices in which the belief is made, on the other, is an internal one. By “practice,” he means conceptually distinct ways of acting and judging. However, the belief cannot be reduced to the practice in which it is appropriate, nor is it caused by it. Phillips does not deny that we have contact with reality, but he shows how metaphysics distorts what that contact amounts to. The central issue in the dispute between Wittgensteinian and analytical philosophers of religion like Nicholas Wolterstorff, Alvin Plantinga, and Richard Swinburne concerns the assumption that realism is metaphysical

realism. Whereas the former denies it, the latter take it for granted.

According to Phillips, concepts are whatever it is we have when we have learned to use language correctly in a certain practice. This implies diversity, which the universalizing tendency of metaphysical realism cannot take into account. If there is one and only one reality which determines what propositions of it are true, then there is only one true description of reality. However, we know from the sciences that the same empirical evidence can support different theories. There is a kind of indeterminacy, which opens up for different descriptions. The possibilities multiply if we consider not only one but several various domains and practices. For instance, a physical description of a causal connection is different from a description of human relations. They cannot be transferred to a foreign domain or practice.

Furthermore, this actualizes the role of the subject as a situated subject. Reality is not over there. Instead, we are part of reality, with which we interact and to which we relate as the beings we are. We interact with and relate to reality together with others and we do it in different ways depending on domain and practice. However, this insight would have unreasonable implications if it were not combined with realism in the sense that we *do* have contact with reality, although it is by and through our conceptualizations of it that we have this contact. Internal realism is an endeavor to establish such a connection.

Internal Realism

The fundamental idea of internal realism is that reality is reality conceptualized by us. According to Putnam, it is not only about internal coherence. There are experiential inputs concerning knowledge. However, internal realism denies that there are inputs which are not, to some extent, shaped by our concepts. It denies, furthermore, that there are inputs which admit of only one description. But it is not the case that just any description is as good as any other. Whether a conceptual choice is

rationally acceptable depends largely on its coherence and appropriateness. In that sense, our conceptions of coherence and acceptability are deeply interwoven with our biology, psychology, and culture. They are not value free because we relate to reality's impact on us from the perspective of what is both possible and important to us as the beings we are. Nevertheless, our conceptions of coherence and rationality are conceptions of something real. They guarantee objectivity, although the objectivity in question is not the metaphysical objectivity of an external God's eye view.

The rejection of this metaphysical, external perspective, however, does not amount to the identification of truth with rational acceptability. Truth is a property that cannot be lost, whereas justification can. Although in earlier times people had reasons to believe, for instance, that the earth is flat, this belief is nevertheless false. The metaphysical realist is right when claiming that truth cannot be defined in terms of rational acceptability but wrong when denying the connection between the concepts of truth and rational acceptability. Seen from our perspective, we cannot grasp either of them without also grasping the other.

For the internal realist, it is important to have a conception of truth we can live by. The metaphysically realist conception of truth as a correspondence relation between propositions of reality and reality as it is, irrespective of how we conceptualize it, does not meet this requirement. It actually presupposes that we have already conceptualized reality, which means that it is no longer a correspondence relation with reality irrespective of how we conceptualize it. This shows that the concepts of truth, rationality, and objectivity must be related to each other.

The main insight of internal realism is its support of a philosophy in which the concepts of truth, rationality, and objectivity are not detached from the ways in which we learn and use them in different practices. Nevertheless, despite the insight that more than one true description of reality is possible, there is no further discussion of the relation between realism and pluralism in the sense that truth can manifest itself in different ways depending on whether we

have to do with different domains and practices such as science, morality, or religion. This shortcoming is amended in pragmatic realism.

Pragmatic Realism

Pragmatic realism, as developed by, for instance, Eberhard Herrmann in *Religion, Reality and a Good Life* (2004), is based on three ideas: first, that reality for us humans is always conceptualized reality; second, that there is one concept of truth but different manifestations of truth in our different life practices; and third, that truth is part as well as a condition of a good life. The first idea is taken from internal realism, whereas the second and third ideas are inspired by Michael Lynch's notion of truth as one and many, for instance, in *Truth in Context* (1998), though he himself does not use the label "pragmatic realism" but talks instead of alethic realism and pluralism.

There is only one concept of truth in the minimal sense that a judgment is true if and only if reality corresponds to that judgment. This does not tell us what judgments are true. For that, we need criteria. However, these criteria differ because truth manifests itself differently in different practices, for instance, in religions and secular ideologies compared to the sciences. Scientific theories are conceptualizations of how reality offers us resistance in empirical regards. Theories are neither true nor false but provide us with rules for what general concepts can be ascribed to what objects in order to generate empirically testable hypotheses. Theories that are not prosperous in this regard are empirically inadequate and therefore say nothing about reality.

In religions and ideologies, conceptualizations in the form of images and narratives are conceptualizations of how reality offers us resistance in existential regards, i.e., they are conceptualizations of the experienced tension between life at its best and the life that is lived. If the conceptualizations are existentially adequate, we can say something true about what it means to live with the inevitabilities of life such as love, happiness,

and joy as well as suffering, guilt, and death. Although we experience these in different ways, there is some common ground, namely, the fact that we do not understand them but must nevertheless relate to them. The main difference between empirical and existential conceptualizations is not appearance but function.

Although science provides us with knowledge of how reality works and thus of the practical conditions of and hindrances to a good life, science is not sufficient when it comes to the mysteries of life. Scientifically, we know a lot about fertilization, but when we hold a newborn baby in our arms, we face a mystery we cannot explain. Similarly, we know a lot about the bodily processes connected with the end of life, but the very fact that a certain person is not there anymore is incomprehensible to us. Religions and ideologies provide us with rituals, images, and narratives for conceptualizing the inexplicable.

In both empirical and existential regards, we need to be able to distinguish between what we *think* is true and what actually *is* true. Otherwise, we would not be able to survive or live a good life. There is no consensus about what constitutes *the* good life, but we all know that a life in poverty, misery, violence, marginalization, and oppression is definitely not a good life.

Truth is both part of a good life and a condition of it. We can get rid of the hindrances to a good life only if our claims, for instance, concerning causal connections, are empirically true and our claims concerning the inevitabilities of life are true to life. In the former case, we can give arguments for why something is true. In the latter case – the manifestation of truth in our actual decisions in life – we can only give arguments for why a certain image or narrative is existentially inadequate by referring to what is definitely not a good life. In both these regards, truth is a condition of a good life. It is also part of a good life in the sense that, as far as empirical truth is concerned, we have to seek truth for its own sake; otherwise, we cannot know what hinders or harmonizes with a good life. Being existentially true to life is also something which cannot be defined in terms of consensus or what is useful to us. Truth is here part of a good life in

the sense that we can sometimes actually tell when life is definitely not a good life.

As every philosophical view, pragmatic realism also has its limitations. It is the expression of a certain philosophical attitude wherein philosophical issues are not detached from human life. Therefore, philosophical issues, such as what conceptions of reality, truth, and objectivity are reasonable, cannot be conceived of as being settled once and for all. The advantage, however, is that pragmatic realism opens up to a critical discussion of *all* phenomena in human life, including science and religion. It opens up to a critical discussion of what functions they have in human life, in what sense their truth claims make sense, and, when understood, by means of what criteria these truth claims can reasonably be justified.

Cross-References

- [Concept of God in Contemporary Philosophy of Religion](#)
- [Emotion](#)
- [Happiness](#)
- [Meaning, the Concept of](#)
- [Philosophy of Religion](#)
- [Philosophy of Science](#)
- [Pragmatism on Religion and Science](#)
- [Truth](#)

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Reality in Buddhism

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The concept of reality or rather the “ultimate reality” experienced by a Buddha – as opposed to the conventional reality commonly experienced by the world – looks back upon a long history in Buddhism. A little more than two and a half thousand years ago, Siddhārtha Gautama is said to have fully awakened to this true reality and spent the remainder of his life as a *Buddha* (lit. “awakened one”) pointing this reality out to others. According to tradition, the Buddha initially doubted whether the reality he realized was too subtle to be conveyed in words. Thus, in the “Detailed Account on the Natural Acts [of the Buddha]” (“Lalitavistarasūtra,” Vaidya 1958, 286), we are told that the Buddha said to himself (my own translation from the Sanskrit), “I found a Dharma, profound, peaceful, pure, luminous, nectar-like, and not conditioned. Even if I taught it, nobody would understand it. I better remain silent and go to the forest.” Tradition relates that it was only through the intervention of the Hindu gods Brahmā and Indra that he was persuaded not to keep what he had learned to himself. His long career as a spiritual teacher and the posthumous attribution of large bodies of discourses, such as the “Discourses of the Great Way” (“Mahāyāna Sūtras”), resulted in vast sacred canons (the Tibetan Buddhist canon consists of more than a hundred huge volumes).

Going by the early scriptures, the Buddha rejected philosophical questions which he did

not consider soteriologically relevant. In his “Shorter Instructions to Mālunkyāputta,” he thus refrained from making statements about whether or not the cosmos is eternal and infinite, the self or rather the soul and the body are the same, or the Buddha exists after death (Chalmers 1926, 304–07).

The Buddhist idea of reality is used with reference not only to states of affairs but also to propositions. Thus, Buddhists are in general agreement that “reality” (in the first sense) is best described (in the second sense) in terms of the four noble truths that were summarized in the Buddha’s first discourse in Deer Park in Sarnath near Benares, the “Discourse of Setting the Wheel of the Buddha’s Doctrine in Motion” (“Dharmacakrapravartanasūtra”). The first of these four is the truth of suffering which is characterized by birth, old age, sickness, and death. This does not deny life’s temporary experiences of happiness but brings to attention the fact that eventually one has to part from what is pleasant or unite with what is unpleasant. Next comes the noble truth of the origin of suffering. In the same proclamation at Sarnath, this is specified as the thirst for desire and becoming, which is, in turn, identified as the source of rebirth in cyclic existence. In the Buddha’s “Account of Enlightenment” (“Bodhikathā”), the dynamic process underlying continued rebirth is then specified in its well-known form of the 12 links of dependent origination: (1) ignorance, (2) intentional deeds, (3) consciousness, (4) name and form (i.e., the five “groups” (“skandha”) of psychophysical existence), (5) the sixfold sphere of consciousness, (6) contact, (7) sensation, (8) thirst, (9) grasping, (10) becoming, (11) birth, and (12) old age and death. In its fully developed form, the entire personality is taken as a stream of momentary psychophysical factors of existence, that continues into future rebirths forever, if one continues to accumulate the mental imprints of “deeds” (“karman”) under the influence of ignorance (Frauwallner 2010, 34–52).

The third and fourth noble truths consist in the cessation of suffering and the eightfold path leading to it. The latter comprises right view, thought, speech, conduct, livelihood, striving, mindfulness,

and concentration. Cultivating the right view and the rest help to uproot ignorance and, thereby, the remaining links of dependent origination: in the absence of ignorance there will be no intentional deeds, and the same follows for the remaining links in the chain. It should be noted that in its early form, like in the “Discourse to Kaccāyanagotta” (“Kaccāyanagotta Sutta”), the links of dependent origination are not reified as something really existing in themselves nor is there any metaphysical speculation about their genesis or causal relations. The Buddha is reported to have simply said, with x as condition there is y . From the termination of x , there is the termination of y . All this is beyond the extreme notions of existence and nonexistence. The extreme of nonexistence is avoided by seeing the arising of the world as it really is and the extreme of existence by seeing the world’s cessation (Bikkhu Bodhi 2000, 544).

In the various systems of Abhidharma (besides its original meaning “[teaching] concerning the factors of existence,” the word *abhidharma* came to be understood as “higher teaching”) that developed after the Buddha had passed away, momentary factors of existence are taken as truly existing in terms of their “specific characteristic” (“svalakṣaṇa”). Apart from a few unconditioned categories, such as space and the soteriologically relevant forms of cessation, the entire world consists of material or mental conditioned factors of existence, which arise and instantly pass out of existence with new ones continuously emerging. Strictly speaking, the conditioned factors of existence consist of four categories: “matter” (“rūpa”), “mind” (“citta”), “mental factors” (“caitta”), and “factors dissociated from mind” (“cittaviprayukta”) (Cox 1995, 12). Although momentary, these building blocks of the universe are held to possess an “own being” (“svabhāva”) and to exist as “real entities” (“dravya”), as opposed to aggregations of these real entities, which exist only as something “designated” (“prajñapti”) (Cox 1995, 148). This can be best illustrated by the example of a flame, which appears to be a permanent phenomenon, at least within a given time frame. It exists only as something designated on the basis of a series of what

each moment is an entirely new flame, or rather, to describe it in modern way, a series of reactions of ever new wax and oxygen molecules. It is only the latter that really exist.

The goal of this analysis is to realize that one's psychophysical existence consists entirely of momentary factors of existence, and there is no such thing as a permanent "self" or "soul" (*ātman*) that anchors them. Frauwallner (2010, 21) observes, however, that the Buddha rejected philosophical questions about the existence of a soul. All the factors of existence that make up a sentient being can be included in the five psychophysical aggregates of "matter" (*rūpa*), "sensation" (*vedanā*), "ideation" (*saṃjñā*), "formations" (*saṃskāra*), and "consciousness" (*viññāna*). All the Buddha's statements concerning a permanent self were assigned provisional meaning to be interpreted in the light of the definitive meaning of momentariness. To illustrate the underlying hermeneutics with an example, on a conventional level of discourse it must be still possible to say "I am going to town" instead of "the five psychophysical aggregates which I self-identify as 'mine' are moving toward a set of factors of existence labeled town."

Of particular interest for the study of Buddhist models of reality is the influential Abhidharma school known as Sarvāstivāda (lit. "maintaining the existence of everything") that included among the existent factors the future and the past. While the own being of a conditioned factor already exists in the future and continues to exist in the past, Cox speaks of the "atemporal issue of the existence of factors in the abstract," its momentary nature can still be upheld by distinguishing different "modes of existence" (*bhāva*). How this change of modes precisely worked remained controversial among the followers of Sarvāstivāda themselves, but the preferred view was to maintain that it is only the present factor's mode that unfolds "activity" (*kāritra*). To be sure, when the present activity of a conditioned factor stops, it ceases, but continues to exist in terms of its own being (Cox 1995, 137–41). In his "Treasury of Higher Teaching" (*Abhidharmakośa*), which became the standard work on Abhidharma, Vasubandhu

(ca. 400–ca. 480 CE) criticizes the existence of a conditioned factor's own being in the three times on the ground that its changing modes are not taken to be different from the own being (La Vallée Poussin 1991, vol. 3, 811–20).

Even though the way "external" reality is presented in the Abhidharma systems is strikingly similar to modern atom theory, one should not underestimate the importance of mind and its mental factors in this system. According to Vasubandhu's "Treasury of Higher Teaching," it is the traces of one's deeds left in the mind (not a creator God or big bang) that brings forth the entire world and that includes external matter (La Vallée Poussin 1991, vol. 2, 551f.). It is not clear whether an idealist position is upheld here, but in his "Proof in Twenty [Verses] that [Everything] is Only Mental Representation" (*Vimśatikā Vijñaptimātratāsiddhi*), Vasubandhu the older (ca. 320–ca. 380 CE, Frauwallner 1951) replies to a follower of Sarvāstivāda that if he accepts that material factors of existence arise through deeds, why he does not then accept that these factors are, like their causes, consciousness as well, the latter only appearing in the form of material factors (Frauwallner 2010, 397). To be sure, not a single Buddhist model of reality has attempted to reduce mind to matter. Of particular interest here is Dharmakīrti's (seventh century CE) argument that only like causes like, which means that material elements cannot cause mental events. Cognitive objects and the senses can support cognition as auxiliary causes, but they are not needed for mental processes such as thoughts or the experience of pleasure. The main cause for a mental event is rather the immediately preceding similar event (Steinkellner 2012, 364–66). Directly related to this observation is also Dharmakīrti's argument for the possibility of rebirth and an infinite number of previous lives. This is most clearly stated in the second chapter of his "Commentary on Valid Cognitions" (*Pramāṇavārttika*) II.34–119, Franco 1997).

Other currents in Buddhist thought have identified a general causal nexus of the world from the internal 12 links of dependent origination. In an early Mahāyāna discourse, the "Rice Seedling Discourse" (*Śālistambasūtra*), for example,

the Buddha is said to have distinguished the causes and conditions of an outer and an inner dependent origination. The causes of the outer one are illustrated by the different stages of a growing rice seedling. The seed is the cause of the sprout, the latter the cause of the leaf, etc. As conditions in this process, six elements are listed: earth, fire, water, wind, space, and the season. The causes of the inner causal nexus are the well-known 12 links starting with ignorance. The conditions are again the six elements but “consciousness” replaces “season.” Any teleological intentional or volitional act on the side of the causes and conditions is excluded. The seed, for example, does not think, “I bring forth the sprout,” and the sprout does not think, “I have been brought forth by the seed” (Reat 1993, 35). The way dependent origination is presented is strikingly similar to our modern understanding of the world in terms of natural laws.

From around 200 CE onwards, the proponents of Madhyamaka took issue with the combination of what were in their eyes, two contradictory predications (1) that factors of existence possess an own being or specific characteristics and (2) that these factors nonetheless arise every moment anew. Such momentariness, or any other form of dependent arising for that matter, contradicts the concept of independent existence, which follows in Madhyamaka if the factors of existence are ascribed their own specific characteristics. Taking their lead from the “Discourses on the Perfection of Wisdom” (“Prajñāpāramitā Sūtras”), Madhyamaka philosophers claim that everything must be empty of such an independent existence. The most eminent Buddhist philosopher of Madhyamaka, Nāgārjuna (fl. 200 CE), argues that if things (such as mind and matter) really exist independently in their own right, they cannot influence each other, which would contradict the Buddhist axiom of dependent origination. Here it is important to note that for a traditional adherent of Mahāyāna Buddhism the discourses on the perfection of wisdom and for that matter also the much later discourses endorsing the Yogācāra doctrine, such as the “Discourse Revealing the True Intention” (“Saṃdhinirmocanasūtra”), were taught by the historical Buddha. Critical philological and

historical research suggests, however, that these discourses were only composed during the period when the doctrines they endorse were formulated.

Nāgārjuna’s observation suggests the viability of a model of reality that equally accepts both mental and material factors of existence under the condition that they are correctly understood to be empty of an independent existence and thus capable of mutual interaction. In other words, dependent origination is inseparably linked to emptiness, that is, the universal absence of locally determined entities. Any “own being” of anything must be viewed as reified constructions of the mind that “simplify” phenomena at the cost of misrepresenting their irreducibly complex interconnectedness. It should be noted that the nature and purpose of Nāgārjuna’s philosophy have remained controversial over the centuries and are still disputed among modern Madhyamaka scholars. Two main issues have been whether knowledge about the true nature of things, such that everything lacks an own being, is possible, and whether Nāgārjuna refutes all linguistic and conceptual attempts to grasp true reality (for a good overview of various interpretations see Huntington 1989 and Burton 1999).

The denial of an own being directly confronted the old Abhidharma ontology by claiming that the new teaching of emptiness has “definitive meaning” (“nītārtha”). As a doctrinal support for this, the “Discourse on the King of Meditative Absorption” (“Samādhirājasūtra,” Vaidya 1961, 36) is adduced. The old definition of definitive meaning has been extended by the Prajñāpāramitā concept of the three doors to liberation (i.e., emptiness, signlessness, and wishlessness). Accordingly, the momentary factors of existence, which possess a specific characteristic and represent the ultimate in the old Abhidharma ontology, are assigned the status of provisional meaning and included under conventional truth. It should be noted that the various Buddhist models of reality operate with two levels of truths, the conventional and ultimate truth. The conventional truth is the phenomenal world which is generally accepted when not further analyzed, while the ultimate truth withstands careful analysis. In Madhyamaka, it is only the

emptiness of the factors of existence from an own being or specific characteristic that meets the requirements of definitive meaning and thus the new ultimate (Lopez 1988, 61–62). This move was not only justified by a new group of discourses which included the above quoted statements but also a number of treatises which took issue with the old ontology of truly existing momentary factors of existence. Something which arises and passes out of existence in every moment cannot be the ultimate truth or exist ultimately.

The traditional explanation of such inconsistencies is that the Buddha taught his disciples different things according to their varying intellectual capacities, inclinations, and convictions. According to Buddhist hermeneutics, a number of discourses were given with the hidden intention to further certain disciples and therefore had only “provisional meaning” (“neyārtha”), that is, were in need of further interpretation. Such discourses must be understood in juxtaposition to discourses in which the Buddha revealed the “definitive meaning” (“nītārtha”) of the reality he had awakened to. Such a division into *neyārtha* and *nītārtha* can be already found in early Buddhism where it was used to explain contradictory statements. The Vaibhāṣikas, for example, explained the inconsistency that the body of the Buddha is at times described as defiled and not defiled, by taking recourse to the distinction into *neyārtha* and *nītārtha* statements. While the definitive meaning is that the body of the Buddha is impure like all other bodies, the contrary statements is *neyārtha* in the sense that it is not the physical body of the Buddha which is pure but the “body of his teaching” (“dharmakāya”) (Honjō 1989, 405–10). Later on, this distinction between *neyārtha* and *nītārtha* proved helpful to justify new models of reality that developed out of, and sometimes in contrast to, the older ones (for a good introduction to these exegetical principles, see the contributions in Lopez 1988).

About a century later, the proponents of Yogācāra, an idealist current of Buddhist thought that reduces matter to mind on the presupposition that “mind alone” (“cittamātra”) exists,

formulated their own interpretation of the discourses on the perfection of wisdom. According to Nakamura (1989, 210), the discourse which endorses the Madhyamaka hermeneutics that the emptiness of an own-being has definitive meaning, that is, the “Discourse of Instructions for Akṣayamati” (“Akṣayamatīnirdeśasūtra”), already existed at the time of Nāgārjuna, and the “Discourse Revealing the True Intention” was written down around 300 CE (Schmithausen 1969, 819).

For the Yogācāras, true reality is the perfect nature of mind, directly realized by the “nonconceptual wisdom” (“nirvikalpajñāna”) of the Buddhas and very advanced practitioners and not the reality of our common sense material world. The perceived object and the related perceiving subject are nothing but a product of false imagination and thus called imagined nature. The process of dependently arising mental factors of existence (i.e., the dependent nature), however, which underlies the falsely imagined world is admitted a higher degree of reality than the one of the imagined nature. To which degree this dependent nature partakes of ultimate reality is a disputed issue. These imagined (*parikalpita*), dependent (*paratantra*), and “perfect” (*pariṇiṣpanna*) natures constitute the Yogācāra model of reality. It is the second major doctrinal development of Mahāyāna Buddhism, the first one being the Madhyamaka notion that all factors of existence are empty of an own being (Mathes 2007, 232–39).

In the seventh chapter of the “Discourse Revealing the True Intention,” this latest development is summarized as the third “Wheel of the Buddha’s doctrine” (“dharmacakra”), the two older layers of doctrine (reflecting Abhidharma and Prajñāpāramitā views, respectively) correspond to the first two dharmacakras. Only the final dharmacakra is declared to have definitive meaning, while the first two are taken to be provisional. At the beginning of this seventh chapter, the Bodhisattva Paramārthasamudgata addresses the doctrinal differences between the Abhidharma and Prajñāpāramitā and directly asks the Buddha about his hidden intention in teaching the latter. The answer is “the three types of ‘essencelessness’” etc. (“niḥsvabhāvatā”), namely,

the imagined, dependent, and perfect natures, which sets the stage for the above-mentioned Yogācāra interpretation of the Prajñāpāramitā. The essencelessness of defining characteristic is the imagined nature, the essencelessness in terms of arising is the dependent nature, and the ultimate essencelessness the perfect nature (Mathes 1996, 161). In other words, the Buddha was thinking of the nonexistent imagined nature when he taught that all factors of existence lack an own being or specific characteristic. From a Yogācāra point of view, such an exegesis not only protects the practitioner from nihilism, but also explains the difference of definitive meaning between the first and second *dharmacakras*: a threefold division of the lack of essence allows the old Abhidharma ontology to be accommodated within the dependent nature and thus retain a distinction between the entirely unreal imagined and the mentally real factors of existence on a relative or conventional level. The Madhyamaka reaction to this interpretation is that the Buddha occasionally even denied the material world in order to help those who have an inordinate attachment to matter. From a historical perspective, it is doubtful, however, whether the Buddha had ever maintained such a view. The respective texts, such as the “Discourse Revealing the True Intention,” were written down around 300 A.D. (see above).

In the “Handbook of Hermeneutics” (“Vyākhyāyukti”) written by Vasubandhu the younger (Schmithausen 1987, part 2, 262), it becomes clear that the proponents of Yogācāra follow the same strategy as the followers of Madhyamaka. In addition to adducing discourses which define definitive meaning in accordance with their own tradition, they point out a problem to which the old ontology leads: while the introduction of Madhyamaka was justified by finding fault with the old doctrine of momentariness, the followers Yogācāra take issue with a nihilistic interpretation of the discourses on the perfection of wisdom. Given the latter’s emptiness of all factors of existence, the existence of real mental events, such as intentional deeds and their retribution, can only be accepted on the level of conventional truth, but then there can no longer be any distinction

between the real mental factors and a purely imagined personal subject (or self), both of which must be accepted on the level of conventional truth. In the eyes of Vasubandhu, it is precisely this lack of distinction which makes the discourses on the perfection of wisdom vulnerable to the charge of nihilism on the side of some opponents from the older Abhidharma schools. At this point, the theory of three natures is presented in order to draw a distinction between existence and nonexistence on the level of conventional truth. Intentional deeds and their retribution constitute the dependent nature. As such they are not absolute, but still more real than the purely imagined self, which does not exist even on the level of apparent truth (Mathes 2007:332–37).

The way the three natures are presented here comes close to Sponberg’s (1981, 97–119) progressive exegetical model of the three natures. The relationship between the dependent and perfect natures can be variously defined along the lines of two models of the three natures. The central focus of the first, which Sponberg calls the “pivotal model,” is on a dependent nature which at times is even taken to exist ultimately, the imagined and perfect natures being respectively just the way the dependent nature appears to be and really is. The dependent is thus a framework for understanding the perfect, which is construed as something abstract, like the state of suffering or impermanence. The “progressive model,” by contrast, focuses more on an emptiness which pervades or transcends all phenomena of the dependent nature. This all-pervading emptiness is sometimes described as possessing positive qualities such as natural luminosity and can exist, contrary to the first model, in its own right (Mathes 2004, 318–22).

Drawing on strands that take the dependent nature as conventional truth, the eighth century scholar Śāntarakṣita (725–788) and his disciple Kamalaśīla started to combine Yogācāra and Madhyamaka views. In his “Lamp of the Middle Way” (“Madhyamakāloka”), Kamalaśīla finds no contradiction between Madhyamaka emptiness and the three nature theory, reconciling the

hermeneutics of the Madhyamaka and Yogācāra. The teaching of non-arising in the discourses on the perfection of wisdom (i.e., the emptiness of the second wheel of the Buddha's doctrine) refers exclusively to the ultimate, while the clarification of this emptiness on the basis of the three nature theory in the "Discourse Unveiling the True Intention" helps to avoid the two extremes of wrong denial and superimposition on the Madhyamaka path. The second wheel of the Buddha's doctrine would then only have provisional meaning in the sense that it lacks the fine distinction into different degrees of reality on the level of conventional truth. In his "Lamp of the Middle Way," Kamalaśīla (1957, 162a₇–b₆) thus writes (my own translation from the Tibetan) "Non-arising and so forth have been taught as having definitive meaning in the 'Noble [Discourse of] Instructions for Akṣayamati'. Therefore it is certain that precisely such [statements] as that there is no arising and so forth [define] the ultimate. If this is the case, how could then the Buddha teach in the "Noble [Discourse] Unveiling the True Intention" the lack of essence of all phenomena, having in mind as the underlying intention the three natures, that is, the three types of essencelessness? There is no fault in this. [...] Since an intellect which has succumbed to either of the two extremes of superimposition and wrong denial does not enter the very profound ocean of the ultimate, which is free from [these] two extremes, the Buddha, for that reason, pronounced the teaching of non-arising and so forth exclusively with respect to the ultimate and having taught [its] underlying intention, that is, the three types of essencelessness, he established a textual [tradition], one of exclusively definitive meaning, in order to teach a Madhyamaka path free from the two extremes. It is not the case that Mādhyamikas do not accept the presentation of three natures".

However, Candrakīrti (ca. 600–ca. 650 CE) was more critical of Yogācāra. In his autocommentary on the "Introduction to the Middle Path" ("Madhyamakāvatāra," VI.36), he points out that factors of existence with specific characteristics do not arise even on the level of conventional truth and, on this basis, he rejects

the Yogācāra interpretation that Nāgārjuna only refuted the imagined and not the dependent (La Vallée Poussin 1992, 123). Since nothing arises in terms of an own being, there can be no passing out of existence in terms of an own being either. Following this line of thought, Candrakīrti explains that the future result of intentional deeds can be maintained even without the Yogācāra notion of a ground consciousness, that is, the dependent nature of the Yogācāras (Madhyamakāvatāra, VI.39, La Vallée Poussin 1992, 123). In his "Introduction to the Middle Path," Candrakīrti thus claims (my own translation from the Tibetan) "Since there is no passing out of existence in terms of an own-being you should know that the fruit [of deeds] will definitely occur even if the termination of the deed sometimes lies back a long time. This works even without a ground [consciousness as a carrier of] its (i.e., the deed's) power."

To conclude, Buddhist models of reality are strikingly heterogeneous, ranging from the realist ontology of the Abhidharma at one end of the spectrum to the idealist position at the other. In a sense, the followers of Madhyamaka stand out by avoiding any model that involves locally determined factors of existence. This allows one to understand dependent origination as a dynamic system of interrelatedness which precludes any clean separation between any individual component of the system – or any subsystem that is singled out for observation – and all the rest. It is this absence of own being and other being from the standpoint of dependent origination that is called emptiness.

Cross-References

- [Buddha \(Historical\)](#)
- [Buddhist Canonical Literature](#)
- [Consciousness \(Buddhist\)](#)
- [Dependent Arising](#)
- [Impermanence \(Buddhist\)](#)
- [Karma \(Buddhist\)](#)
- [Physics in Buddhism](#)
- [Science in Buddhism](#)
- [Truths, four Noble](#)

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Reciprocal Altruism

► [Altruism](#)

Reciprocity

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Reckoning

► [Arithmetic in Islam](#)

Reconstructionist Judaism

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Recovery

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Description

Recovery is the study of improvement after an injury or insult. This can occur in any organ

throughout the body. This chapter considers recovery in the brain, particularly after the occurrence of a sudden event such as stroke or trauma or spinal cord injury. Recovery can be spontaneous or treatment-induced. It can be partial or complete. Recovery can be measured in terms of brain events: Do cells grow back? Does electrical activity normalize? Do brain regions fire when it is time to move the leg? Recovery can also be measured in terms of behavior: can the person move better than before? Recovery can be considered in many different domains, such as movement, sensation, thinking, feelings, eating, speaking, and more. Recovery can also be measured in different dimensions, such as activity or participation. Recent developments include an increasing number of studies focused on bringing new treatments to patients in order to promote a degree of recovery beyond that which occurs spontaneously.

Self-identification

Science

Recovery is a science at many levels. One can speak of recovery in molecular, cellular, and genetic terms – reductionist and appealing to the benchtop scientist. In this way, we learn about the molecular underpinnings of a patient's recovery. Recovery can be examined at the systems level, seeing how regions of an organ, such as different cortical zones around the brain, interact. Much of modern functional neuroimaging focuses on this level. Recovery can be viewed at the behavioral level, such as by clinicians, psychologists, or sociologists. This is perhaps the most important focus of all, as recovery of function is paramount; getting patients back home to loved ones is the ultimate goal of this branch of science.

Characteristics

Recovery is distinct from other clinical scientific disciplines in several ways. First, when discussing stroke therapeutics in particular, recovery is distinguished by the broad time window. Many acute

stroke therapies focus on the first few hours after stroke, but recovery-based therapies under evaluation often are initiated days/weeks after onset of stroke injury. This permits attention to a broad range of psychosocial issues that often cannot be addressed with acute therapies. Also, recovery has many analogies with normal function. That is, the process of recovery is similar to normal development, to learning, and to learning a new skill. These points of analogy might have therapeutic implications, for example, perhaps the best pathway to repair the brain is to mimic the normal pattern of brain development.

Relevance to Science and Religion

Recovery is a biological process influenced by psychosocial functions. As such, religious issues can influence a person's outlook, mood, motivation, and social satisfaction, and therefore can impact recovery.

Sources of Authority

The most important person with control over recovery is the patient, who sets goals and motivation levels. Second, the family and close social circle have a major influence, as these persons are of great influence at many levels. In some settings, persons who dispense rehabilitation therapy can have an enormous influence on recovery.

Ethical Principles

On the one hand, the standard ethical principles of medical practice apply. On the other hand, recovery can be so influenced by psychological and social state, and one must be particularly mindful of these issues.

Key Values

The key values in the field of recovery are to restore function. In the spirit of the World Health

Organization, recovery aims to repair the affected organ in order to improve body function, increase the patient's activity level, and increase patient participation in social activities.

Conceptualization

Nature/World

Nature and the world is the arena in which the subject exists and recovers. Nature/world is a source of many influences on recovery.

Human Being

A human being is a person, an individual. A human being is the one undergoing recovery.

Life and Death

Life is the state of being animate, of being living. Death is its absence. Recovery can only occur in the living.

Reality

Reality is the world around us, the real world.

Knowledge

Knowledge is what we know, what information and experiences that are available to us.

Truth

Truth is that which is reality.

Perception

Perception is how reality is described by the individual.

Time

Time is the fourth dimension.

Consciousness

Consciousness is the state of being aware and awake, of interacting with one's environment.

Rationality/Reason

I have no response for this Q.

Mystery

A mystery is a problem that still needs to be solved.

Relevant Themes

Much of recovery is influenced by individual personality features, such as motivation, hope, and satisfaction.

Cross-References

- [Body](#)
- [Brains, Artificial and Computational](#)
- [Depression](#)
- [Limbic System](#)
- [Neuroimaging](#)
- [Neuropathology](#)
- [Neurophysiology](#)
- [Neuropsychology](#)
- [Neuroradiology](#)
- [Neuroscience](#)
- [Neurosurgery](#)
- [Robot Societies](#)

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Recursion

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Recursion is a tool that every programmer should master. Recursion is very similar to induction in mathematics. For example, a recursive algorithm must have at least one base case (to end the recursion) and a case to represent the looping.

For many problems, there are multiple algorithms that can produce a correct solution. Often-times, the recursive algorithm is the shortest and easiest for other programmers to understand; however, the recursive algorithm may not be the most efficient.

An example of a recursive algorithm for computing the factorial of a number is given below. Note that the algorithm is written in Java-like pseudo-code. The reserved word `public` means that this method is visible throughout the program.

```
public factorial (n)
  if (n = 0 or n = 1)
    then return 1
  else
    return (n * factorial (n - 1))
```

Red Blood Cells

► [Transfusion Medicine](#)

Redemption in Judaism

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Related Terms

[Redemption and Science in Judaism](#); [Science and redemption in Jewish religion](#); [Views of redemption in Jewish science](#)

According to classical rabbinic theology, redemption (geulah in Hebrew) is one of the three unique actions of God, together with creation and revelation. In medieval philosophical theology, these three become identified with the single timeless act of the radically unified single deity of the universe who in fact is the God of Israel. What differentiates the theme is not the action itself but its object. God's single action directed toward the cosmos both originates and ends it. The logical consequence of this line of thought is that time does not exist, for the beginning (creation) and the end (redemption) are one and the same. Yet, it is quite clear, to the rabbis no less than the church fathers, that this world is far from redeemed. "This world" (ha-'olam ha'zeh) is the domain of time, where time is what is after creation and before redemption. Yet, when seen from an absolute rather than a human perspective, redemption and creation are both conditions of every present moment. Creation is not in the past and redemption is not in the future. These terms are aspects, in fact limit aspects, of life in the present.

Prophetic texts can be found in the Hebrew Scriptures that allude both to a messianic age (yemot ha-moshiach) and to an end of days. On the messianic age, see (for example) Ez 11:13–15, where the prophet speaks of a "remnant" (she-erit) of Israel that will survive the first Babylonian exile and reestablish the Jewish theocracy, and he alludes in passages to predictions of what the rabbis will interpret to mean the resurrection of the dead. (The most

famous allusion is Ezekiel's vision of the valley of dry bones reassembling into living beings at God's command. (Ez 37:1–28)).

We are told that this resurrected “nation” will bring about “peace” (shalom). The prediction seems to be clear, but it is not. What is the “nation” that is resurrected? Is it some members (viz., a “remnant”) of the nation Israel or the entire nation? Is it Israel or is it also other nations as well? Again is it all or some within all the nations who will be resurrected? In other words, is this the “old Israel” (on which rabbinic Judaism will insist) or is this a “new Israel” (on which Christianity will insist)?

But “nation” is not the only ambiguous term. “Peace” (shalom) also has many meanings. In its most simple sense, it means that the messianic age will be a time period in which there will be no wars between nations. But the term's meaning need not be restricted to national wars. It can refer to any kind of conflict – conflict between neighbors, between friends, between families, and (most important of all) conflicts within ourselves between our different human inclinations, some good and some bad and some better than others. In other words, the “shalom” spoken of here is a peace of perfection, of physical and psychic completeness. Hence, on this interpretation, the messianic age will last just as long as it takes (however long that is) for the world to become perfect. Then it will be transcended by a radically different kind of reality.

This prophetic anticipation of a realm of universal perfection that will succeed the age of becoming perfect is how the rabbis interpreted some of Isaiah's prophesies about the future, especially Isa 9:1–2 and 45:3–7. In these texts, the prophet envisions a time when there will no longer be darkness and everything will be light. Here the prophet says little more than this, but it is not hard to visualize what this means. If there is no darkness, then there are no shadows; if there are no shadows, then there are no distinguishable shapes. And if there are no shapes, then there are no distinct entities. Many of the rabbis (and certainly many of the medieval Jewish philosophers and Kabbalists) shared this prophetic vision and drew out its consequences.

Before the beginning of the world (creation), there was only the light of God, and God made room for the world by making room for the dark. This world is the story of the interplay (in the language of the medieval Jewish natural philosophers) between the darkness of mundane matter and the intelligible light of the divine form. In the end, we are here told, the form will again dominate over the matter, the light over the dark, and once again, all will be light, which means that all will be God. It is a vision of what from a human perspective is universal death. But what expires is the material aspects of reality, including the human, and what persists universally is the divine.

What I have presented so far as early rabbinic inferences from the words of the Hebrew Scriptures became formalized as rabbinic dogma by Moses Maimonides (1135–1204) in his Commentary on the Mishna. There we are told that “all of Israel has a share in the World to Come” (chpt 10 of tractate Sanhedrin of the *Mishna*), and that the list of Jews excluded from this share are anyone who denies the resurrection, who teaches that the Torah is not of divine origin (literally, that it is “not from the heavens”), and someone called an “epicurean” (“apikoros” in Hebrew). An epicurean, Maimonides tells us, is someone who denies 13 “foundations of the Torah,” including (12) there will be a messianic age, and (13) there will be a resurrection of the dead. However, this is explicitly only a reference to the messianic age. Subsequent commentaries will extend Maimonides' statements either to say that the messianic age is the end of days or that the end of days will follow the messianic age.

There are comparable voices within the culture of modern science that raise comparable kinds of predictions about a final stage of human historical evolution that is evocative of Judaism's dogmas of a messianic age and an end of days. Michio Kaku, for example, predicts a day when through humanity's combined knowledge from quantum mechanics in physics, the biomolecular revolution in the life sciences, and the information revolution in the cognitive science, we will know virtually “everything” that there is to know

and the Age of Enlightenment will come to an end, not because it has been overthrown, but because it has been fulfilled.

There are many other apparent points of at least coincidence if not identity between what Judaism proclaims about the final redemption and what at least some modern scientists say about the not-too-distant future. First, the rabbis predict that the messianic age will be so radically different from this world, that there is no comparison between the two. Notably the laws of nature will themselves be new, so new that (for example) lions can lie with lambs rather than killing them, and (in general) sin will disappear from the world. Similarly Ray Kurzweil predicts that in the very near future, the rate of development of technology will increase exponentially to a point in which change will be temporally continuous, a state so inconceivable from a present human perspective that Kurzweil identifies this future stage of the world as “the singularity.”

Second, the rabbis predict that in the messianic age, there will be an end to death. Similarly, cultural historians such as David Nye foresee a time when our biological and medical knowledge is sufficiently advanced that entities living and dying will be a matter of human choice and not natural accident or necessity. Third, the conquest of death will necessitate major changes in moral judgments. From the perspective of secular philosophy, philosophers like Peter Singer point to many examples where rethinking of values is required. For example, the more we know about them, the more life and death become arbitrary, so that coming into life and passing into death requires human intentionality. In this vein of thought, lines become at least fuzzy between not just life and death but between what is human and what is not human, so that it becomes increasingly necessary to move ethics outside of its traditional anthropocentric focus. Similarly, as Rabbi Elliot Dorff and other scholars of Jewish bioethics demonstrate, Jewish law no less than ethics in general needs to be rethought and reconstructed in new ways as a consequence of new technology, especially in medical ethics. (See “► [Bioethics in Judaism](#)”).

The above are only examples of the extensive degree to which the claims and problems of prognostications about the future ends of humanity and the cosmos are parallel in both Judaism and modern science. But there are critical differences as well. The most obvious discordance in this case is that the prophets of the end in science are scientists and engineers armed with the power of collective human scientific research and experimentation. None of them claim to be prophets whose source of insight is divine revelation. Furthermore, not every prediction is as humanly affirmative as the prophecies of Kaku. On the contrary, the cosmological physicist Steve Weinberg (1977, p. 154) soberly states, “The more the universe seems comprehensible, the more it seems pointless.” And pointless it is from a human perspective. On this prophecy, the universe will continue to expand endlessly toward infinity, and as it expands, it will become endlessly less dense and endlessly colder, to a point sometime in the very distant future where nothing that we could recognize as an entity would exist. The temperatures will be too low for any form of life to exist, and distances between particles will be so enormous, that no force could hold any two particles together to constitute a compound entity. However, it should be noted, this end of days in universal death is not unlike Isaiah’s prediction of universal light conquering all darkness. What is judged from a human perspective as “pointless” can be affirmed (for better or for worse) as “fulfillment” from a divine perspective.

Cross-References

- [Historical Theology](#)
- [Judaism: An Overview](#)
- [Kabbalah in Judaism](#)
- [Natural Sciences in Judaism](#)
- [Philosophy in Judaism](#)
- [Physics in Judaism](#)
- [Psychology in Judaism](#)
- [Theology in Judaism](#)
- [Time](#)

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Redemption and Science in Judaism

► Redemption in Judaism

Reductionism

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Related Terms

Top Down

Reductionism is a view of areas of knowledge as capable of being arranged in hierarchical fashion, and then claiming that a lower level entails the one just above it. Consider the following short list of areas of study, from top to bottom: humanities, history, sociology, psychology, biology, chemistry,

and physics. Reductionism claims that complete knowledge and understanding at a lower level will enable you to deduce results at the next higher level. A reductionism program is any attempt to implement such a claim for any pair of levels.

Science and technology have been able to produce impressive results by using reductionistic thinking. A complicated system, such as an automobile, is best understood by conceptualizing it as an assembly of subsystems. If there is a malfunction, one should isolate the subsystem where the problem resides and test its components; if a headlight does not work, you do not begin by checking the level of the oil in the engine.

Most scientists and engineers would agree (Barbour 1990, 165; Peacocke 1993, 217) that a hierarchy of studies exists. They would not necessarily agree that (1) the hierarchy is simple: There may be interconnections that skip one level or more; (2) a specific order or place in it connotes any particular value (ethical, societal, economic, etc.), or (3) the reductionist program is valid. There is, however, a tendency for some biologists to favor reductionism because they want to oppose vitalism, the notion that living beings have some kind of vital essence that separates them from nonliving matter.

The list of areas in the hierarchy is certainly of interest (Barbour, Peacocke, loc. cit). Ian Barbour distinguishes three types of reductionism: (1) methodological, (2) epistemological, and (3) ontological. Methodology guides research programs; epistemology concerns relations between adjacent levels; ontology claims to speak about reality. As Barbour states, the three types of reductionism do not make equivalent claims, but writers often do not distinguish carefully among them. Methodological reductionism is seen as quite proper in science.

However, according to some philosophers, there are six established types of reductionism: (1) ontological reductionism, (2) reductive materialism, (3) eliminating materialism, (4) scientific reductionism, (5) causal reductionism, and (6) methodological reductionism. Nevertheless, by showing how these are related to one another, Anne L.C. Runehov suggests that these can be

reduced to two types of reductionism, namely, ontological reductionism and methodological reductionism (Runehov 2007: 204–206).

Ontological reductionism has the purpose of rendering an exhaustive explanation of some phenomenon, process or event (*the explanandum*) in terms of another phenomenon, process, or event (*the explanans*). Accordingly, *something x* is explained in terms of *nothing but y*. A variant, for example, is to maintain that everything that exists is made up of a small number of basic substances that behave in regular ways like atoms, quarks, or energy. Then one has applied ontological reductionism. Nancey Murphy understands ontological reductionism as “no new kinds of metaphysical ‘ingredients’ need to be added to produce higher-level entities from lower level ones” (Murphy 1998: 65). Her definition rejects the existence of vital forces or entelechy in the life sciences, as well as mind or soul as the basis of consciousness. She also designates a type of reductionism that has even stronger claims than ontological reductionism, namely, *reductive materialism* which dictates that all higher-level explananda can be exhaustively explained in terms of lower level explanantia with the addition that only the lower level explanantia are really real while the higher-level explananda are only composite structures made of atoms (Murphy 1998). The latter type of reductionism makes the ontological reductive argument, that religious experiences are nothing but experiences caused by God, impossible, because God is apprehended as a higher-level explanans, which cannot be reduced to composite structures made of atoms. Still, in my view, reductive materialism is a form of ontological reductionism, even the strongest form.

Yet another type of ontological reductionism, and which is gaining ground, is known as *eliminating materialism*, which dictates that mental states such as religiosity and love are simply misnomers. One day all such concepts will be seen as inadequate and it will become clear that what is at stake is pure neural-chemistry. Eliminating materialism projects the success of science in explaining misnomers in the past onto the future (Churchland 2002). The exhaustiveness hence

lies in the future. Which form of ontological reductionism is applied depends on how the explanans is defined.

When the explanans is a scientific explanation, we are dealing with *scientific reductionism*, which is a form of ontological reductionism when it is argued that phenomena, processes, and events can exhaustively be explained by science. It is the same *causal reductionism* when it is intended that the explanandum can be exhaustively explained by what caused it (Stenmark 2001, 21–22). Causal reductionism is actually understood as a bottom-up hierarchy from, which if true, it would follow that the laws of the sciences ranked higher up in the hierarchy should be reducible to the laws of physics.

Thus, *reductive materialism* is an extreme form of ontological reductionism while *scientific reductionism* and *causal reductionism* may be forms of ontological reductionism if the claim is that the explanans exhaustively explains the explanandum. What all types of ontological explanations have in common is that it is the explanans that exhaustively explains the explanandum or at least will be able to do so in the future.

A different type of reductionism is known as *methodological reductionism*, which can also be understood in different ways. Firstly, it can be understood as every explanation ought to be continually reduced to the very simplest possible explanation. Secondly, it may be apprehended as a research strategy for analyzing things to study, such as cells, in terms of their parts, such as macromolecules, as well as for applying successful theories in one area, such as Darwinian evolution, to other areas, such as sociology or religion. Thirdly, methodological reductionism may aim to reduce a whole into a specific set of parts for a scientific purpose without claiming that this is all there is to that whole. An illustration of such reductionism would be to explain pain in terms of its neurological correlations. For instance, such a neurological explanation would be an example of a scientifically reductionist explanation that is not a form of ontological reductionism, because the scientific explanans is not

meant to exhaustively explain the explanandum (pain is not maintained to be nothing but neural activity).

Runehov suggests there are two main types of reductionism: ontological reductionism and methodological reductionism. The difference between these two types of reductionism is that ontological reductionism signifies that phenomena, processes, or events can be exhaustively explained by other phenomena, processes, or events. Methodological reductionism, on the other hand, means that a whole is reduced to a specific set of parts for a scientific purpose without claiming that this is all there is to that whole. Hence, there is no claim for exhaustiveness. Hence, one can have causal ontological reductionism or causal methodological reductionism – likewise, it is with scientific reductionism.

Controversies Regarding Reductionism

Scientists often make overt claims for reductionism of all kinds. I cite two examples:

Thus eventually one may hope to have the whole of biology ‘explained’ in terms of the level below it, and so on right down to the atomic level.... (Francis Crick, quoted in Barbour 1990, 165).

“The underlying physical laws necessary for the mathematical theory of a large part of physics and the whole of chemistry are thus completely known, and the difficulty is only that the exact application of these laws leads to equations much too complicated to be soluble.” (Dirac 1929, 714).

These examples epitomize the bottom-up approach. Opposition to reductionism is evident among many of those who deal with the upper levels of the hierarchy. They often use “reductionist” as an insult hurled at a scientist – sometimes justly, sometimes not. Antireductionists tend to deal with rather complex systems that they describe holistically. If they allow for a hierarchy, they emphasize the need for top-down causation, as when a thinking brain (psychology) brings about the motion of a body part (biology). The reductionist claim – that both happenings are the result of electrochemical

activities in the body – is not seen as useful by a holist, who would favor explanations involving bodily processes, brain processes, and conscious processes acting in concert.

The case against reduction is strengthened by emergence, defined as a phenomenon that occurs at a particular level in the hierarchy, completely and qualitatively unexpected from all we know about the next lower level. A simple example might be the schooling behavior of some species of fish; the behavior of one animal does not prepare you for the collective behavior when large numbers are present. Other examples of emergence are numerous (Johnson 2001).

The difference between living and nonliving matter is again an example of emergence, perhaps the most important of all. Life could be considered as an emergent phenomenon, arising from chemistry. Vitalism was formerly widely maintained as a way of sanctifying life by setting it apart from other things. In chemistry, organic compounds were seen as distinct – made only by living beings. Inorganic matter was considered lifeless. In 1828, Friedrich Wöhler synthesized urea, an organic substance, from totally inorganic ingredients. This discovery struck a damaging blow to vitalism. Finally, on May 20, 2010, the geneticist Craig Venter announced in the journal *Science* that he and his team had created synthetic DNA from the four chemical building blocks that ordinarily form DNA, and inserted it into a bacterium from which the natural DNA had been removed. The newly created bacterium reproduced normally, with instructions from the new DNA. Venter’s team had created a life form that had never lived before and opened a new era of synthetic life (Gibson et al. 2010).

This is certainly a noteworthy feat in methodological reductionism, but it does not necessarily establish ontological reductionism. The future of synthetic biology will be a holistic process involving science, ethics, economics, and politics.

Cross-References

- [Divine Action](#)
- [Epistemology](#)

- [Evolution](#)
- [Holism](#)
- [Religiosity](#)
- [Religious Experience](#)
- [Scientism](#)

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Reflective Judgment and Moderate Living

- [Wisdom \(Philosophically\)](#)

Reform Judaism

- [Progressive Judaism](#)

Reformation

- [Physics in Protestantism](#)

Regulation

- [Control Theory \(Cybernetics\)](#)

Relational Buddhism

- [Psychology in Buddhism](#)

Relational Dharma

- [Psychology in Buddhism](#)

Relational Ontology

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Relational ontology is the philosophical position that what distinguishes subject from subject, subject from object, or object from object is mutual relation rather than *substance*. Ontologically, substance refers to the essence or nature of a being. The substance of God is immaterial, self-existent, immutable, and eternal. Conversely, the substance of the universe is material, contingent, mutable, and temporal. While distinction of substances clearly differentiates God from the cosmos, it implies that union of God and the cosmos is impossible since ontologically distinct substances cannot interpenetrate. Hence, true God cannot remain true God and be truly immanent in the cosmos. Conversely, true cosmos cannot remain true cosmos and be conceived

within the being of God. Substance ontology thus precludes the possibility of conceiving the self-creativity of the cosmos as the immanent creativity of God-*qua*-Creator and suggests a “God of the gaps” divine-world relation in which God’s creativity in the cosmos is intrusive rather than intrinsic.

In contrast, a relational ontology upholds the distinction between Creator and the created without insisting on radical separation. A basis for this ontology can be traced to Thomas Aquinas as he reflects on whether the term “person” signifies “relation” in the Trinity. According to Aquinas, “a divine person signifies a relation as subsisting. And this is to signify relation by way of substance, and such a relation is a hypostasis subsisting in the divine nature, although in truth that which subsists in the divine nature is the divine nature itself (1989: Ia.29.4).” Consequently, triune Persons share the same divine nature but are distinguished by their relation one to another. Nonetheless, this relation is not distinct from nature but in fact subsists within it and is the divine nature itself. Hence, in *God For Us: The Trinity and Christian Life*, Catherine La Cugna could claim, “A relational ontology understands both God and the creature to exist and meet as persons in communion. In other words, the meaning of to-be is to-be-a-person-in-communion. God’s To-Be is To-Be-in-relationship, and God’s being-in-relationship-to-us is what God is. A relational ontology focuses on personhood, relationship, and communion as the modality of all existence.” In addition to LaCugna (1991: 250), other contemporary scholars have taken up Aquinas’ understanding of nature as relation. Relational ontology has been particularly useful to many in the theology-science dialogue like Arthur R. Peacocke who utilize a panentheistic model of God-world relationship to express divine action in the creative processes of the cosmos. Countering the critique that in panentheism there is no distinction between God and creation, relational ontology contends that the ontological distinction between Creator and created is relational, a distinction of “subjects” rather than “substances.” Hence, one can maintain the panentheistic

relationship between God and creation while upholding the ontological distinction between Creator and creation.

Cross-References

- [Divine Action](#)
- [Divine Creativity](#)
- [Evolutionary Theology](#)
- [God of the Gaps](#)
- [Ontology](#)
- [Panentheism](#)
- [Transcendence and Immanence](#)

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Relationality

- [Externalism and Internalism](#)

Relations

- [Relations in Buddhism](#)

Relations in Buddhism

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Related Terms

[Buddhist causality](#); [Conditional relations](#);
[Conditionality](#); [Relations](#)

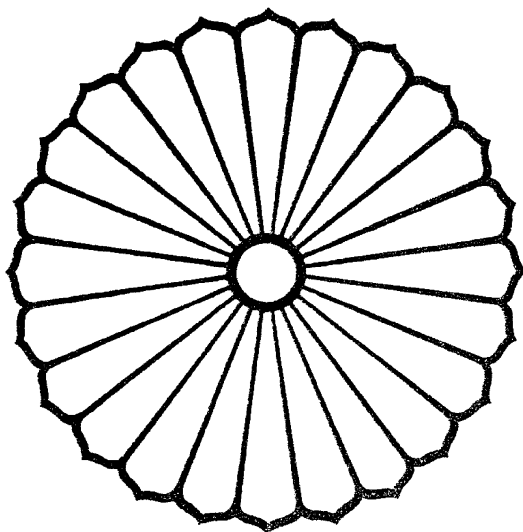
Description

Paṭṭhāna belongs to the “higher teachings” of the Buddha, the *Abhidhamma* of *Theravāda* Buddhism (<http://www.abhidhamma.com/>). The term “*Paṭṭhāna*” (*Pāli*) is composed of the prefix “*pa*,” various, and “*ṭhāna*,” cause or condition; thus, *Paṭṭhāna* means “various causes or conditions,” or “a system of relations.” *Paṭṭhāna* is usually translated as “conditional relations.”

Causality or conditionality plays an important role in Buddhism. Already in his first sermon, the Buddha taught about cause and effect: the first noble truth, suffering (*dukkha*), as effect, and the second noble truth, craving (*taṇhā*), as the cause for suffering. (See entry “► [Dukkha](#)”). Then, in his doctrine of dependent origination (*paṭiccasamuppāda*), the conditionality within the cycle of rebirth (*saṃsāra*) is explained with 12 factors which are themselves conditioned and condition the next factor. (See a short explanation of dependent origination under the entry “► [Truth](#)”). But *Paṭṭhāna* treats conditionality completely and in the deepest and exactest way possible (Fig. 1).

Paṭṭhāna is laid down in the seventh book of the *Abhidhamma Piṭaka* (<http://www.abhidhamma.com/>; Ko Lay 1986; Nyanatiloka 2008), the third part of the *Pāli* canon or “*Tiṭṭhaka*.” Fundamental knowledge of *Abhidhamma* is necessary to understand *Paṭṭhāna*.

This last, large book of the *Abhidhamma* is decidedly the most profound, subtle and abstruse of the seven. Therefore, it is also called “the great book” (*mahāpakaraṇa*), or “a complete book with infinite methods” (*anantanaya samanta paṭṭhāna*). Whereas the previous six *Abhidhamma* books analyze all ultimate realities (*paramattha dhammas*), i.e., one’s direct experiences, in minute detail according to various aspects; *Paṭṭhāna* relates them again to each other and describes the causes or conditions, the effects, and the conditioning forces. (The ultimate realities according to *Abhidhamma* are consciousness (*citta*), mental factors (*cetasika*), matter (*rūpa*), and *Nibbāna*. Altogether, 24 conditioning forces are enumerated,



Relations in Buddhism, Fig. 1 The universal symbol of *Paṭṭhāna*: the wheel of life

mostly referred to as relations or conditions (*paccaya*). In the terms of ultimate reality, *Paṭṭhāna* is the science of relations between the conditioning states (*paccaya-dhamma*), the conditioned states (*paccayuppanna-dhamma*), and the conditioning forces (*paccayasatti*), which have the power to link each cause to its effect by its specific function of production (*janaka*), support (*upatthambhaka*), or maintenance (*anupālana*) (Fig. 2).

For instance, in the text, it is said: “The visible object-base is related to eye-consciousness element and its associated states by the force of object condition ((Nārada Mūla Paṭṭhāna Sayadaw) Vol. I, Chap. II, 2 (i)).” Here, the visible object-base (*rūpāyatana*) refers to the actual cause, i.e., the conditioning state, and the eye consciousness (*cakkhuviññāṇa*), and its mental factors (*cetasika*) refer to the actual effects, i.e., the conditioned states, while the force of the object-condition (*ārammaṇa-paccaya*), i.e., the conditioning force, makes the cause relate with its effects by production and support. However, the complete picture, why eye consciousness and its mental factors arise, is more complicated and includes other conditions

Ultimate realities (paramattha dhammas)	Cause or conditioning state (paccaya)	Effect or conditioned state (paccayuppanna)
	1. Consciousness (<i>citta</i>)	1. Consciousness (<i>citta</i>)
	2. Mental factors (<i>cetasika</i>)	2. Mental factors (<i>cetasika</i>)
	3. Matter (<i>rūpa</i>)	3. Matter (<i>rūpa</i>)
	4. <i>Nibbāna</i>	
	5. Concepts (<i>paññatti</i>)	

Relations in Buddhism, Fig. 2 Cause and effect in Abhidhamma terms

such as pre-nascence, presence, non-disappearance, and association. Indeed, it is a huge, multiple-dimensional network of causes and effects which *Paṭṭhāna* explains step by step in its volumes (Five volumes in Pāli (Caṭṭha Saṅgāyana edition), six large volumes in the Burmese and Siamese Pāli edition, two volumes of about 500–600 pages in the English translation of a part of *Paṭṭhāna* only, Pali Text Society (PTS)).

The complex system of relations is complicated yet logical and reasonable. The whole universe can be explained with it. As it is common in the teachings of the Buddha, the emphasis is put on human beings and their liberation from suffering (*dukkha*) and the round of rebirth (*saṃsāra*). *Paṭṭhāna* is the last, huge step to completely understand and penetrate mind (*nāma*) and matter (*rūpa*), their conditioned arising, decay, ceasing, and their nature of nonself (*anatta*). (See entry “► [Anatta](#)”). One will clearly see the dependences and the conditionality of all things, so that one might be ready to finally give up and let go all hankering after, clinging and identifying, which is the way to liberation, the path leading to the realization of *Nibbāna*, the final goal in Buddhism.

U Ko Lay, a renown Burmese Buddhist writer and translator, wrote in “An outline of the *Paṭṭhāna* system of relations” in his “Guide to Tipiṭaka” ((Ko Lay 1986)): “The Great Treatise of *Paṭṭhāna* arranges all conditioned things, (22 Tikas and 100 Dukas of the *Mātikā*), (These matrixes (*mātikā*) are taught in the *Dhammasaṅgaṇī*, the first Abhidhamma book.) under 24 kinds of relations, describes and

classifies them into a complete system for understanding the mechanics of the universe of Dhamma.” (Ko Lay 1986, Chap. X, VII., p. 157) (Fig. 3)

The 24 conditions (<i>paccaya</i>) and sub-conditions	
1. <i>Hetu-paccaya</i>	Root-condition
2. <i>Ārammaṇa-paccaya</i>	Object-condition
3. <i>Adhipati-paccaya</i>	Predominance-condition
<i>Ārammaṇ' adhipati</i>	Object-predominance
<i>Sahajāt' adhipati</i>	Conascent-predominance
4. <i>Anantara-paccaya</i>	Proximity-condition
5. <i>Samanantara-paccaya</i>	Contiguity-condition
6. <i>Sahajāta-paccaya</i>	Conascent-condition
7. <i>Aññamañña-paccaya</i>	Mutuality-condition
8. <i>Nissaya-paccaya</i>	Support-condition
<i>Sahajāta-nissaya</i>	Conascent-support
<i>Purejāta-nissaya</i>	Pre-nascent-support
<i>Vatthu-</i>	Base-
<i>Vatthārammaṇa-</i>	Base-object-
9. <i>Upanissaya-paccaya</i>	Decisive support-condition
<i>Ārammaṇ' upanissaya</i>	Object decisive support
<i>Anantar' upanissaya</i>	Proximity decisive support
<i>Pakat' upanissaya</i>	Natural decisive support
10. <i>Purejāta-paccaya</i>	Pre-nascent -condition
<i>Vatthu-purejāta</i>	Base-pre-nascent
<i>Ārammaṇa-purejāta</i>	Object-pre-nascent
11. <i>Pacchājāta-paccaya</i>	Post-nascent-condition
12. <i>Āsevana-paccaya</i>	Repetition-condition
13. <i>Kamma-paccaya</i>	Kamma-condition
<i>Sahajāta-kamma</i>	Conascent kamma
<i>Nānakkaṇṇika-kamma</i>	Asynchronous kamma

(continued)

The 24 conditions (<i>paccaya</i>) and sub-conditions	
14. Vipāka-paccaya	Result-condition
15. Āhāra-paccaya	Nutriments-condition
<i>Rūpāhāra</i>	material nutriment
<i>Nāmāhāra</i>	mental nutriment
16. Indriya-paccaya	Faculty-condition
<i>Purejāta-indriya</i>	Prenascence faculty
<i>Jīvit'indriya</i>	Material life faculty
<i>Sahajāta-indriya</i>	Conascence faculty
17. Jhāna-paccaya	Jhāna-condition
18. Magga-paccaya	Path-condition
19. Sampayutta-paccaya	Association-condition
20. Vippayutta-paccaya	Dissociation-condition
<i>Sahajāta-vippayutta</i>	Conascence dissociation
<i>Purejāta-vippayutta</i>	Prenascence dissociation
<i>Pacchājāta-vippayutta</i>	Postnascence dissociation
21. Atthi-paccaya	Presence-condition
<i>Sahajāta-atthi</i>	Conascence presence
<i>Purejāta-atthi</i>	Prenascence presence
<i>Pacchājāta-atthi</i>	Postnascence presence
<i>Āhāra-atthi</i>	Nutriments presence
<i>Indriya-atthi</i>	Faculty presence
22. Natthi-paccaya	Absence-condition
23. Vigata-paccaya	Disappearance-condition (same as no. 22)
24. Avigata-paccaya	Non-disappearance-condition (same as no. 21)

These 24 conditions do not work separately but collectively in groups; they join together constituting nine groups (with overlaps, i.e., some conditions participate in several groups) (According to Dr. Nandamālābhivamsa, chapter “Paṭṭhāna” in “Fundamental Abhidhamma” (download: http://www.abhidhamma.com/txt_Patthana.pdf) and Abhidhammattha Saṅgaha (Bodhi 2007)):

1. Object (*ārammaṇa*) group: eight conditions (object, predominance, support, decisive support, prenascent, dissociation, presence, and nondisappearance) (For a detailed explanation, see *Paṭṭhāna – Conditional Relations* by Agganyani (download: http://www.abhidhamma.com/txt_Patthana_conditional_relations.pdf)).
2. Conascence (*sahajāta*) group: 15 conditions (conascence, support, presence, and nondisappearance always; usually several out of

mutuality, result, dissociation, and association; and occasionally some out of root, predominance, nutriment, kamma, faculty, jhāna, and path) (See *Paṭṭhāna – Conditional Relations*, Sahajāta group, by Agganyani (download: http://www.abhidhamma.com/txt_Patthana_Sahajata_group.pdf)).

3. Proximity (*anantara*) group: seven conditions (proximity, contiguity, decisive support, repetition, kamma, nonpresence, and disappearance).
4. Prenascence (*purejāta*) group: six conditions (prenascence, support, faculty, dissociation, presence, and nondisappearance).
5. Postnascence (*pacchājāta*) group: four conditions (postnascence, dissociation, presence, and nondisappearance).
6. Nutriment (*āhāra*) group: three conditions (nutriment, presence, and nondisappearance).
7. Faculty (*indriya*) group: three conditions (faculty, presence, and nondisappearance).
8. Natural decisive support (*pakatūpanissaya*) group: two conditions (decisive support and *kamma*).
9. *Kamma*: one condition (*kamma*).

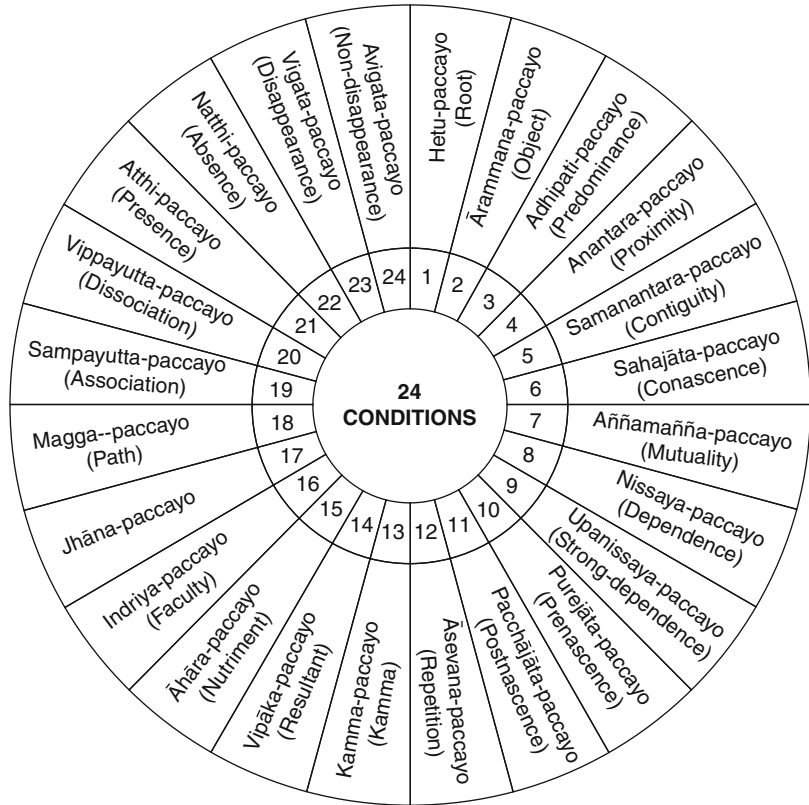
The conditioning phenomena mostly do not “produce” the effect but are one of the various necessary conditions for the effect, or they support or just influence the effect in one or another way. Important to understand is that the effect must not necessarily arise later than the cause. They can occur at the same time or the effect might even arise earlier than the cause. The *Paṭṭhāna* explains in great detail how or why the cause conditions its effect, which *dhammas* can be related – or not – by what conditioning force.

The conditions (*paccayas*) also can be grouped according to mental (*nāma*) or physical (*rūpa*) nature of the conditioning and conditioned states:

1. Mind is related to mind by the force of six conditions: Proximity, contiguity, absence, disappearance, repetition, and association.
2. Mind is related to mind and matter by the force of five conditions: root, kamma, result, *jhāna*, and path.
3. Mind is related to matter alone by the force of one condition: postnascence.
4. Matter is related to matter by one condition: faculty (physical life faculty).

Relations in Buddhism,

Fig. 3 Paṭṭhāna: the 24 conditions (Pāli and English) (Figure from Mehm Hla Aung Gyi 1998b)



5. Matter is related to mind by the force of one condition: prenascence.
6. Mind, matter, *Nibbāna*, and concepts (*paññatti*) are related to mind by the forces of two conditions: object and decisive support.
7. Mind and matter are related to mind and matter by the forces of nine conditions: predominance, conascence, mutuality, support, nutriment, faculty, dissociation, presence, and nondisappearance.

Structure of Paṭṭhāna

Paṭṭhāna is made up of two main chapters (*vāra*): the “brief chapter” and the “great chapter.” (According to Mehm Hla Aung Gyi 1998a, pp. 7–13) (Fig. 4).

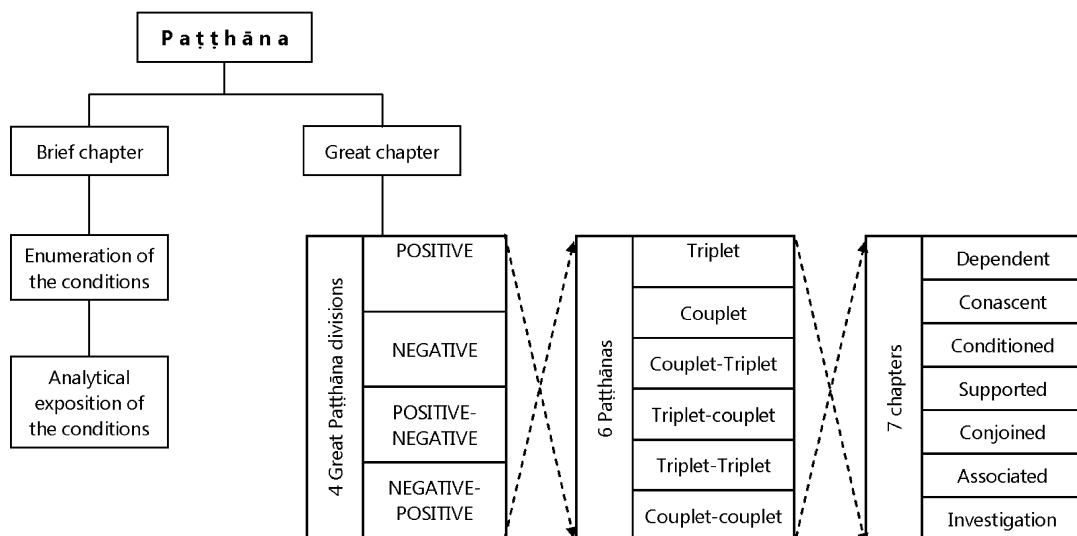
The brief chapter consists of two parts: the “Enumeration of the conditions” (*paccayuddesa*) and the “Analytical exposition of the conditions” (*paccayaniddesa*). The latter gives a brief account of the conditioning and conditioned states of each of the 24 conditions.

The great chapter is divided into four great divisions which are applied to all 24 conditions:

1. Positive: *Anuloma Paṭṭhāna* – Both the conditioning and the conditioned state are positive, i.e., both arise.
2. Negative: *Paccanīya Paṭṭhāna* – Both the conditioning and the conditioned state are negative, i.e., both do not arise.
3. Positive–negative: *Anuloma Paccanīya Paṭṭhāna* – The conditioning state is positive, but the conditioned state is negative.
4. Negative–positive: *Paccanīya Anuloma Paṭṭhāna* – The conditioning state is negative, but the conditioned state is positive.

Each of these four “Great Paṭṭhāna Divisions” consists of “Six Paṭṭhānas” or ways of application:

1. Triplet: *Tika Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in their 22 triplets (*tika*).
2. Couplet: *Duka Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in their 100 couplets (*duka*).



Relations in Buddhism, Fig. 4 Structure of Paṭṭhāna

3. Couplet-triplet: *Duka-Tika Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in their 100 couplets (*duka*) as reference and the three sections of the 22 triplets (*tika*).
4. Triplet-couplet: *Tika-Duka Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in their 22 triplets (*tika*) as reference and the two sections of the 100 couplets (*duka*).
5. Triplet-triplet: *Tika-Tika Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in each triplet (*tika*) as reference and the three sections of the remaining 21 triplets (*tika*).
6. Couplet-couplet: *Duka-Duka Paṭṭhāna* – application of the 24 conditions (*paccayas*) to the phenomena in each couplet and the two sections of the remaining 99 couplets (*duka*).

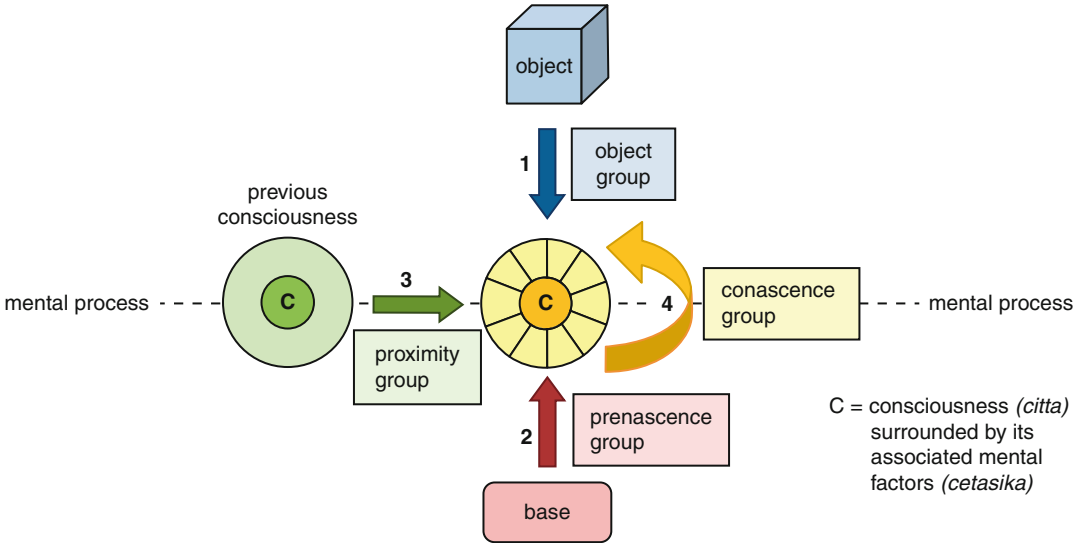
Furthermore, all points are detailed in seven chapters:

1. Dependent chapter (*paṭicca-vāra*)
2. Conascent chapter (*sahajāta-vāra*)
3. Conditioned chapter (*paccaya-vāra*)
4. Supported chapter (*nissaya-vāra*)
5. Conjoined chapter (*samsāṭha-vāra*)
6. Associated chapter (*sampayutta-vāra*)
7. Investigation chapter (*pañhā-vāra*)

While the ancient *Paṭṭhāna* books (Nārada Mūla Paṭṭhāna Sayadaw) and the commentaries in Abhidhammattha Saṅgaha ((Bodhi 2007)) and Visuddhimagga ((Buddhaghosa 2011, 1975)) are very dry and scholastic, some well-educated modern Abhidhamma teachers have the ability to instruct *Paṭṭhāna* in connection with the mental process (*vīthi*) or with the doctrine of dependent origination (*paṭiccasamuppāda*) and to explain the practical application in daily life, which can be very fascinating and eye opening (<http://www.abhidhamma.com/>; van Gorkom 2010; Ledi 1986; Nandamālābhivamsa 2007; Naing 2005).

For example, in the mental process (*vīthi*), for each consciousness (*citta*) taking part in the process (at least), four points or groups of conditions (*paccaya*) have to be considered:

1. The object with which the consciousness works, i.e., the object group
2. The base on which the consciousness arises, i.e., the prenascent group
3. The previous consciousness, i.e., the proximity group
4. The mental factors (*cetasika*) associated with the respected consciousness, i.e., the conascent group (Fig. 5).



Relations in Buddhism, Fig. 5 The four conditioning groups for one consciousness in the mental process

Self-identification

Science

As seen from the above figure, *Paṭṭhāna* is most scientific and goes beyond what is commonly called science. Explaining completely the conditionality of life and the animate universe by all possible relations and subatomic forces between mind, matter, concepts, and even *Nibbāna* in fact can only be understood as scientific approach.

Nevertheless the purpose of *Paṭṭhāna* is not to be an abstract science but to apply and fully penetrate reality in order to attain liberation, meaning, to realize *Nibbāna*.

Religion

Even if Buddhism is regarded as a religion, *Paṭṭhāna*, belonging to the *Abhidhamma*, which is a part of the *Pāli* canon of *Theravāda* Buddhism, cannot be called a religion or part of a religious teaching, because it is a mere detailed explanation of cause and effect. In particular, it is not a religion in the sense that one blindly has to believe and follow any laws, instructions, or commandments. Furthermore, as the *Paṭṭhāna* system of relations covers the complete explanation of conditionality, there is space

neither for a creator god nor for the concept of an individual soul.

However, the legend around the Buddha’s realization of the *Paṭṭhāna* belongs to the area of ancient religious belief.

In the Introduction of the “*Atthasālinī*,” (“The Expositor,” the commentary to the *Dhammasaṅgaṇī*, the first book of the *Abhidhamma*) it is stated that the Buddha, during the fourth week after his enlightenment, sat in the “Jewel House,” in the northwest direction, and contemplated the *Abhidhamma*. (The “Jewel House” is said to be the place where the seven books of the *Abhidhamma* have been contemplated). Then: “And while he contemplated the contents of the ‘*Dhammasaṅgaṇī*,’ his body did not emit rays; and similarly with the contemplation of the next five books. But when coming to the ‘Great Book,’ (*Mahāpakaraṇa* = *Paṭṭhāna*) he began to contemplate the 24 universal causal relations of condition, of presentation, and so on, his omniscience certainly found its opportunity therein. For as the great fish *Timiratipiṅgala* finds room only in the great ocean 84,000 yojanas in depth, so his omniscience truly finds room only in the Great Book. Rays of six colours- indigo, golden,

red, white, tawny, and dazzling- issued from the Teacher's body, as he was contemplating the subtle and abstruse Dhamma by his omniscience which had found such opportunity (...)
(Part I (Ganthārambhakathā), 2.4, §13)."

Another sign of religiosity might be the common practice of its chanting, especially in Myanmar. It is believed, that in the time of decline and decay of the Buddha's teachings, the Abhidhamma will be the first *piṭaka* to disappear, and out of it, *Paṭṭhāna* will be lost at first. Therefore, pious Buddhists especially care for the maintenance of *Paṭṭhāna*, and there is a widespread custom to chant the whole *Paṭṭhāna* at the end of the rainy season (*vassa*) in monasteries and nunneries, which takes about 5 days and nights continuously – nowadays through loudspeakers, trusting it is a great blessing for everybody to hear it.

Characteristics

It is the abstract, scientific completeness, which is the uniqueness of *Paṭṭhāna*. Without having to rely on a mysterious "first cause," which in religions usually is assigned to a creator god, *Paṭṭhāna* can explain the conditionality of life, the whole *saṃsāra*. The nonself or nonsoul (*anatta*) (See entry "► [Anatta](#)") doctrine typical of the Buddha's teaching becomes fully evident through *Paṭṭhāna*.

Relevance to Science and Religion

The teaching of conditional relations in *Paṭṭhāna* has its own scientific logic, which at first seems unusual, eccentric, and odd to Western students. Because of the difference in approach, comparison and scientific exchange are very difficult. Nevertheless, some basics might be interesting for psychologists, psychotherapists, physicians, physicists, and others. In the field of application of *Paṭṭhāna*, almost nothing has been or is done. The majority of religious-oriented people and representatives of the various religious convictions might be hesitant to reflect on the *Paṭṭhāna*,

because they fear to lose faith in their religion. The greatest hindrance for an exchange between the traditional teaching and Western-oriented students is the profundity of *Paṭṭhāna*, which requires pre-knowledge of the entire Abhidhamma. To this day, there are few Western students and teachers who have studied and are well versed in the Abhidhamma and *Paṭṭhāna*. Asian Abhidhamma and *Paṭṭhāna* scholars, however, are occupied and engaged in teaching mainly at monasteries or Buddhist universities and have little interest in or opportunity for scientific exchange with Western scholars.

Sources of Authority

Paṭṭhāna as a part of the *Abhidhammapiṭaka* was reexamined and confirmed in all six Buddhist councils. (The first Buddhist council was held 3 months after the Buddha's demise, and only Enlightened Ones (*Arahats*) were allowed to participate. The latest council was held from 1954 to 1956 in Yangon, Myanmar, to which a great number of Buddhist scholars of various countries were invited and participated). It was included on the oldest palm leaves found in the Aloka cave near Matale, Sri Lanka, when the Pāli canon was written down for the first time during the fourth Buddhist council in the first century B.C.E. The version of the fifth Buddhist council of 1871 is engraved on the famous marble slabs of Kuthodaw Pagoda in Mandalay, Myanmar. (The 729 marble slabs comprising the entire *Pāli* canon are dubbed the biggest book of the world).

Advanced Vipassanā meditators are able to experience and observe at least parts of the relations and conditionality, which confirms what the Buddha himself had realized and laid down in the *Paṭṭhāna*. (Insight meditation. See "► [Vipassanā](#)" in the entry).

Ethical Principles

Ethical principles are important in the entire Buddhist teaching and serve as a necessary

foundation for the development of knowledge and wisdom (*paññā*). The system of relations in the *Paṭṭhāna* is classified according to wholesome, unwholesome, and neutral states everywhere. Wholesome (*kusala*) is always moral and ethical and conducive for liberation. Unwholesome (*akusala*) is mostly immoral or unethical and definitely not conducive for one's own liberation. Neutral or kammically variable (*abyākata*) is a state which is neither wholesome nor unwholesome in itself but can take over the quality of the other associated states.

Key Values

Key values of *Paṭṭhāna* are analytical, discriminative knowledge and wisdom (*paññā*), not as an end in itself but for the purpose of seeing things as they really are, especially their nature of nonself (*anatta*), which leads to “liberation through wisdom” and the realization of *Nibbāna*.

Conceptualization

Nature/World

Paṭṭhāna has a realistic view. Mind (*nāma*) and matter (*rūpa*) are distinct phenomena which really exist for a short instant and which cannot mix, associate, or substitute each other. But they are related as taught in the *Paṭṭhāna*. Some of these relations can be experienced, seen or known in nature, between human actions and the environment or among beings.

The following issues are the same as in the entry “Abhidhamma.” Therefore, they are treated briefly here.

Human Being

A human being is not of interest and not directly defined in the *Paṭṭhāna*, as this is a system of mere abstract relations, causes and effects. The concept of a human being can appear only as a conventional object as conditioning state – never as effect which can be only ultimate realities.

Life and Death

Life

Life is characterized in the Abhidhamma by two phenomena called life faculty (*jīvitindriya*), one mental, the other physical. The physical life faculty is special in *Paṭṭhāna* as it is involved in the only matter-to-matter relation. It is related by the force of the faculty-condition (*indriya-paccaya*) only to coexisting material phenomena of the same material group (*rūpa-kalāpa*), which are supported by it and protected from decay.

By contrast, the mental factor (*cetasika*) of mental life faculty is involved in various relations and is conditioning mental phenomena by maintaining them especially.

Origin of Life

The main cause for life is kamma according to Buddhism. In the *Paṭṭhāna*, it is the asynchronous kamma relation (*nānakkhaṇika-kamma*) which has the power to produce a new life.

Death

What conventionally is called “death” is precisely speaking a concept which according to the teaching of *Paṭṭhāna* is conditioning but cannot be conditioned itself. Death consciousness (*cuti-citta*) is conditioned, and kamma – productive as well as destructive – and kammic result (*vipāka*) are also conditioned.

Reality

Most important for the understanding of *Paṭṭhāna* is the definition and usage of “reality” and especially “ultimate realities” (*paramattha dhammas*). All realities, conventional (*paññatti*) and ultimate (*paramattha*), are included as cause or conditioning state in the system of relations, but as effect or conditioned states, only three types of ultimate realities are possible: consciousness (*citta*), mental factors (*cetasika*), and matter (*rūpa*). *Nibbāna*, the unconditioned, cannot be produced, supported, or influenced in any way. When “seen,” i.e., grasped as an object, the effect on our mind will be peace and bliss.

Knowledge

Knowledge (*ñāṇa*) or wisdom (*paññā*) is an ultimate reality, a beautiful mental factor (*sobhana cetasika*). Knowledge can be developed, increased, conditioned – e.g., through the study of *Paṭṭhāna* or through insight meditation (*vipassanā-bhāvanā*). There are several factors and circumstances conducive to knowledge such as a concentrated mind, examples of teachers, healthy food, etc. Knowledge itself can be a conditioning state as well, i.e., is working as a condition, e.g., bringing clarity and equanimity, removing doubt, etc., and resulting in right view and finally in liberation.

Truth

Truth is not directly mentioned in *Paṭṭhāna*. All the explained relations are true in the highest sense and can be proved. In the meaning of reality, although conventional and ultimate truth both take part in the system of relations, definitely, ultimate truth is emphasized.

Perception

Perception (*saññā*) according to Abhidhamma is a universal mental factor (*cetasika*) that associates with all types of consciousness. Setting marks and recognizing marks, which are the functions of perception, are both conditioned by various facts, e.g., the object itself, one's eyesight and mindfulness (*sati*). Perception is also conditioning, e.g., one's emotional reactions on a recognized object and the physical effects on the body.

Time

According to Abhidhamma, time is as concept and relative. In *Paṭṭhāna*, time is used to compare different events and distinguish their simultaneousness, conascence, prenascence, or postnascence. This is an important difference as it determines which conditional forces are involved.

Consciousness

Consciousness (*citta*) is one of the four ultimate realities in Abhidhamma, and 89 or 121 types

are differentiated. In *Paṭṭhāna*, consciousness plays an important role concerning the conditioning as well as on the conditioned aspects of many relations. For each single consciousness in the continuous "stream of consciousness" or in one mental process, various conditions are necessary to coincide in order to produce, support, maintain, or in any way influence the respective consciousness. One of these conditions is the previous consciousness, which by dissolving gives opportunity to the next one to arise. The specific, fixed sequence of consciousness (*citta nīyāma*) comes about because of the conditional relations working in the process.

Rationality/Reason

The system of conditionality as found in the *Paṭṭhāna* is scientific, rational, and logical. But the intellectual understanding in theory is only scholasticism. The application and penetration in daily life is the way to liberation.

Mystery

In *Paṭṭhāna*, all conditionality is well explained in great detail. No questions concerning cause and effect remain unanswered. Hence, there is no space for mystery in *Paṭṭhāna*. Only the legend of the Buddha contemplating in the Jewel House with the issuing of the rays from his body seems a bit mysterious – but that is not at all the essence of *Paṭṭhāna*.

Cross-References

- [Abhidhamma, Southern](#)
- [Anatta](#)
- [Consciousness \(Buddhist\)](#)
- [Dependent Arising](#)
- [Dukkha](#)
- [Impermanence \(Buddhist\)](#)
- [Karma \(Buddhist\)](#)
- [Psychology in Buddhism](#)
- [Reality in Buddhism](#)
- [Science in Buddhism](#)
- [Truths, Four Noble](#)

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Relationships

- Attachment: Theory and Patterns

Relativism Cultural

- Cross-Cultural Psychology

Relativity

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Related Terms

Eddington; Free will; God's foreknowledge; Gravity; Length contraction; Principle of relativity; Space; Spacetime; Speed of light; Time; Time dilation

Introduction

Albert Einstein's theory of relativity is divided into two parts. He proposed his special theory of relativity in 1905. This dealt with the effects on space and time of uniform motion. The general theory was put forward in 1916 and incorporates the effects on space and time produced by gravity and accelerated motion. We begin with the special theory.

The Principle of Relativity and the Speed of Light

The *principle of relativity* states that the laws of nature are the same for all inertial frames of reference. An inertial frame is one in which, according to Newton's law, an object will continue at rest or in a state of uniform motion in a straight line unless acted upon by an unbalanced force. The principle encapsulates the common observation that, provided one is moving in a steady fashion, neither accelerating nor changing direction, life carries on normally.

Among the laws of nature are Maxwell's laws of electromagnetism. From these, one is able to calculate what the speed of light, or of any other electromagnetic radiation, should be in a vacuum. It is denoted by the symbol c and comes out to be approximately 300,000 km/s.

The principle of relativity and the laws of electromagnetism were well known to all physicists. It took the genius of Einstein to recognize that, although they each made perfect sense when thought of separately, they did not seem to make sense when put together. According to the principle, the laws were the same for all inertial observers, and that must apply to Maxwell's laws – including the conclusion to be drawn from them that the speed of light had the value c . In other words, the speed of light must be the same for all observers, regardless of the motion of the observer or that of the source of light.

Thus, for example, the speed of the light emitted by a moving car's headlights must be seen by the driver to leave the car at speed c but must also be observed by a pedestrian standing by the roadside to approach at the same speed c . How can this be? If the light behaved like a bullet being fired from a moving gun, then one would expect the pedestrian to find that, just as the speed of the car would have to be added to the muzzle speed of the bullet, so the speed of light would be c plus the speed of the car. On the other hand, if light were to behave like water ripples given out by a boat moving over the surface of a lake, then the driver would expect to find that the speed of light ahead of the car would be slower relative to the car than the light emitted to the rear – the car chasing after the forward-moving waves and leaving behind the rear-going waves. However, neither is the case. It is an experimental fact that the speed of light is a constant – depending neither on the speed of the observer nor the speed of the source of light.

The constancy of the speed of light together with the principle of relativity has come to be known as the two *postulates* (or fundamental principles) of special relativity. All the conclusions of special relativity stem from acceptance of these two postulates.

Taken together, they demonstrate that there is something amiss in the way we conventionally add and subtract velocities. And if there is something wrong with our conception of velocity (which is simply distance divided by time), then that in turn implies there must be something wrong with our conception of space, or time, or both.

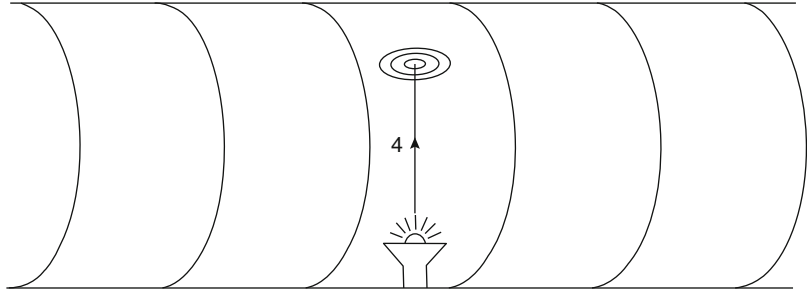
It is important to note that what we are dealing with here is not some peculiarity of light or electromagnetic radiation. *Anything* traveling at the same speed as that of light will have the same value for its speed for all inertial observers. What is crucial is the speed (and the implications for the underlying space and time) – not the fact that we happen to have come across this problem in the context of electromagnetism.

Time Dilation

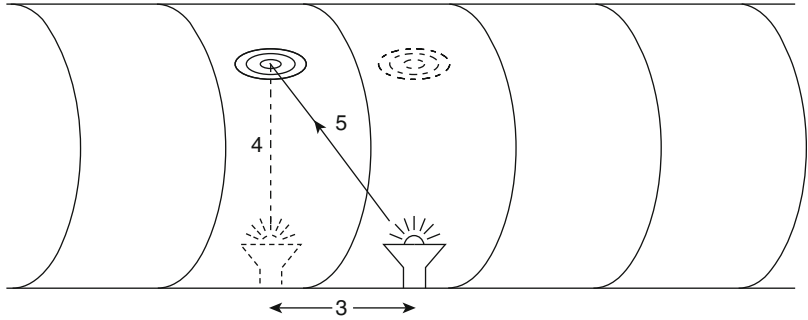
To see what is amiss, imagine an astronaut in a high-speed spacecraft and a mission controller on the ground. They both have identical clocks. The astronaut is to carry out a simple experiment. On the floor of the craft, she is to fix a lamp which emits a pulse of light. The pulse travels directly upwards at right angles to the direction of motion of the craft (see Fig. 1). There, the pulse strikes a bullseye target fixed to the ceiling. Let us say that the height of the craft is 4 m. With the light traveling at speed c , she finds that the time taken for this trip t' , as measured on her clock, is given by $t' = 4/c$.

Now let us see what this looks like from the perspective of the mission controller. As the craft passes him overhead, he too observes the trip performed by the light pulse from the source to the target. According to his perspective, during the time taken for the pulse to arrive at the target, the target will have moved forward from where it was when the pulse was emitted. For him, the path is not vertical; it slopes (see Fig. 2). The length of this sloping path will clearly be longer than it was from the astronaut's point of view. Let us say that the craft moves forward 3 m in the time that it takes for the light pulse to travel from the source to the target. Using Pythagoras's theorem, where $3^2 + 4^2 = 5^2$, we see that the

Relativity, Fig. 1 The astronaut arranges for a pulse of light to be directed towards a target such that the light travels at right angles to the direction of motion of the spacecraft



Relativity, Fig. 2 According to the mission controller on earth, as the spacecraft passes overhead, the target moves forward in the time it takes for the light pulse to perform its journey. The pulse, therefore, has to traverse a diagonal path



distance traveled by the pulse to get to the target is, according to the controller, 5 m.

So what does he find for the time taken for the pulse to perform the trip? Clearly it is the distance traveled, 5 m, divided by the speed at which he sees the light traveling. This we have established is c (the same as it was for the astronaut). Thus, for the controller, the time taken, t , registered on his clock, is given by $t = 5/c$.

But this is not the time the astronaut found. She measured the time to be $t' = 4/c$. So, they disagree as to how long it took the pulse to perform the trip. According to the controller, the reading on the astronaut's clock is too low; her clock is going slower than his.

And it is not just the clock. Everything going on in the spacecraft is slowed down in the same ratio. If this were not so, the astronaut would be able to note that her clock was going slow (compared, say, to her heartbeat rate, or the time taken to boil a kettle, etc.). And that in turn would allow her to deduce that she was moving – her speed somehow affecting the mechanism of the clock. But that is not allowed by the principle of relativity. All uniform motion is relative. Life for the

astronaut must proceed in exactly the same way as it does for the mission controller. Thus, we conclude that everything happening in the spacecraft – the clock, the workings of the electronics, the astronaut's aging processes, her thinking processes – all are slowed down in the same ratio. When she observes her slow clock with her slow brain, nothing will seem amiss. Indeed, as far as she is concerned, everything inside the craft keeps in step and appears normal. It is only according to the controller that everything in the craft is slowed down. This is *time dilation*. The astronaut has her time; the controller has his. They are not the same.

And this is the case whenever one has two observers moving relative to each other; the time dilation effect is always there. This means that, strictly speaking, whenever we undertake a journey – say, a bus trip – on alighting we ought to readjust our watch to get it back into synchronization with all the stationary clocks and watches. The reason we do not is that the effect is so small. For instance, someone opting to drive express trains all their working life will get out of step with those following sedentary jobs by no

more than about one millionth of a second by the time they retire, hardly worth bothering about.

At the other extreme, were an astronaut capable of traveling at a speed very, very close to that of light, time for her would effectively come to a standstill. She would hardly age at all and would, in effect, live forever. The downside, of course, is that her brain would have almost come to a standstill, which in turn means she would be unaware of having discovered the secret of eternal youth.

So much for the theory. But is it true in practice? Emphatically, yes. In 1977, for instance, an experiment was carried out at the CERN laboratory in Geneva on subatomic particles called *muons*. These tiny particles are unstable, and after an average time of 2.2×10^{-6} s (i.e., 2.2 millionths of a second), they break up into smaller particles. They were made to travel repeatedly around a circular trajectory of about 14 m diameter, at a speed of $v = 0.9994c$. The average lifetime of these moving muons was measured to be 29.3 times longer than that of stationary muons – exactly the result expected, to an experimental accuracy of 1 part in 2,000.

In a separate experiment carried out in 1971, the theory was checked out at aircraft speeds using identical atomic clocks, one carried in an aircraft and the other on the ground. Again, good agreement was found. These and innumerable other experiments all confirm the correctness of the time dilation prediction.

Length Contraction

Imagine the spacecraft traveling from the earth to a distant planet. Knowing both the speed of the craft and the distance from the earth to that planet, the mission controller can work out how long the journey should take as recorded on his clock. The astronaut can do the same kind of calculation. She agrees with the mission controller about their relative speed, but her journey time will not be the same as the controller's – because of time dilation. So, will she not find that she has arrived too soon – that she could not possibly have reached the distant planet at the agreed

speed in the reduced time? That would allow her to conclude that it must be she who is really moving. This would violate the principle of relativity which holds that the laws of nature are the same for all inertial observers, so one cannot decide who is “really moving.” Something is clearly wrong. But what? It cannot be the speed; both observers are agreed as to that. No, the resolution of the dilemma lies with their respective estimates of the distance from the earth to the planet. Just as the controller has his time and the astronaut has hers, he has his estimate of the distance between the earth and the planet, and she has hers. The astronaut is perfectly happy about her arrival time at the planet. If her recorded journey time is, say, half that of the controller, then her estimate of the distance separating the earth and the planet is half that which it is according to the controller. Thus, her estimates of time and distance are perfectly self-consistent – just as the controller's set of estimates are internally self-consistent.

In this way, we come across a second consequence of relativity theory. Not only does speed affect time, it also affects space. As far as the astronaut is concerned, everything that is moving relative to her is squashed up, or contracted. This applies not only to the distance between earth and the planet but to the shape of the earth itself and of the planet itself; they are no longer spherical. All distances in the direction of motion are contracted, leaving distances at right angles to that motion unaffected. This phenomenon is known as *length contraction*.

Four-Dimensional Spacetime

All this talk about different observers having different perceptions about space and time can be disorienting. One occasionally hears people claiming that relativity theory can be summarized in the phrase “all things are relative” – implying that it is a free-for-all and anyone can believe anything they want! Nothing could be further from the truth. Observers might not assign the same values for time intervals and spatial distances, but they do agree about how their

respective values are related – through the relevant formulae for time dilation and length contraction. These are determined with mathematical rigor.

Not only that, there is a measurement about which all inertial observers can agree: In ordinary, everyday life, we are happy to accept that if someone were to hold up a pencil in a room full of people, everyone would see something different. Some would see a short-looking pencil, others a long one. The appearance of the pencil depends on one's viewpoint – whether one is looking at it end-on or broadside-on. Do these differing perceptions worry us? Do we find them disconcerting? No. This is because we are all familiar with the idea that what we see is merely a two-dimensional projection of the pencil at right angles to our line of sight. What one sees can be captured on a photograph taken by a camera at the same location, and photographs are but two-dimensional representations of objects that actually exist in three spatial dimensions. Change the line of sight and one gets a different projected length. We are happy to live with these different appearances because we are aware that when one takes into account the extension of the pencil in the third dimension – along the line of sight – then all observers in the room arrive at the same value for the actual length of the pencil – the length in three dimensions. Those who are viewing the pencil end-on, and thus see a short projected length, have to add in a large contribution for the component of length along the line of sight; those viewing broadside-on with a long projected length have little to add in the way of the component along their line of sight. Either way, they arrive at the same value for the true length in three dimensions.

We use this as an analogy for explaining our differing perceptions of time and space. In 1908, 3 years after Einstein had published his special theory of relativity, one of his teachers, Hermann Minkowski (who once described his distinguished student as “a lazy dog”!), approached the subject from a different angle and suggested a reinterpretation. He proposed that what relativity was telling us is that space and time are much more alike than we might suspect from the very

different ways in which we perceive and measure them. Indeed, we should stop thinking of them as a three-dimensional space plus a separate one-dimensional time. Rather, they were to be seen as a four-dimensional *spacetime* in which space and time are indissolubly welded together. The three-dimensional distance we measure (with a ruler, say) is but a three-dimensional projection of the four-dimensional reality. The one-dimensional time we measure (with a clock) is but a one-dimensional projection of the four-dimensional reality. These ruler and clock measurements are but *appearances*; they are not the real thing.

The appearances will change according to one's viewpoint. Whereas in the case of the pencil being held up, a change of viewpoint meant changing one's position in the room relative to the pencil, in spacetime, a change of viewpoint entails both space and time and consists of a change in speed (which is spatial distance divided by time). Observers in relative motion have different viewpoints and therefore observe different projections of the four-dimensional reality.

What is the nature of this four-dimensional reality? What are the contents of spacetime? These will depend on the three dimensions of space and the one dimension of time. In other words, they are *events*. Events are characterized by their happening at a certain point in three-dimensional space and at a certain instant of time. Four numbers then precisely locate the position of the event in spacetime. One event might be the spacecraft leaving earth at a certain time. A second event might be the arrival of the craft at the distant planet at a different location in space and at a later instant of time.

Our two observers, the astronaut and the mission controller, disagree about “appearances,” that is, the difference in time between the two events and also the difference in space between the two events. However – and this is the crucial thing – they do agree about the separation between these two events in four-dimensional spacetime – as would all other observers, regardless of their speeds. And it is the fact that all observers are agreed as to what exists in four

dimensions that strengthens the idea that spacetime is what is real.

One of the disconcerting features about four-dimensional spacetime is that nothing changes. Changes occur in time. But spacetime is not in time; time is in spacetime (as one of its axes). It appears to be saying that all of time – past, present, and future – exist on an equal footing. In other words, events that we customarily think of as no longer existing because they lie in the past do exist in spacetime. In the same way, future events which we normally think of as not yet existing do exist in spacetime. There is nothing in this picture to select out the present instant, labeled “now,” as being anything special – separating past from future.

We are presented with a world where it is not only true that all of space exists at each point in time but also all of time exists at each point in space. In other words, wherever you are seated now reading this book, not only does the present instant exist, but also the moment when you began reading and the moment when you later decide you have had enough and you get up and go off to make a cup of tea.

We are dealing with a strangely static existence, one that is sometimes called “the block universe.” Now there is probably no idea more controversial in modern physics than the block universe. It is only natural to feel that there is something especially “real” about the present instant, that the future is uncertain, that the past is finished, that time “flows.” All these conspire against acceptance of the idea that the past still exists and the future also exists and is merely waiting for us to come across it. Some leading physicists, while accepting that all observers are indeed agreed on the value of the mathematical quantity we are calling “the distance, or interval, between two events in four-dimensional spacetime,” nevertheless deny that we must go that extra step and conclude that spacetime is the true nature of physical reality. They maintain that spacetime is merely a mathematical structure; that is all.

The block universe idea does have its problems. Where does the perceived special nature of the moment “now” come from, and where do we

get that dynamical sense of the flow of time? For a discussion of such topics, see the entry ► [Time](#).

There are various other consequences of special relativity, such as, for example, nothing can travel faster than the speed of light. Matter can be shown to be a locked-up form of energy, which when released provides us with nuclear energy and fuels the Sun. You are directed to the further reading if interested (Stannard 2008). Meanwhile, we turn to Einstein’s general theory of relativity.

Curved Spacetime

Consider a spacecraft orbiting the earth with its engines off. It travels in a curved orbit rather than moving in a straight line because of the action of the earth’s gravity. The astronaut steps out of the craft and floats there alongside the craft. She too is in orbit about the earth – more or less the same orbit as the craft. The force of gravity pulls on the spacewalker and upon the craft in just the right way to make them both travel the same trajectory. In order to do this, it must pull on the heavier spacecraft more strongly than on the astronaut. How does it know how to do this? In any case, why would gravity want to make them travel the same path?

Einstein’s response to this was to suggest that in the presence of a gravitating body, the “natural” motion of an object is *not* that of remaining stationary or moving at constant speed in a straight line. Instead, he proposed that near gravitating bodies such as the earth, the space itself becomes distorted. It is curved in such a way that the natural path followed by all objects is whatever path we observe it to be: the orbit followed by the spacewalker and the craft around the earth.

One way of thinking about this is to imagine a banked race track. On such a track, two very different vehicles can cruise around with little need for the driver to steer because the cars are induced to follow the curved path by the way the track is banked at the corners. The track is distorted or curved in such a manner that it is no longer “natural” for the vehicle to continue in

a straight line. It no longer requires a steering force to alter its direction of motion. The “steering” is provided by the shaped track.

So what Einstein is saying is that we do not need to invoke a force – the gravity force – to keep the astronaut and the craft in orbit about the earth. There is no force that needs to be fine-tuned to keep objects of different mass on the same path. Instead, both the astronaut and the craft are just following the natural path that *all* objects will follow if they start out from the same position with the same velocity. Thus, Einstein replaced the notion of gravity forces with a completely new conception – that of a *curved space*.

And such curvature would be expected to affect everything passing through that region of space – including light. This prediction of Einstein’s was triumphantly verified in 1919 when Arthur Eddington, in a famous experiment, showed that starlight grazing the rim of the sun during an eclipse was indeed bent – the star emitting the light appeared to be in a different position in the sky to where it is normally found when the sun is in a different part of the heavens. Thus, it seems that the sun produces a dimple in space, much like that which one would get when placing a heavy ball bearing on a sheet of rubber.

Certain massive stars, when they run out of fuel, can no longer hold themselves up under their own gravity; they collapse. Their gravity becomes ever more intense, and the curvature of space becomes so great that nothing can escape – even light. This gives rise to a *black hole*.

The crux of general relativity is that matter tells space how to curve, and space tells matter how to move. Space is no longer to be regarded as the passive stage on which the actors – material objects and light – perform their drama. Space itself becomes a performer.

Bearing in mind how we were led by special relativity to conclude that space and time constituted a four-dimensional spacetime, we must further conclude that we ought not to be thinking solely of a curved space but rather of *curved spacetime*. The time axis together with the three spatial axes is all affected by the presence of the gravitating body. This gives rise to

a phenomenon known as the *gravitational redshift*. It means that time runs at different rates in the presence of gravity. It runs slightly slower downstairs than it does upstairs. This effect has been verified experimentally by flying a precise atomic clock in an airplane and comparing it with an identical one on the ground. The effect is normally very tiny, but in the extreme case of a black hole, at the edge of the hole (called its *event horizon*), time actually comes to a halt.

Now you might be thinking that this is all very well: replacing the notion of gravitational forces with that of a curved space or spacetime. But is this not just a matter of personal preference as to how one chooses to see things? Can one not stick with the Newtonian idea of gravity forces if one wishes?

In most everyday situations, Newton’s theory holds to a level of precision that is perfectly adequate. Even when computing the orbits of satellites, it is fine to use the familiar inverse square law of gravitation. Mathematically, Newton’s theory is much easier to handle than general relativity. For this reason alone, physicists will go on talking about gravity forces and will use Newton’s law. Nevertheless, they know that the general theory of relativity provides the more accurate predictions and is a superior way of understanding the physics. Newton’s law, while being a useful “recipe” for solving most problems – those involving weak gravity and speeds much less than that of light – offers little insight as to what is really going on.

Relativity and Religion

It has long been recognized that God’s relation to time could be different from ours. Although we interact with God *in* time – for example, when we engage in intercessory prayer – it is also believed that God is, in a sense, *beyond* time – he is transcendental; he is unchanging. But this raises a difficulty: If he never changes, what is the point of asking him for anything; our request will not change his mind.

Furthermore, it is held by Christians that God has foreknowledge – he knows the future.

This has never been easy to accept. After all, how can God know the future before I and everyone else have made up our minds as to what we shall do? Surely God could only have such knowledge if humans were nothing more than totally predictable automatons. What then of our supposed free will? For this reason, it is understandable that many people – including those theologians called “process” theologians – reject this claim. And yet, God’s foreknowledge is part and parcel of orthodox Christian belief. It is what gives believers added confidence in the assurances from God that all in the end will be well for those who love him. It is not a case of God having a better judgment as to what the future might contain; he actually *knows* the future – so it is claimed. If we are somehow to accommodate these strange ideas about God in relation to time, then our commonsense notions of time need a shake-up. And that is what relativity theory does with its conception of spacetime.

According to this block universe idea, all of time exists on an equal footing, past, present, and future. Though we do not ourselves have access to that future, in some sense it is held to exist – it is waiting for us to come across it and experience it consciously. That would seem to make it easier to believe in a God who might not be subject to such a constraint – a God who, in addition to being imminent in the world, interacting with us in a dynamic day-to-day relationship, can also adopt a transcendental viewpoint from which to take in the broad sweep of the whole of the spacetime reality.

Does acceptance of spacetime compromise our sense of free will? Not necessarily. One can regard all the events of our life, etched into the fabric of spacetime, as being a record, much like some video recording. The existence of a video recording of some sequence of events does not, of course, detract from the recorded incidents being actions freely undertaken at the time. In the same way, the transcendental record of our lives as they exist in spacetime consists of freely taken decisions.

How can asking God for anything *in* time affect the outcome when the future, in *physical* terms, is fixed – set in concrete? This in fact poses no problem if one believes God has

foreknowledge and has therefore been able to build the answer to the prayer into the fabric of spacetime. Indeed, some religious people think nothing of praying for events that have already happened, but about which they do not as yet know the outcome. They do so confident that an all-knowing God will be aware that such a prayer will be offered up later and so takes that into account in determining the outcome.

One final thought: resurrection. What gets resurrected when we die? How were we at the very end of our life? Unfortunate for those who end up with Alzheimer’s or some other debilitating disease, but with spacetime, all instants of time are present to God. Our childhood is just as vivid to God as any other time. That being so, why would God resurrect only the final point of our life story? He might prefer the way we used to be rather than how we subsequently turned out! Why not in some sense raise the whole of one’s life? That would make for a rather strange resurrection “body.” But no one knows what kind of “body” we shall have anyway. Thoughts of a block universe can really transform one’s thinking about what can and cannot be done.

Cross-References

- ▶ [Cosmology](#)
- ▶ [Energy in Physics](#)
- ▶ [Gravity](#)
- ▶ [Physics in Christianity](#)
- ▶ [Space](#)
- ▶ [Space and Time](#)

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Relativity Theory

- [Space](#)
- [Time](#)

Religion

- [Modernity in Buddhism and in Islam](#)

Religion and Pseudoscience

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Related Terms

[Pathological science](#); [Quasi-science](#)

Pseudoscience is False Science

Pseudoscience means false science. In a strict sense, the term refers to *teachings that contradict science but are nevertheless presented as scientific*. In a wider sense, pseudoscience also covers teachings that contradict science even though they are not presented as scientific. In this wider sense, a pseudoscience is *a doctrine that is claimed to represent the best available knowledge on some particular subject matter but does not do so because it contradicts legitimate scientific knowledge*. An astrologer who

makes false scientific claims in favor of astrology pursues pseudoscience in both senses. An astrologer who repudiates science and claims that astrology is better than science pursues pseudoscience in the wide but not in the strict sense.

The conflict between science and pseudoscience only arises in areas where scientific knowledge is obtainable. Science cannot determine how best to perform Johan Sebastian Bach's music, since this is a matter of taste and not of science. For analogous reasons, standpoints on ethics, metaphysics, and religious faith that do not concern scientific subject matter cannot legitimately be labeled as pseudoscientific.

The Demarcation Problem

Philosophers of science have proposed various criteria for the *demarcation* between science and pseudoscience. The most famous of these is Karl Popper's (1902–1994) criterion that in order to be scientific, a statement has to be falsifiable. By this it is meant that it must be possible to specify some (hypothetical) empirical evidence that would be sufficient reason to give it up. Imre Lakatos (1922–1974) put forward a modified version of Popper's criterion. In his view, the demarcation criterion should not be applied to an isolated hypothesis or theory. Instead it should refer to a whole research program that is characterized by a series of theories successively replacing each other. Science is characterized by each new theory having a larger empirical content than its predecessor; pseudoscience violates this criterion. Thomas Kuhn (1922–1996) suggested a radically different demarcation criterion, namely, that science must be capable of puzzle-solving. George Reisch (b. 1962) proposed that scientific disciplines are characterized by being adequately integrated into the other sciences.

More complex, multi-criteria demarcation criteria have also been put forward. Robert K. Merton (1910–2003) characterized science as ruled by an ethos with four institutional imperatives: Science should be based on universal, impersonal criteria of truth (universalism). It should proceed through social collaboration and therefore belong to the community rather than to

individual persons (communism). It should have institutional control mechanisms to curb the effects of any personal or ideological motives that individual scientists may have (disinterestedness). Finally, it should allow detached scrutiny of beliefs that are dearly held by other institutions (organized skepticism).

Many authors who are practically concerned with exposing pseudoscience have proposed multi-criteria lists consisting of common traits of pseudoscience, such as belief in authorities, non-repeatable experiments, unwillingness to test one's own theory, disregard of refuting information, etc.

In spite of this diversity in demarcation proposals, there is virtual unanimity among scientists in most particular issues of demarcation. There is widespread agreement, for instance, that astrology, homeopathy, ancient astronaut theory, creationism, and Holocaust denialism are pseudosciences. In spite of a few points of controversy, for instance, the status of Freudian psychoanalysis, the general picture is one of consensus rather than controversy in particular issues of demarcation. The reason for this seems to be that most pseudosciences deviate from science to such a large extent that they fail by multiple criteria. For the same reason, much less than a complete characterization of the borderline between science and pseudoscience is needed to characterize most cases of pseudoscience (Hansson 2009).

Most writers on the demarcation issue agree that the demarcation between science and pseudoscience changes as science progresses. Yesterday's science, now refuted, can be today's pseudoscience. Shifts in the opposite direction occur, but much more rarely.

Pseudoscience and Religion

Pseudoscience can have many types of motivations, e.g., personal, political, and religious ones. In modern societies where science is perceived as having more authority than what religion has, the prospect of proving one's religious standpoints with science may appear attractive. Attempts to do so can be found in virtually all religions, but they tend to be particularly common in new

religious movements. Some of the practices in movements such as New Age are based on magical beliefs that are at the same time criticized by scientists for being pseudoscientific and by theologians for being superstitious or pseudo-religious. Attempts at scientific verification of religious beliefs often have their origin in religious doubt; neither the firm believer nor the firm disbeliever needs empirical verification.

In secularized societies such as Western Europe and antireligious societies such as China, religious beliefs have sometimes been presented as science in order to further their acceptance. Anthroposophy has extensive teachings on reincarnation, and recognizes many supernatural beings, but denies being a religion and instead describes itself as "spiritual science." In China, Qigong has been cleansed of spiritual elements and presented as a science-based practice. Conversely, in some social circumstances, there may be advantages to gain from being identified as a religion. Scientology, whose extensive pseudoscientific teachings contain comparatively few religious elements, puts much emphasis on being a religion and a church. Such a classification has substantial advantages, legally and taxation wise, for the movement in question, but it is not obvious that self-attributions of this nature should be taken for granted in scholarly assessments of a movement.

Some pseudoscientific movements, such as UFO movements focusing on their leaders' alleged encounters with aliens, have characteristics in common with religions but are usually not classified as such. There are also examples of pseudoscientific assertions *about* religious subject matter that are not part of any religious strivings. Claims that Dan Brown's novel *The Da Vinci Code* represents actual facts about Christianity belong to the clearest examples of this.

From the viewpoint of religious purpose, religiously intended pseudoscience can be divided into four main categories:

1. Alleged scientific proof of the literal veracity of Scriptures or traditional dogmas
2. Alleged scientific proof of the authenticity of venerated physical objects

3. Alleged scientific proof of afterlife or the existence of nonhuman spiritual beings
4. Alleged scientific proof of divine interference or the spiritual powers of humans

In what follows, major examples from each of these categories will be discussed.

The Veracity of Scriptures and Traditional Dogmas

Creationism, one of the largest and most influential pseudoscientific movements, attempts to prove that biological evolution did not take place. In its place creationists promote accounts of the origin of species that are compatible with their literalist interpretation of Scripture. In much the same vein, archeological evidence has been misrepresented to make it confirm scriptural narrations. In recent years, attempts have also been made to find scientific justification for traditional religious views related to human reproduction, in particular views negative toward homosexuality.

Creationism has its origin in American Protestant biblical fundamentalism. Although theological critique of evolution was expressed in the nineteenth century, evolution did not become a major issue until around 1920. At that time, the teaching of evolutionary biology became more widespread due to the rapidly increasing number of public high schools. In the first phase of the movement's history, its goal was to ban the teaching of evolution. However, in 1968, the US Supreme Court ruled that state legislation banning the teaching of evolution was unconstitutional (*Epperson v. Arkansas*). In the years that followed, the creationist movement adjusted their tactics to this decision. This led to a second phase in their history, when the primary goal was to make it legally required for biology teachers to devote equal time to evolution and so-called creation science. In 1987, the Supreme Court ruled that such a regulation was illegal since it was intended to advance a particular religious view (*Edwards v. Aguillard*). After that, the creationist movement made a new adjustment, entering a third phase in which "intelligent design" was the catchword. God was replaced by an unidentified "intelligence," but the argumentation against evolution was

essentially the same as in the previous phases. In 2005, this third strategy met the same fate as its two predecessors: It was defeated in a federal court. The court found that "intelligent design" was just a new guise for religiously motivated creationism. Therefore, it was unconstitutional to require that biology teachers read aloud a statement promoting intelligent design before teaching evolution (*Kitzmiller v. Dover Area School District*). The creationist movement is now in a fourth phase in which none of its previous three strategies are legally viable. It is as yet unclear what its future strategy will be (Matzke 2010).

There are two major creationist factions: young earth creationism and old earth creationism. According to the former view, all species that have ever lived on earth were created separately by God in the course of 6 days, not more than about 10,000 years ago. Proponents of the latter view believe that all species (or "kinds") were created separately but on a longer time scale. Old-age creationists steer clear of most of the conflicts that young earth creationists have with geology, physics, and astronomy in issues concerning the age and development of the earth and its geological structures. However, the two types of creationism share the same conflicts with biology since they both deny the overwhelming paleontological and genetic evidence of biological evolution and of the common origin of all living species.

Creationist argumentation consists largely in reinterpretations of selected parts of the paleontological evidence. In addition, considerable efforts have been spent on attempts to show that the mutations required for the development of complex organs are too improbable to be credible. Hence, it is claimed that the eye could not be the result of mutations – it is a highly complex organ, and if only one of its many essential parts is missing, then it would be of no use to the individual. However, biologists have shown how the eye has developed in small steps from simple light-sensitive cells to eyes similar to ours (that first appeared around 540 million years ago). Each step in this development provided a functional advantage over its predecessor that

explains its evolutionary success (Young and Edis 2006).

Although creationism originated in Christianity, it has spread to Judaism and Islam. Both these transferred versions rely heavily on pseudoscientific arguments from American Christian fundamentalism. Islamic creationism is particularly strong in Turkey.

Biblical archeology. Since the middle of the nineteenth century, attempts have been made to prove the veracity of biblical narratives with archeological means. The so-called biblical archeological school, founded by William F. Albright (1891–1971), interpreted a wide variety of archeological findings as confirmations of the Bible. This approach was popularized by Werner Keller (1909–1980) in a mass-market book, *The Bible as History* (German original in 1955). In the second half of the twentieth century, this approach was persistently criticized by academic archeologists, and it is now academically marginalized. Research by the British archeologist Kathleen Kenyon had an important role in these discussions. In the 1950s, she performed methodologically outstanding excavations at Jericho that resulted in reliable stratigraphic dating. Previous excavators had found traces of a military defeat of Jericho and concluded that they resulted from events described in the Bible. Kenyon showed that the events inferable from the archeological evidence took place much earlier than the Biblical events.

Other alleged archeological proofs of scriptural accuracy have been similarly refuted, but outside of academia, attempts to obtain such proofs still take place. Probably the most popular objective of such ventures is to find Noah's Ark. Claims have repeatedly been made that the vessel has been found on Mount Ararat, but none of these identifications have withstood critical scrutiny.

Mormon archeology. The Book of Mormon that was introduced in 1830 has given rise to a considerable amount of spurious archeology. Latter Day Saints have tried to prove the veracity of the book's claim that people from the Middle East traveled to America and settled there around 600 B.C. Attempts have been made to associate

various historical monuments and other findings in America with the narratives in the Book of Mormon, but there is consensus among archeologists that these interpretations are not credible. Factual inaccuracies in the Book of Mormon, such as claims that horses and elephants existed at America at times when they did not, have contributed to bringing the Mormon version of American history into academic disrepute. In addition, the claim that American Indians largely descend from migrants from the Middle East contradicts the solid genetic evidence that has recently been obtained, showing that the indigenous American population came from Asia.

Sexual reorientation therapies. Christian, Mormon, Jewish, and Muslim organizations that consider homosexuality to be sinful have created organizations working to convince gay and lesbian persons to reform themselves. In particular in the USA, they offer sexual reorientation therapy, often in combination with religious efforts. Mainstream psychiatric and psychological organizations have criticized this type of therapy. They consider it to be both pseudoscientific and unethical, and this for three major reasons: lack of evidence that homosexuality is a mental health problem in need of treatment, lack of evidence indicating long-term success of such treatment, and risks of negative effects of the intervention (Grace 2008).

The Authenticity of Venerated Physical Objects

Relics are either bodily remains or objects that have been in contact with a holy person. Relics have an important role in Buddhism, Catholic and Orthodox Christianity, and to a smaller extent also in Hinduism and Islam. The authenticity of a relic is usually seen as a prerequisite for its veneration. In some cases, attempts have been made to prove the authenticity of a relic with scientific means. The most famous example when this has led to pseudoscience concerns the shroud of Turin.

The shroud of Turin is a 4-m long cloth of linen that carries what seem to be the imprints of the front and back of a crucified man. It is kept in the Cathedral of St. John the Baptist in Turin

where it is venerated as the burial cloth of Jesus Christ. The earliest known record of its existence dates from the middle of the fourteenth century. It was then kept in a church in Lirey in France. In a letter to (anti)pope Clement VII in 1389, the French Bishop Pierre d'Arcis reported that the Dean of the church of Lirey had acquired "a certain cloth cunningly painted, upon which by a clever sleight of hand was depicted the twofold image of one man, that is to say, the back and front." The Dean was "falsely declaring and pretending that this was the actual shroud in which our Saviour Jesus Christ was enfolded in the tomb." In order to attract pilgrims "so that money might cunningly be wrung from them, pretended miracles were worked, certain men being hired to represent themselves as healed at the moment of the exhibition of the shroud." However, his predecessor Henri de Poitiers had performed an investigation and then "discovered the fraud and how the said cloth had been cunningly painted, the truth being attested by the artist who had painted it, to wit, that it was a work of human skill and not miraculously wrought or bestowed." Clement VII decided that the shroud could only be exhibited if it was announced that "it is not the True Shroud of Our Lord, but a painting or picture made in the semblance or representation of the shroud."

After a period of private ownership, the shroud was transferred to Turin in 1578. Its modern prominence began in 1898 when it was first photographed. The supposed imprint appeared more clearly on the photographic negatives than in direct inspection of the cloth. In the 1970s, scientific investigation of the cloth was undertaken. Some of the investigators made pro-authenticity claims that could not be substantiated, e.g., claims that pollen grains from plants that grew only in Palestine had been found on the cloth.

In 1988, the outcome of carbon dating of the cloth was reported. Three independent laboratories had analyzed samples, and they had all obtained dates between 1260 and 1390. This is compatible with Pierre d'Arcis's report but not with the theory that the cloth is authentic. However, some "shroudologists" have questioned the dating, claiming, for instance, that a burst of radiant energy

at the moment of Christ's resurrection had changed the carbon ratio. Such a radiological process has as little support in physical science as it has in evangelical and traditional Christian accounts of the resurrection.

Early shroud advocates claimed that the picture had been produced on the cloth by contact with sweat, blood, and ointments. However, such contact would not give rise to the distinct picture that is seen on the shroud. Furthermore, a direct imprint of a face would be distorted in a way that the picture on the shroud is not. Modern investigators have shown one way in which the shroud could have been produced by a medieval artist, namely, by rubbing of the cloth on a bas-relief sculpture. There is no evidence that this method was actually used, but its availability shows that the shroud could in fact have been "cunningly painted" as d'Arcis reported it to have been (Nickell 2007).

Afterlife and Nonhuman Spiritual Beings

Attempts to contact the spirits of the deceased and other spiritual beings have a long tradition, although religious authorities in some of the major religions have condemned such practices. The surge of spiritualism in the late nineteenth century Northern America and Europe was accompanied by endeavors to authenticate séance room phenomena. Attempts to prove the reality of reincarnation have primarily been based on reports on alleged past-life memories.

Scientific spiritualism. In 1848, Kate and Margaret Fox, two young sisters in Hydesville, New York, appeared before the public as spirit mediums. In their presence, spirits communicated through knocking sounds. (Later, Margaret Fox confirmed that these sounds were produced by natural means such as the cracking of joints.) This was the impetus of a rapidly growing movement, and a large number of mediums came forward. The usual format was a spiritualist séance that took place in the dark. The medium conveyed messages purportedly emanating from the spirits of deceased persons, usually relatives of the séance participants. A variety of so-called physical phenomena flourished in the darkness of the séances, such as levitation, table-lifting, and "materialized" spirits.

In the late nineteenth and early twentieth centuries, spiritualism had several million practitioners, i.e., participants in séances. However, the movement was severely damaged by a series of exposures. Critics and ex-mediums explained how the physical phenomena were produced. (The creation of illusions requires much less skill in a dark room than on the illuminated stage of the performing illusionist.) It was also revealed how mediums cooperated by providing each other with information about séance participants and their deceased relatives. In the 1920s, spiritualism lost most of its appeal and influence (Brandon 1983).

Spiritualism attracted the attention of scientists and scholars of different persuasions; some were critical of spiritualism whereas others hoped for scientific evidence of afterlife. The Society for Psychical Research was formed in London in 1882, and the corresponding American organization 3 years later. Scientific investigations caused problems for many mediums whose physical phenomena were exposed. On the other hand, a significant amount of pseudoscience was also produced. In particular, some scientists lacking competence in the art of magic illusions declared trivial darkroom illusions to be genuine spiritual phenomena. When standard scientific criteria of evidence have been applied, no proof of spiritualist phenomena has been obtained.

Since the 1930s, investigators have largely lost interest in séances and mediums. Psychic research has developed into parapsychology that has its focus primarily on alleged phenomena such as telepathy, clairvoyance, precognition, and psychokinesis (the act of moving an object with the unaided power of mind). These phenomena have weaker connections with religion than the classical séance room phenomena. Due to the lack of a phenomenon that can be shown in experiments satisfying standard criteria such as repeatability, parapsychologists have not been able to convince mainstream science that their objects of study exist.

Weight of the soul. In 1907, the American physician Duncan MacDougall (c. 1866–1920) reported investigations on six patients who had all consented to spend their last hours in a bed placed on a large scale. He reported an average

weight loss of 21 g in the course of dying. Similar studies on 15 dying dogs showed no such weight loss. This was taken to indicate that humans differ from dogs in having a soul weighing about 21 g that leaves the body at the moment of death.

However, the experiment was so badly executed that no conclusions can be drawn from it. The method of weighing was not reported but appears to have been grossly inaccurate. The time of death was also uncertain in several cases. The experiment is scarcely taken seriously today. This is partly due to its pseudoscientific character, partly also due to the combined scientific and religious difficulties with the concept of a soul with a weight.

Reincarnation. Interest in reincarnation was stimulated in the West by spiritualism and by the theosophical movement. Some psychical researchers made studies of persons who appeared to have memories from earlier lives. Such endeavors were intensified in the second half of the twentieth century, largely through the work of Ian Stevenson (1918–2007) who made a large number of case studies. Most of these concern children between the ages of 3 and 7 years who reported memories from previous lives. Attempts were made to corroborate these narrations by identifying the deceased persons in question and comparing the narrations to what was known about their lives. Stevenson also put much emphasis on findings of birthmarks in places where the previous person had been injured. However, despite extensive search for convincing cases, none has been found that defies natural explanation.

Other parapsychologists have used hypnosis to bring forth hidden memories from previous lives in adult persons (so-called past-life regression). The most famous of these cases was the “Bridey Murphy” case. An American woman, hypnotized in 1952, reported having lived as an Irishwoman in the early nineteenth century. According to the hypnotist, her knowledge of Ireland was unexplainable, except by reincarnation. However, further investigations revealed severe inaccuracies in the reporting of this case.

The major problem with hypnotic past-life regression is that false memories are easily created under hypnosis. Such memories are at least as vivid as real memories, and once they are

created, the subject cannot distinguish them from real memories. Due to information that the subject has, for instance, from historical films and books, hypnotically induced past-life narratives often appear to be historically credible. However, on closer scrutiny, inaccuracies have been found even in seemingly impressive past-life “recollections”; these narrations correspond better to today’s popular views of previous periods than to what life was really like in these periods.

In summary, neither the “memories from previous lives” obtained from children nor those obtained under hypnosis from adults have features that require a nonnatural explanation. Claims that reincarnation has been scientifically proved will therefore have to be classified as pseudoscientific (Edwards 2002).

Divine Interference and Spiritual Powers

Pseudoscience has often been invoked in support of claims that divine or other supernatural interference takes place in a way that interrupts the flow of naturally caused events. Such claims differ in how much emphasis they put on the causal role of deity, respectively, that of the (gifted) human beings who bring forth such interventions. At one end of this continuum, we find accounts of divine interventions in the form of miracles that are initiatives by God. At the other end, we find individual persons (mediums or psychics) who are reported to be in command of spiritual powers. Many of latter type of cases can be described as modern forms of magic.

Miracles. A miracle is a fortuitous event, not following the ordinary causal laws, that is attributed to deity. Miracles have a place in most major religions. In most cases, healing from disease is the most important form of miracle that is recognized. However, judgments that such a miracle has been proven tend to be problematic from the viewpoint of medical science. Religious authorities often take the lack of any known natural explanation of a cure from a disease as proof that a miracle has taken place. Such an inference disregards the natural phenomenon of spontaneous remission from serious diseases.

Attempts have been made to scientifically validate the efficacy of praying for the health of

another person. In such studies, severely ill persons have been randomized between groups that were subject to prayers and groups that were not, and the medical outcomes with and without prayers were statistically compared. The results from these studies are contradictory, and many of them have methodological limitations. The largest and methodologically one of the best of these studies failed to show any positive effect of prayer, but a (unexplained and possibly spurious) negative effect was found of knowing that one was prayed for (Benson et al. 2006). Obviously, these studies make use of a problematic concept, namely, that of divine interventions that can be controlled and randomized.

Some alleged miracles are much less purposeful than recovery from disease. Weeping and drinking statues and the liquefaction of congealed blood are examples of this. Such miracles usually have less support from religious authorities. In most of these cases, no attempts are made to invoke science in support of the miracles, but scientifically minded critics have nevertheless been keen to point out the possibility of pious fraud or other natural explanations (Nickell 1992). Religiously motivated skepticism against some of these phenomena has referred to difficulties in explaining why deity would choose such trivial demonstrations.

Psychic powers. Individuals have tried to prove their spiritual powers by demonstrating a variety of so-called psychic abilities. Some of the phenomena that have been used for such purposes in close connection with organized religion are fire immunity, handling of poisonous snakes, eating poison, survival for long periods without food (inedia), and levitation. At longer distance from organized religion, a large variety of physical phenomena explainable as legerdemain have been used to prove the special powers of (self-)chosen individuals. As yet, none of these phenomena have been produced under controlled conditions that exclude sleight of hand or other natural explanations. Attempts to prove their genuineness have often resulted in pseudoscience.

Science, Pseudoscience, and Religion

In view of the last century’s experience of pseudoscience and its connections with religion, the

traditional picture of the relationship between science and religion needs to be modified. The prevalent view is that science creates problems for religion. In the modern age, it is much more commonly pseudoscience that creates serious problems for religion. Creationism and other forms of religiously motivated pseudoscience unnecessarily transform religion to a falsifiable set of doctrines, doing thereby a disservice to religion as well as to science. Fortunately, there is an antidote against pseudoscience. It is called science.

Cross-References

- [Alchemy](#)
- [Astrology](#)
- [Creationism](#)
- [Intelligent Design](#)
- [Magic](#)
- [Philosophy of Science](#)
- [UFO Cults](#)

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Religion as Attachment

- [Attachment: Theory and Patterns](#)

Religion, History of

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Related Terms

[Religionswissenschaft](#)

Description

The term “history of religions” described a type of scholarship in the study of religions that incorporates multiple methodologies in order to gain a better understanding of the many varieties of religious belief, practice, and expression. Typically, the discipline traces its roots to F. Max Muller who developed what he called *Religionswissenschaft*, or the “science of religions.” Muller used this term to indicate a study of religion that was “scientific,” that is, removed from questions of personal belief. When translated to English, Muller’s term most commonly became known as the “history of religions.” Alternate terms for “history of religion” that have been used (though not always considered interchangeable by all scholars) include “the academic study of religion,” “comparative religion,” “the phenomenology of religion,” and sometimes simply “the study of religion” (Kitagawa 1959; Capps 1995).

In describing and analyzing religions, most historians of religion came to acknowledge that the task needs to be self-reflective; since a purely objective perspective is an impossibility, the scholar’s subjectivity contributes importantly – whether harmfully or benevolently – to the study itself. As historian of religions, Jonathan

Z. Smith has famously stated that “religion is solely the creation of the scholar’s study...For this reason...the historian of religion must be relentlessly self-conscious” (Smith 1982). Yet this self-consciousness does not make the discipline of the history of religions solipsistic. Instead, historians of religion locate *themselves* within the study of religion and thus can honestly assess religious phenomena by acknowledging their own gains from these studies. Only by doing this can the study of the history of religions become relevant and significant to the self and others. As Charles Long has written, “It is [the] reciprocal criticism of self and other which permits the interpolation of the phenomenon into our lives” (Long 1986).

More recently, the history of religions has turned this self-consciousness upon the discipline itself. By uncovering the ethically questionable methods and goals used by the discipline in the past, contemporary scholars hope to illuminate the ways that the concept of religion continues to be meaningful for human beings. For example, David Chidester has suggested that viewing religions is dynamic rather than static human endeavors (Chidester 1996). Perspectives such as these may help to cultivate a sense of humility and fallibility that could contribute to better studies of religion in the future. In thus “complicating” rather than “clarifying,” the historians of religions “celebrate the diversity of manners, the opacity of things, the variety of species” (Smith 1978).

Self-identification

Science

The history of religions is a subcategory within the human sciences; the term “human sciences” is not one that is commonly used today, more frequently such human sciences are counted among the social sciences or the humanities/humanistic studies. According to Joseph Kitagawa, translating F. Max Muller’s term *Religionswissenschaft* as “science of religions,” never gained popularity among English-speaking scholars due in part to the fact that “the English word ‘science’ tends to

be misleading”; it typically refers to the biological, physical, chemical sciences, rather than to the “human sciences” (Kitagawa 1959). As science in the broad sense, the history of religions seeks to comprehend religions from as objective a stance as possible. Yet as a *human* science, the history of religions recognizes that objectivity is, in fact, impossible, and it acknowledges that the subjective position of the scholar is both inevitable and of central importance to the study of religion itself (Wach 1967).

Religion

The history of religions seeks to critically analyze and comprehend religious traditions, beliefs, practices, and texts rather than instill or actualize religious experiences or expressions.

Characteristics

The distinctiveness of this discipline lies in its ability and propensity to synthesize and make use of multiple methodologies in order to contribute to a richer understanding of human experience and creativity. While specific methodologies, such as psychology, philosophy, theology, sociology, etc., may be used in order to study religions, the historian of religions typically does not limit herself to an isolated or singular methodology, but works to gain understanding of the phenomena of religions through a synthesis of methodological practices. The history of religions is also a distinctive discipline in its subject of study; it examines the complex and multiple ways that humans have sought to creatively and meaningfully make sense of the world through practices and beliefs categorized as religious.

Relevance to Science and Religion

Some historians of religion would be interested in the area of “science and religion” insofar as some religions or subjects of study within the discipline might themselves be interested in the interactions between science and religion. Another impetus

for interest in this area might come more clearly from the historian of religions herself; if a historian of religions has a specific interest in relationships between science and religion, this interest may inform and dictate not only the subject but also the methodology used in analyzing that subject.

Sources of Authority

As some scholars of religious studies have noted, the study of religion could be considered a “field” rather than a “discipline.” From this perspective, it means that the “field” of religious studies makes use of a variety of methodologies of other disciplines in order to assess religion(s). The history of religions would certainly fall under this conceptualization. Thus, there are numerous sources of authority, and whether a source would be considered authoritative would depend upon the methodologies employed by a particular historian. There are two main ways to conceptualize “authoritative sources” in the history of religions. (1) In general, authoritative sources for the history of religions would include religious and theological texts, commentaries on such texts by religious practitioners, personal accounts of religious experiences, observations of and interviews with religious practitioners, and examinations of material cultures. These sources would be considered authoritative only insofar as they might be considered exemplars of a particular form of human creativity and religious expression or experience; such sources are not necessarily considered authoritative because of the personal religious or ethical perspectives of the scholar. (2) Another way to identify authoritative sources within the history of religions would be to consider the contributions and perspectives of important past historians of religion. Yet contemporary scholars of the study of religion are frequently critical of their forebears in the discipline while acknowledging the significance of such earlier contributions. Thus, contemporary scholars often grant more authority to the findings of contemporary colleagues in recent journal

articles and book publications in the discipline as they seek to continually improve and enlarge the discipline itself.

Ethical Principles

The genealogy of the ethical principles that guide the discipline of the history of religions can best be located in the Enlightenment. The “Enlightenment impulse,” according to Jonathan Z. Smith, “was one of tolerance and, as a necessary concomitant, one which refused to leave any human datum, including religion, beyond the pale of understanding, beyond the realm of reason.” Thus, the history of religions has at its core the desire to know and appreciate the creativity of human beings as they attempt to make sense of their places in the world. Much contemporary scholarship in the history of religions has sought to uncover the problematic realities of such Enlightenment impulses, including an examination of the relationship between often violent colonial and imperial enterprises and the early history of the discipline. The ethical principles guiding such developments stem from a desire to reduce the ideological and sometimes physical violence common in encounters between cultures and individuals. Of course, such an ethical perspective still contains the core Enlightenment goal of attempting to understand humanity and the world at large. In more contemporary scholarship, however, this impulse acknowledges the fact that such understanding will always be partial and temporary. See, for example, Jonathan Z. Smith’s *Imagining Religion* (Smith 1982) and *Relating Religion* (Smith 2004) and David Chidester’s *Savage Systems* (Chidester 1996).

Key Values

The key values of the discipline of the history of religions are those of the Enlightenment, which sought to increase both understanding of human religious experiences and tolerance for different cultures, societies, and individuals. For more explanation, see [Ethical Principles](#) above.

Conceptualization

Note on the Definitions

In its current state, the history of religions does not so much seek to create overarching definitions for such terms as to examine the varying ways in which human beings have conceptualized these terms and understood them as meaningful and diverse. Therefore, these terms would be defined anew each time they are reconsidered in culture and scholarship.

Nature/World

Typically refers to the natural environment in which human beings formulate meaning and significance.

Human Being

Typically refers to *Homo sapiens*. Human beings are usually understood as being central to religious creativity.

Life and Death

Conceptions vary widely depending on religio-historical context.

Reality

May be visible (the natural environment), invisible, or a combination of both. The place toward which humans seek to orient themselves in meaningful ways.

Knowledge

Information gained about reality.

Truth

Verified or authentic knowledge. May be accessed by a person to help that person orient themselves to reality.

Perception

One method by which humans gain knowledge about the world, or the knowledge gained from that human activity.

Time

Conceptions vary widely depending on religious context.

Consciousness

The state of being conscious or aware; usually implies some awareness of one's place in the world.

Rationality/Reason

One method by which humans gain knowledge about the world.

Mystery

Something unknown or only partially knowable; may possess religious significance.

Relevant Themes

Additional issues as regards the history of religions' engagement with science and religion would be study-specific; that is, issues and themes would be particular to a specific historian's scholarly concerns. See [Relevance to Science and Religion](#) above.

Cross-References

- ▶ [Critical Theory](#)
- ▶ [Cultural Studies](#)
- ▶ [History of Ideas \(Intellectual History\)](#)
- ▶ [Philosophy of Religion](#)
- ▶ [Religion, Sociology of](#)
- ▶ [Religion, Theory of](#)
- ▶ [Religious Experiences](#)
- ▶ [Religious Studies](#)
- ▶ [Worldview](#)

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Religion, Sociology of

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Related Terms

[Role of religion in society](#); [Sociology and religion](#)

Society and Religion

► [Sociology of religion](#) is a social science that studies the religious phenomenon. There has been much discussion of possible definitions of sociology of religion, and of ► [religion](#) in particular as an object of sociological study. Generally, a distinction is made between a substantive and a functional approach. The substantive approach may be exemplified by Durkheim (1915) when he speaks of “beliefs and practices” as the ground of the “moral community” called a “church.” Luckmann (1967) is said to demonstrate the functional approach when he refers to “symbolic universes” as “socially objectified systems of meaning” by way of “social processes” considered as “fundamentally religious,” which lead to the “formation of the Ego” and the “transcendence of biological nature.”

However, when we make a thorough exploration of Durkheim’s and Luckmann’s writings, we

observe that Durkheim is also alive to function (religion helps solidarity), and that Luckmann is not only concerned with function (religion is a conception of the world made up of specific contents). Thus, in reality, those quoted as exemplary champions of one or other perspective emerges as more possibilistic and open to less rigid, more polyvalent formulations. In short, contents and functions are inseparable and should rather be considered as a unique whole which permits realizing much more complex and interconnected analytical and interpretative procedures.

For example, we might start from the idea that the meta-empirical referent in attributing meaning to human existence is a particular characteristic of religion. At the same time, however, it is sensible to leave an opening also for responses which do not envisage an explicit referral to the dimension of the empirical non-verifiability and the inaccessibility of direct experience. Thus, a meta-empirical referent would possess a merely indicative character. There is no conflict between the transcendent level and that of the real. It is rather as though we were to look at the same object from two different viewpoints; the canalizing of a non-human presence within reality. One vision does not exclude the other. They are not in opposition and indeed at times they may converge on the same conclusion – the understanding-explanation of life in a religious key.

Thomas Luckmann’s theorization regarding the “invisible religion” (Luckmann 1967) has attracted much attention on the part of sociologists, even though it has not always brought scientific consensus. The idea of a functional substitution of church religion by a series of topics, such as “individual autonomy, auto-expression, auto-fulfillment, mobility ethos, sex, and familism” has developed parallel to the theory of secularization.

Luckmann further believes that the modern sacred cosmos has a relative instability depending on the various social strata in which it is active, as proof of its internal incoherence and disarticulation. In fact, Luckmann reminds us that traditional, customary religious themes are

re-ordered in the orbit of the secular and the private, especially by the young and urban dwellers. Thus, Durkheim's prediction of a wholly individual religion would seem to come true.

Robert N. Bellah and collaborators (1985, 1996) define the intensification of individualism by the term "Sheilaism," as a wholly personal religious form which can, thus, take the name of the person who embodies it (Sheila Larson). "I believe in God. I'm not a religious fanatic. I cannot remember the last time I went to church. My faith has carried me a long way. It is Sheilaism. Just my own little voice." On the other hand, as Bellah makes clear, religious individualism may be present in "church religion" itself, but historic roots go back in time, in the exemplary case of Anne Hutchinson, to the eighteenth century. She "began to draw her own theological conclusions from her religious experiences and teach them to others, conclusions that differed from those of the established ministry." Still more typical is the religious individualism shown by Tim Eichelberger: "I feel religious in a way. I have no denomination or anything like this." For these subjects, as in invisible religion as hypothesized by Luckmann, one of the main objectives is "self-fulfillment," and perhaps in Freud's terms the *Ich-Leistung*, the autonomy of the individual.

Bellah's "civil religion" has not really been taken into consideration because of the ethnocentric perspective of the sociological reading of the "religious dimension" which is specifically applicable to United States society. It is a well-known fact that Bellah attaches major importance to a series of beliefs, symbols, and rituals which have not removed the religious factor from politics. The contents of this kind of "civil religion" are furnished by the perception of a universal reality bearing religious characteristics which are reflected in a people's initiatives, especially those referring to biblical concepts: exodus, chosen people, new Jerusalem, sacrifice, etc. The religious element often acts as a unifying factor among individuals or groups otherwise in contrast. Religious identity can, thus, partly make up for the lack of a national identity. Seen from this

dimension, "civil religion" was held to be the unifying element which made possible the birth and development of the United States of America.

The Berger and Luckmann (1966) lesson remains authoritative: the social construction of reality is the basis from which the value system branches out, a circuitry which directs social action and rests on an objectified and historicized world-view which is, thus, endowed with a religious character it is hard to lose. The ultimate meaning of life itself is clearly written therein and orientates attitudes and behaviors.

In Roberston's (1970) approach, religion is a part of the process of globalization, based on relationship between individuals, mankind, national societies, and the systems of various societies. But it should be borne in mind that some religious organizations foster a nationalistic fundamentalism to protect their roots and to reshape the world order. Besides, Robertson rejects at the same time both the hypothesis of secularization and of desecularization. Therefore, religion will play a central role in the construction and reconstruction of societal identities, because it is capable of enhancing closeness among different cultures, creating in such a way the basis for the globalization.

For Luhmann (1977) religion is a social system which regulates the relationships of people with the world in a comprehensive and ultimate meaning. But the "environment" is more complex than the system. And society is a social (external) system that aims to regulate the environment (internal). The system (and religion itself as system) is able to reduce the complexity of environment that is external with respect to the system, which elaborates the answers to the complexity of system. This systemic differentiation presupposes that religion fulfills the function of transforming the indeterminate world, to reduce its complexity. At the end, religion does not disappear but it is not so central because it is just interpretative of reality, instead of being integrative in durkheimian terms.

However, it may now be more convenient to aim at disarticulating religious phenomenology from within, following a reading with more stratified dynamics and multiple faceting. In practice,

it is not clear there are only church religion and invisible religion *à la* Luckmann (1967). Rather, we may propose another hypothetical solution which envisages intermediate categories more or less close to the two extremes defined in terms of visibility and invisibility.

An initial post-Luckmann interpretation was articulated in 1983 and applied to the Italian situation (but not only) during the International Conference of Sociology of Religion (held at Bedford College, London): “besides the interests and pressures coming from ecclesiastical sources, are there any other premises or factors which can explain religious bearing on Italian politics? In particular, it is important to verify first of all how the institution fares under the pressure of an extended ‘religious field’ containing varied and attractive options, including anti-institutional purposes. Second, we must ask ourselves whether in practice religious influence in political choices concerns only Catholicism (or Christianity) or any religious expression in general. Third, we must see whether the country’s history or its national culture marks the existence of fixed elements, bearing common values leading (directly or indirectly, in specific or vague ways) to a widespread model of religious socialization (based prevalently on patterns of Catholic reference)” (Cipriani 1984).

Stark and Bainbridge (1980) have elaborated on “exchange theory” and on the idea of “compensation” as a promise for a future reward that could be accepted as a compensatory form to be exchanged for the established objective. Actually the persons accept religious compensators for rewards that do not exist in their life. Stark, in particular, has a peculiar idea of religious market and therefore, he carries out research on religious conflict, on the stability and dynamics of religious economies, and on the development of Christianity. The market pluralism does not lead to the end of religious confessions, because religions become stronger and competitive, especially if they give a convincing answer to individual expectations.

In Hervieu-Léger (2000) perspective, the emotion has a key role. The new Christianity consists of “emotional communities,” deriving

from a strongly personalized choice that creates a direct bond between the community and each of its members. There is a quest for self-fulfillment through a compromise between Christianity and modernity. Religion is a kind of “authorized collective memory” which plays a critical role vis-à-vis the institutions.

“Believing without belonging” is another successful theoretical expression that accompanies Grace Davie’s suggestion: in a situation of religious individualism, the religious experience tends to be separated from institution and religious practice. But, in Nordic countries of Europe, it seems that formula can be reversed: “belonging without believing.” Another proposal comes from Davie: a “vicarious religion” which means “the notion of religion performed by an active minority but on behalf of a much larger number, *who implicitly at least not only understand, but quite clearly approve of what the minority is doing*” (Davie 2007). It is a key point to understand the situation of religious Europe: few Europeans attend weekly rites but many appreciate the presence of religious buildings in their countries.

The “invisible religion” perceived by Thomas Luckmann (1967), which is based on the assumption of a crisis of the institutional apparatus, seems to be applicable only in relation to certain aspects of modern societies, and does not completely destroy the so-called church religion.

Today, we must ask if we are faced with an absolute novelty or whether, rather, the Luckmann’s “modern religious themes” are nothing more than the sedimentation of preexisting, more or less subterranean channels, long incorporated in traditional religious modes, and surfacing now not for simply contingent reasons. The lack of research in this regard and the great weight of social control found in some particular historical and geographical contexts may be among these reasons.

An example is provided by the sociological trajectory of the Polish *Solidarnosc* movement. Its link to the Polish Catholic church was useful for a while. Then, once liberation from the communist system was attained, its influence began to wane, to the point of reducing to a glimmer. Meanwhile, other individualistic and familistic demands

had been able to prevail, damaging the previous solidarity between the politico-trade union movement and religious membership. Today, religious practice, though still high in comparison with other European nations, is marking time, indeed retreating, in the face of the new modern demands of the rising generations unaware of the previous experience and, in addition, not averse to welcoming the westernizing (and secularizing) breezes of consumerism and the use of free time. But this occurred not only because of the passage from one age cohort to the next, but also because of prior sources already functioning within the formal, compact facade of solidarity of the past. Thus, even in a Poland sacralized to the utmost there were the forerunners of a future secularization *in nuce*. In fact, surveys show a lessening of confidence in the church from 82 % in 1990 to 57 % in 1992. To complete the argument one must, however, point out that this has not involved the total supersession of Catholic religious experience, but has rather favored the regeneration of previously existing impulses not wholly evident and visible. In short, in the practicing, believing Pole too there was concealed the individualist, familistic subject, wholly inclined toward self-fulfillment and -expression.

Again, we see the ambiguous, ambivalent character of secularization. It seems to erode the religious institution, but really only assists the principal factors of a very complex acceptance, made up of consensus on values and dissent in fact, of facile decision and conflicting choices. The new mode of belief supplants the church-religion model but readapts it to new behavioral spheres which proclaim individual autonomy and independence.

After the wave of secularization and the more recent development defined as “religious revival,” social scientists studying the religious phenomenon are becoming far more cautious about the use of certain data, which even today give importance to either the secularization or the revival hypothesis. It has already become apparent that in both cases this process is probably due to a tendency toward the “sociological construction of inconsistency” by means of purely theoretical reasoning, or of a marked use

of figures and results which are put together in scientifically feeble ways.

If we then examine other hypotheses which on the international level, in the field of sociology of religion, are frequently under discussion, we can see that they are not totally applicable in many cases. In fact, any effort to verify these hypotheses has generally failed.

Modernization increases with security, but diversity of nations is at the origin of different behaviors linked to value systems of Christians, Muslims, Confucians. The economic trend remains the same in various regions of the world, but cultural heritage influences the output.

Now new religious communities and religious organizations are settling in different parts of continents, sometimes very far from their original habitats. Christianity (Catholicism, Orthodoxy, and Protestantism) is the most widespread religion together with Islam. Religions are well diffused around the world, but there are substantial differences in belief, behavior, and practice, and there are various branches of each religion, with some specificity in religious movements. In general, religions are supported by national culture, and are peculiar of a region, but many influences can be found all over the countries. In any case the impact of the religious presence is evident everywhere.

Two hundred and fifty years have passed since David Hume published in 1757 *Four Dissertations: The natural history of Religion, of the Passion, of Tragedy, of the Standard of the Taste* followed by *Dialogues Concerning Natural Religion*, in 1779: thanks to the English empiricist – whose books were enlisted by the Catholic Church in the *Index Librorum Prohibitorum* – the first systematic attempt of a religious study starting from human experience instead of a metaphysical perspective.

Sociology started with A. Comte, approximately one century later. However, the studies of Hume were to anticipate the principles of a scientific approach to religious phenomenon. This approach was continued by Durkheim and Weber, further developed by Le Bras and Bellah, up to now when sociology of religion is experiencing a particularly good period, even if great theories and masters are lacking (such as

Parsons and Luhmann), and others (like Berger and Luckmann) are less present.

Certainly, the number of good quality researchers has increased, notwithstanding the absence of absolute excellence normally recognized by the majority of the scientific community. In the meantime, there are a good number of field researches, illustrating interests ranging from the more traditional sector of Christian religious experience to that of new religions, with a particular increase in Islamic studies and in the generally neglected Asiatic realities.

A backward situation is noted, however, on the state of the studies concerning religious diversity in Africa.

Sociology of religion seems to be in good standing at the beginning of new millennium. But a comparative approach is necessary more and more, namely regarding European and American context, just to begin. Generally speaking, at the moment, for instance, European and North American publications of sociology of religion seem to ignore the scientific production in other continents. And Asian, African, and Australian contribution is not known as it would deserve. Linguistic barrier is still an obstacle. But now new solutions can be found. And *Internet* can help very much. In particular in Central and South America as well as in Africa, in Asia, and in Oceania new trends are in progress. A stronger effort must be done for a better reciprocal knowledge at international level in order to diffuse theories and empirical results that remain unknown just because of lack of translation, and of communication.

From a theoretical point of view, sociologists of religion are not ready to afford new situations created by migration processes. And methodological and technical tools of analysis still lack of an accurate profile, reliable in new and different situations.

More than in the past, sociological approach to religion needs qualitative empirical studies. The nature of religion and religiosity escape from traditional questionnaires. Sociologists of religion should concentrate on detailed interviews of individuals coming from different backgrounds, on the supposition that freedom of expression, without any kind of restriction and

with no pre-coded responses, can give way to a higher level of spontaneity in the answers and as consequence a deeper knowledge of crucial religious issues. This solution will favor a more complex interpretation of data.

Nature/World

Both are objects of religious perceptions of individuals and give reasons for the meaning of life.

Human Being

He is conceived mostly as social actor with attitudes and behaviors.

Life and Death

This discipline do not deal with these specific topics.

Reality

It is socially constructed through socialization and daily life.

Knowledge

It is the way of approaching reality thanks to education received and know how accumulated.

Truth

A religious truth doesn't exist from a sociological point of view.

Perception

It is useful to understand the individual *Weltanschauung* and to define the situation that social actor is living.

Time

It is a core category in terms of diachronic research and memory.

Consciousness

It can be individual or collective (Durkheim) and can refer to aspects of moral nature.

Rationality/Reason

According to rational choice theory, it refers to maximizing behavior, through market preferences.

Mystery

It is outside the field of discipline but concerns a lot of religious phenomena.

Issues/themes/concepts relevant for the discipline: belief, church, sacred, secularization, symbols.

Cross-References

- [Das Heilige, Concept of](#)
- [Faith and Belief](#)
- [Magic](#)
- [Pilgrimage](#)
- [Psychology of Religion](#)
- [Religiosity](#)
- [Religious Studies](#)
- [Religious Experiences](#)
- [Ritual](#)
- [Secularization, Secularity, Secularism](#)

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Religion, Theory of

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Related Terms

[Deconstructive theology](#); [Postmodern a/theology](#); [Postmodern religious theory](#); [Postmodern theology](#)

Description

Religious theory, derived from variations and appropriations of poststructuralism and postmodernism of the 1970s and 1980s, stands today for a reappraisal of a traditional, modernist form of thinking in religious studies and theology; religious theory is a form of radical thinking that abandons recourse to foundations, epistemological, metaphysical, logical, or ethical. Recent developments include an expansion of religious studies into the fields of art history, contemporary continental philosophy, literary theory, digital cultural studies, post-Lacanian psychoanalysis, post-colonialism, and political theology.

Religious theory is largely associated with a generation of scholars after the development of the death-of-God theology in the 1970s. Earlier figures, Carl A. Raschke, Charles E. Winquist, and Mark C. Taylor, although considered postmodern theologians, are central to the subdiscipline today. Religious theory is poststructuralist or postmodernist in its methodology and emphasizes the contingent, relational, and non-totalizing aspects of religious thought, language, and culture.

Self-identification

Science

The poststructuralist and postmodernist methodologies of religious theory places it in an antagonistic relationship to science and social science. Poststructuralist and postmodernist theories of epistemology, especially (post) Enlightenment epistemology as it is outlined by Jean-François Lyotard in *The Postmodern Condition: A Report on Knowledge*, reject the possibility of objective, total knowledge. Religious theory understands science and social science as totalizing discourses that preempt, eclipse, or repress different forms of knowing, experience, and valuation.

Lyotard's *The Postmodern Condition* is an extended critical analysis of the ways in which science forms historical, ideological, and political hegemonies.

Religious theory, as an (anti)method, does not attempt to reduce "religious" events or phenomena to a set of discernible criteria. In other words, religious theory emphasizes the relational and contingent elements of "religious" events or phenomena by investigating linguistic, cultural, historical, philosophical, and theological matrices that make such events or phenomena visible and meaning within specific contexts.

Religion

Religious theory is a subfield of study in religious studies that privileges poststructuralist and postmodernist methodologies. It is an approach to the study of religion and theology.

Characteristics

Religious theory's intellectual turn to a postmodernist, deconstructionist, non-referential, post-death-of-God theology as a way of remarking religious studies and theology through "linguistics" is distinctive as a methodology. This linguistic turn was especially significant for the early development of the subdiscipline. In his 2000 encyclopedic essay entitled "Theology," Charles E. Winquist sketches theology's trajectory across three phases of analysis, beginning with theology's "close alliance" with "philosophies of being" to "philosophies of consciousness," and finally to "philosophies of language." It is the latter, "philosophies of language," that Winquist views (after 1984) as forming the conceptual context for a postmodern theology or religious theory. Language, more precisely a post-Saussurean understanding of language, opened a space for early religious theorists to challenge the traditional rules of theological and religious studies language, reconfiguring theology and religious studies as a self-referential linguistic system with "no positive term" (Saussure) or no "outside" the text (Derrida).

Relevance to Science and Religion

Religious theory, as it develops from poststructuralism and postmodernism, see itself as a necessary counter methodology to the methodologies of an Enlightenment science and, later, social science. Religious theory is not regressively antiscience, but it does refuse science's claims to epistemological certitude. Religious theory, at the methodological level, finds flaws in any methodology that claims to unfold absolute, objective truth, epistemological, metaphysical, or ethical.

Sources of Authority

The major sources of religious theory are poststructuralist and postmodernist discourses of the late 1970s and 1980s. These discourses, advanced by such thinkers as Jacques Derrida, Gilles Deleuze, Michel Foucault, and Jean-François Lyotard,

radically transformed thinking and research in the humanities. Religious theory also develops from a more general continental philosophy of religion in which figures such as Hegel, Kierkegaard, and Heidegger figured prominently.

In many ways, religious theory as a subfield of religious studies begins as a postmodern field in which multiple disciplines and methodologies come to inform its praxis.

Ethical Principles

Religious theory does not accept “ethical principles” as a self-evident set of procedures and outcomes. Ethics in religious theory is a problem of ethics requiring epistemological and metaphysical inquiry.

Key Values

Religious theory values transdisciplinary inquiry in the study of religion and theology. It also values the self-reflective use of poststructuralist and postmodernist discourses in critical analysis of key terms, concepts, and issues within the wider field of religious studies.

One key value in religious theory comes from postmodernism—non-totalization. Religious theory does not seek to form a totality; instead, religious theory, informed by poststructuralist and postmodernist discourses, is a perpetual critique of all totalizing, reductive maneuvers in religious studies.

Conceptualization

Nature/World

An inaccessible and/or wholly nondetermined space mediated by language, consciousness, history, culture, ideology, and the senses.

Reality

There is no discernible ultimate reality in religious theory. Reality is a site of contestation

within historical, cultural, ideological, theological, and philosophical spaces.

Knowledge

Contingent, contextual, and unavailable in any absolute form.

Truth

See [Knowledge](#).

Perception

Sensory perception is mediated by culture, history, ideology, and language.

Time

Temporality is a construct and not necessarily organized in a linear fashion.

Consciousness

See [Knowledge](#).

Rationality/Reason

Rationality/reason is an historical, cultural, political, and ideological construct. This is especially true of the “universality of reason.”

Mystery

Mystery is traditionally everything that is not explainable through conventional scientific, rational discourse. It also has the connotation of belonging to a transcendent reality and therefore has no significance to religious theory.

Relevant Themes

Religious theory is antagonistic to the totalizing and reductive practices of modern science and social science. Religious theory, however, is open to scientific conversations, especially those in contemporary physics in which a uniform reality is called into question.

Cross-References

- [Critical Theory](#)
- [Humanities](#)

- [Physics](#)
- [Philosophy of Science](#)
- [Quantum Theory](#)
- [Technonature and Theology](#)

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Religionswissenschaft

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Related Terms

[Religion, History of](#)

A German word that literally means "the science of religion," or more generally the scholarly study of religion, that is, "religious studies." In the nineteenth century, German scholars sought to identify the nature of Gnosticism, which prior to that time had simply been condemned as a

form of doctrinal deviance or "heresy," not by theological argument but by critical and empirical research into its appearance in the context of the ancient history of religion.

Cross-References

[Religion, History of](#)

Religiosity

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Related Terms

[Religious experience](#); [Religiousness](#)

The term "religiosity" originates in a western tradition of reflecting religious phenomena. "Religiosity" is – from a linguistic/etymological point of view – related to other terms like "religiousness," "religious," "religion," which all root in the Latin word *religio*. From a conceptual point of view, religiosity is related to terms such as "spirituality," "piety," "devoutness," or even "godliness." Obviously, in a semantic sense, the meaning of these religiosity-related terms is different with overlapping components. Furthermore, the term "religiosity" carries an emotional charge of varying degrees dependent upon their historical associations and attitudes. In some languages, like the English, the term is more related to religious practice; in others, it can be used as a general anthropological term which covers cognition, emotion, attitude, and self concepts. For example, the French term *religiosité* means both "religious disposition" and "religious affection." This means there is no need to relate the term "religiosity" to some established religion. Similarly it is for the

German term *Religiosität*, and the Swedish, Danish, and Norwegian, among other terms. That the term is understood as a religious disposition, for example, opens it for an interdisciplinary understanding. Indeed, one can ask, what are the underpinning variables (genes, evolutionary perspective) for such disposition? However, this involves some difficulty for cross-language conversation as well as for translating English texts into other European languages and opens the floor to many misunderstandings. Furthermore, the ability to distinguish between “religiosity” and “religiousness” is a privilege of the English language, which signals the possibility of two different perspectives of the same phenomenon.

There is no scientific discipline which really conceives “religiosity/religiousness” as the central matter of its field (Angel et al. 2006). The fact that there is no consensus of the most appropriate meta-theoretical approach to defining “religiosity/religiousness” implies that it is hard, perhaps even impossible for scientists to design and undertake investigations of “religiosity/religiousness.” There are concepts which define religiosity into a sociological, a psychological, an anthropological category, or has been reclaimed as a key term of theology or religious studies. It is worth stressing that the adjective “religious” corresponds to the two nouns “religion” and “religiosity” (Angel et al. 2006). Therefore the adjective “religious” functions as a relating term, by which personal experience of individuals on the one hand can be connected to systematic or cultural aspects of religion (van Belzen 1997) or to *civil* religion on the other hand (Bellah 1967). In this regard, “religious experience” may be understood as an integral concept to qualify the relationship between the cultural and subjective dimensions of religiosity.

The theoretical status of religiosity or religiousness is, compared to the theoretical status of religion, highly under-reflected. That might be one of the reasons why especially in Anglo-Saxon publications within psychology of religion, the term “religiosity” or “religiousness” is rarely found. On the contrary the term “religion” is frequently used even when the

term “religion” actually refers to “religiosity or religiousness” or to specific religious experiences. We can find examples of such misunderstandings or misinterpretation of the meaning of religion within psychology of religion, neuropsychology of religion, cognitive science of religion, neuroimaging studies of religious experiences, biological/evolutional studies of religion, studies of Western religion, studies on children and religion. Also, the study of “evolution of religion” seems to be merged with the study of “evolution of religiosity.”

One of the major problems is that the term “religiosity” is not well understood, and hence, its essential function as a key concept is neglected. One of the actual challenges is to find an accurate definition for religiosity. Clearly, this would be an advantage for performing interdisciplinary research on religion as well as on individual or social religious experience. Religiosity, especially when conceived in an anthropological way, offers this excellent chance, because it allows to distinguish between a formal notion of human self-expression (in English the term “religiosity” might be favored) and a “personally qualified,” meaningful self-expression, strictly bound to the private atmosphere of human beings.

On the other hand, there is emerging interest to work out a distinction between religiosity and religiousness in regard to its phenomenology. You even may find interest for these attempts especially in concepts of psychology of religion (Wulff 1997; Paloutzian and Park 2005). Similar, though lesser efforts have been made by *sociology of religion* (Clarke 2009) and *philosophy of religion* (Phillips 1976; Tilghman 1993). But even psychology of religion (which is strange enough – not named psychology of religiosity), in contrast to sociology and philosophy of religion, refers to the term “religiosity” to identify its own research field as well as to define its scientific self-understanding. In these discussions, the concept of religiosity is clarified and investigated on its validity and soundness, its varieties, and range of meanings.

As a formal concept, religiosity can basically be linked to philosophical and scientific

approaches, especially to the question “what it is to be a human being” (e.g., to be a human being in relation to her environmental, historical, cultural [including religious], mental, and biological status). In this sense, religiosity might have the function of “homoeostasis type II”: Usually homoeostasis (type I) means a self-regulating system with tendency to maintain stable in a bio-physiological sense. The idea of religiosity as “homoeostasis type II” intends to broaden the horizon. Introducing religiosity as a “homoeostasis type II,” hence implies a self-regulating system with tendency to maintain stable in a holistic and transcendent sense (Angel et al. 2006).

To put it differently, the whole spectrum of psychological and sociological research on religiosity would contribute to the understanding of religiosity in its developmental, personality-related, and dynamic aspects. This way of thinking was actually already opened by William James in his Edinburgh Gifford Lectures and published in his milestone “The Varieties of Religious Experience” (James 1902). In order to understand religiosity, it is necessary to integrate into its conception the cognitive and emotional aspects, credition (the process of believing), and this, both in a moral and action-related dimension. Psychology of religion has worked out a wealth of rating scales measuring different dimensions of religiosity (Hill and Hood 1999). A variety of approaches to the study of religiosity may also include investigations of the biological (genetic) underpinnings and the biochemical processes related to entheogen (psychedelic).

The function of religiosity can be seen as a way to achieve balance, orientation, and meaningfulness in everyday life. In this regard, not to be neglected are the roles played by attachment (Kirkpatrick 2005), coping (Pargament 1997), stress reduction, and mental health (Koenig 2001), by forgiveness, flourishing, and so forth. However, not to be neglected either are the more negative sides of religiosity, namely, aggressiveness, neuroticism, rigidity, and fundamentalism (Hood et al. 2005), which are dysfunctional to processes of healing and coping. Indeed, patient’s

(client’s) religiosity has been taken into account within clinical, psychotherapeutic psychology and psychiatry.

Cross-References

- [Credition, the Process of Belief](#)
- [Emotion](#)
- [Faith and Belief](#)
- [Gifford Lectures](#)
- [Love \(Alterity, Relationship\)](#)
- [Philosophy of Religion](#)
- [Psychology of Religion](#)
- [Religion, Theory of](#)
- [Religious Experiences](#)
- [Worldview](#)

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Religious

- [Biology of Religion](#)

collaboration with the transcendent or divine to cope, whereas in harmful religious coping, “anger at God” or a feeling that one is being punished predominates.

Religious Affiliation

- [Conversion](#)

Religious Education

- [Practical Theology](#)

Religious Beliefs and Philosophy

- [Philosophy of Religion](#)

Religious Education (RE)

- [Religious Education Theory, Roman-Catholic, Southern Europe](#)

Religious Commitment

- [Conversion](#)

Religious Education Theory, Roman-Catholic, Southern Europe

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Religious Coping

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Related Terms

[Church](#); [Religious education \(RE\)](#)

Religious coping is a multifaceted concept reflecting a variety of ways of bringing one’s religious life to bear on stressful experience. Pargament and colleagues have researched and written extensively upon the varieties of religious coping. In general, religious coping is more likely to be healthy and can lead to preservation of physical and emotional health, a greater sense of self-efficacy, and recognition of real threats to well-being, rather than denial of them. However, it is possible to distinguish helpful from harmful kinds of religious coping. Pargament argues that the most important difference between them may be that in helpful religious coping there is an experience of

General Background

Christian communities since ever have taken care for the religious education of their children. As an academic discipline, the development of a field called “Religious Education Theory” is closely linked to the general development of universities, of academic theology, and of its institutional setting within a society and its legal framework (Hemel 2002, 50–53).
While Italy, France, and Spain all are countries with huge majorities of a catholic population, the social mind-set toward institutional catholic religious education (RE) is enormously diverging.

France

In France, since 1905 there is a strict rule concerning the separation of State and Church. It is accepted also by Church members and valid throughout France with the exception of the Eastern provinces of Alsace and Lorraine. Academic Theology exists at the level of a private Catholic University (“Institut Catholique”) in Paris and within one State University (Strasbourg in Alsace/Alsatia). Religious education is seen mostly as a task of both, families and the local community. As a consequence, the wording nearly always refers to “catéchèse,” that is, catechesis, seen as the effort of Christians to transmit their religious belief to the next generation. Where RE in schools exists (such as in the East of France), it is still called “catechesis,” and participation is strictly voluntary. This means that French catholic RE is less academic in style than in other countries, more focused on building a Christian community including songs and liturgical celebrations (Adler and Vogeleisen 1981).

Spain

In Spain, academic theology includes RE theory as part of “Practical Theology.” As RE is part of the normal school curriculum and Spain has more than 90% of a nominally catholic population, the original idea of RE in public schools was the “integral Christian education” of the young generation. Political and social changes brought about a structure where now RE – although being a voluntary school subject – is part of the normal school curriculum. It is seen as a task of both, public schools and the Catholic Church, to give young persons the chance to learn something about religion and religious culture even if they are not active members in their Christian communities. As an alternative, “Ethics” is an optional school curriculum to be chosen instead of “Religion.”

Generally speaking, Spain has been modernizing tremendously during the past decades. As a part of this development and despite the crisis of 2008/2009, parts of public life are “anticlerical”

in nature, eager to minimize educational influences of religious forces. As a consequence, the academic study of RE theory does not only include the professional training of future teachers but also involves reflections concerning the importance of a school curriculum of RE for “all” young persons, independent from their religious interest (Pajer 1991; Documentos colectivos 1980).

Italy

In 1984, a State Agreement between the Vatican and Italy (“Concordato”) has given a new structure to the public teaching of religion in Italian schools. “Religion” is an optional school curriculum within the context of public schools, aiming at teaching the value of the “cultural heritage” of Catholic Christian religion in Italy. Specialized teachers of religion, mostly educated in “Faculties of Religious Sciences,” feel integrated into the public school while being, at the same time, committed to a “disclosure” of religious content to their pupils.

Activities of pastoral care for the youth, of catechetical preparation of the sacraments and of other social or religious activities are seen as the specific focus of parish communities and of other catholic associations. This means that the reflection on RE as a school curriculum is not strongly linked to the general theological discussion which is typical for faculties of theology in major centers. RE theory rather has a position of “making use” of contemporary theology, always having in mind the specific purpose of “religion” in schools. On the other hand, Italian teachers of Catholic religion in schools have made a tremendous effort to professionalize the school teaching of religion, maintaining high didactical standards and at the same time a high level of loyalty to the Catholic Church who formally empowers them to their profession (Ruta 2004).

RE Theory in Italy, France, and Spain Oscillating Between Scientific Discipline and Spiritual Practice

For a clear evaluation of the rather spiritual, religious, or rigorously scientific character of RE

theory in each country, it will be useful to see the purpose of the discipline in the framework of religious communities and overall societies. Italy has a long tradition of universities, and “Bologna” is the first European university ever. Still today, the Bocconi University in Milan, the Gregorian University in Rome, and others enjoy a high scientific reputation far beyond religious disciplines. Therefore, RE theory in Italy tends to claim academic rigor, suffering – at the same time – from the rather particular status of the various “Faculties of Religious Sciences.” As the name itself states, there is the conviction that “Religious Sciences” are a serious part of the scientific world.

In France, things are completely different, and there is no specific college for the training of future teachers of religion, simply because of the separation of State and Church. As a consequence, RE theory is seen as a historical and practical part of theological studies (e.g., at the Faculty of Theology in Strasbourg which exists due to the Concordate, that is, a historical State Treaty between Alsatia and the Vatican). Taking into account this context, a spiritual and religious view of RE prevails (“catechesis”).

Spain somewhere is in between France and Italy. The Catholic Church, unrivaled as State Religion during centuries, is proud of its theological faculties. In those faculties, however, RE plays a minor part. As a consequence, some see it as “the application” of theology in the context of school learning, and others have a more modern view including a scientific claim for RE in its various life contexts (Gevaert 1986).

The Scientific Contribution of RE Theory in Italy, France, and Spain

The concept of science in itself is not as clear as that which the predominance of empirical, methodological, and natural sciences might suggest. If science is seen as a specific endeavor of human reason to discover, understand, describe, and change the natural and cultural world, then “dense description” of religious education and of educational reality

in the context of societies with a very distinctive historical pattern is in itself part of a scientific exercise. Beyond this, a lot of empirical data and studies are being produced more in Italy than in France.

Finally, there is a rich flavor of historical work showing the distinctive patterns of educational, social, and theological framing in the course of centuries.

Nevertheless, the scientific content of most of RE literature in Italy, France, and Spain is limited. This is due to at least two reasons: First, most of the RE literature refers to a specific interpretation within a specific context, that is, it is part of a “flow of interpretations.” Second, there is no strong tradition of experimental approach to RE theory. Giving reasons to this attitude, most of the protagonists would argue that human dignity in such a particular situation as RE is not in line with the methodological setting of a scientific experiment. As a matter of fact, RE theory is more part of social and cultural sciences than part of an experimental tradition.

Sources of Authority, Ethical Guidelines, and Key Values of RE Theory in Italy, France, and Spain

Talking about Catholic RE theory in countries like Italy, France, and Spain makes it easy to refer to the Bible and to the teaching of the Church as sources of authority. It would be too easy, however, to stop there. As a matter of fact, in all of these countries, a deep respect of the individual and unique nature of each young person is part of the common set of convictions and values in RE theory. This means that the respect for the biological, moral, spiritual, and personal development of each young person is a key value in treating any kind of religious subject. While in the past the integration of the young generation into the Church community might have prevailed, today’s RE theory aims at the individual, personal growth and the promotion of each individual personality by disclosing them the spiritual, intellectual, and emotional world of

Catholic Christian religion. This “client-centered” perspective has the consequence of “additional” authorities in a state-of-the-art knowledge of psychology and sociology, of general educational theory and other cultural sciences. One of the key values, therefore, is also (1) the continuous effort of finding out which kind of knowledge is reliable and (2) in discussing which is the best way of using both, spiritual and religious traditions and modern psychological and educational knowledge.

Basic Concepts from the Standpoint of RE Theory in Italy, France, and Spain

If we look at basic concepts such as (1) nature/world, (2) human being, (3) life/death, (4) reality, (5) knowledge, (6) truth, (7) perception, (8) time, (9) consciousness, (10) rationality/reason, and (11) mystery, we never should forget the double context in the framing of RE theory as a discipline which is (a) the context and history of a specific country and society, and (b) the spiritual and academic context of theology, social and cultural sciences.

Let us take the example of (1) nature/world. It is absolutely clear that RE theory in all of our reference countries will refer to God as the creator of the world. Nature corresponds to the loving will of God to create and maintain nature. On the other hand, within the European context, it is equally clear that virtually no protagonist of RE theory will find a difficulty in combining this religious standpoint with the actual debate concerning evolution, origin of the universe, and the more. The standard tenet of RE theory is a “convergence” between religious convictions and scientific theories. Looking at the concept of “human being” (2), the standard argument would be that all proven scientific data on human beings can be valid but that there is some “intellectual and spiritual” value added for a religious perspective of human beings as created and loved by a personal God. Reality (4), therefore, is more than what science can tell us, and it is God who guarantees the truthfulness of knowledge (5), of truth (6), and of the trustworthy nature of our perceptions (7), as far as they are not strictly determined and limited by our biological nature.

Concepts such as life/death (3) are habitually seen from a double perspective, that is, from all which can be actually known from scientific evidence and – on top – from the spiritual and religious perspective of a religious believer who believes in a life after death. Even time (8) is seen as part of God’s creation, independent upon any other linguistic and intellectual endeavor in understanding the nature of time. One of the advantages of such a religious perspective is the insight into the limitations of everybody’s consciousness (9) and individual rationality (10). Human reason takes part in the global universe of reason but the ultimate reason is God.

As these reflections are part of a common religious world-view of European Catholic Christianity, there is no distinctive difference between Italy, Spain, and France as far as such concepts are being concerned. Due to the general setting of RE, however, French authors and protagonists favor a stronger spiritual perspective which means that the “mystery” (11) of our existence, of the world, of God, and of all the riddles of life may have a stronger evidence in the practice and theory of RE. It is clear, however, that “mystery” is a category in line with the limitations of human reason, and that all mystery would be disentangled by God and God’s ultimate reason.

Issues of Particular Relevance in RE Theory in Italy, France, and Spain

Similar to other regional and linguistic traditions of Christian and Catholic RE, one of the interesting issues in RE is a comprehensive world-view within the context of a religious framework. Different from other disciplines, this means that RE theory dares to speak out hypotheses (e.g., on a life after death) which are beyond scientific evidence and which at the same time opens for revision, better insight and doubt.

Contrary to what could be expected, the use of rational arguments is therefore generally broader than in other disciplines because religious rationality will argue even in those fields where safe knowledge is far from being available. On the other hand, the unified structure of the universe

allows for minimum requirements of logical coherence even if strong evidence cannot be expected. It is not astonishing, therefore, that the relationship of “faith” and “reason” continues to be an important issue, not only within RE theory but also (and probably not by chance) within the pontificate of Benedict XVI.

Another common but also distinctive issue is the topic of interreligious dialogue. It is strongly present in Italy, not so strong in France and until recently barely existing in Spain. The reason is simple: A dialogue with the Islam, in general, is driven by a strong presence of Muslims which has not been the case before the recent immigration waves in such Southern and West European societies.

One of the consequences of the new situation of “religious competition” will probably be the fact that Christian Catholic RE theory in Italy, Spain, and France during the coming years will focus more on what is so specific and valuable in their own world-view, as compared to other religious and nonreligious traditions.

Cross-References

► [Religious Education, Protestant](#)

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Religious Education, Protestant

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Related Terms

[Christian education](#); [Protestant education](#)

Description

Protestant education has long had a central role in religious training in the Christian tradition. As Henri Marrou, Adrian Dupuis, and other historians note, a major reason that Protestants place such an emphasis on schooling is because Christianity was the first school of thought to assert that all people are created as equal before their Creator and therefore all should be educated. The Greek, Roman, Asian, and Middle Eastern philosophies and religions focused on training the elites. But Christianity asserts that, “There is neither Jew nor Gentile, neither slave nor free, nor is there male and female. . .” (Galatians 3:28, Holy Bible, NIV). It also asserts that “God shows no partiality. . .” (Romans 2:11, Holy Bible, NIV). For centuries, in various places throughout the world, Protestant education and public school instruction were closely aligned. Protestant education generally now operates as distinct from the public school system, but one advantage of that is that churches are able to operate with greater autonomy than they did when the Christian worldview was more integrated in the public school system.

Self-Identification

Science

Protestant education views itself as in many ways a science both in terms of the study of improving itself and also in terms of the part of education

that involves science and scientific inquiry. Protestants generally view scientific discovery as very connected to the Christian faith. In the Christian mindset, there is no contradiction between the quest for scientific truth and God. And indeed, Christians view the growth of science as a quest for truth as totally consistent with a personal relationship with God. For Protestants, the key tenet in this regard is found in the Bible text of John 8:32 (NIV, Holy Bible) where Jesus Christ declares, “You will know the truth and the truth will make you free.” Admittedly, when Christ made this statement, He referred primarily to spiritual truth. Nevertheless, the attitude of the Protestants toward education was generally very forward-looking (Bartlett, 1978). They believed that since all of God’s creation represented His truth, that education in a more general sense was worth pursuing.

Religion

By definition, Protestant education involves religion, but leaders and teachers in this discipline view themselves as teaching academic truth. Although these educators view themselves as first and foremost teaching spirituality and character, they are also pleased that their students far exceed public school students in academic performance. Research indicates that their students outperform their counterparts in traditional public schools and public charter schools in every single major subject matter, that is, math, science, reading, and social studies. Usually that advantage is about 1 year. Research also indicates that the racial and socioeconomic achievement gaps are a good deal smaller in their schools than is commonly witnessed in the public schools.

Research indicates that students in these faith-based schools outperform public school students for reasons strongly associated with the fact that these schools are religious (Jeynes, 1999).

For example, both meta-analyses and national-wide studies demonstrate that the students indicate that they view Christian teachers as considerably more caring and possessing higher expectations than educators commonly do in the public schools (Jeynes, 1999). These schools also emphasize the work ethic, a sense of

purpose in life, and self-discipline far more than what one is going to see in the public schools (Jeynes, 2007). Studies also indicate that Protestant schools have much higher levels of racial harmony and considerably fewer gang problems than one generally finds in the public schools (Jeynes, 1999). Research evidence suggests that these advantages are linked to the Christian nature of these schools. And therefore even though Protestant schools view themselves as concurrently both religious and academic, the leaders of these schools view these two emphases as concurrently active in Protestant schools.

Characteristics

Protestant education views scientific inquiry as inextricably connected with the pursuit of God and divine truth much more so than other religions do. In Protestant schools, the Christian faith of scientists such as Nicholas Copernicus (1473–1543) and Francis Bacon (1561–1627) is often highlighted. Schools often point out that Pope Clement approved and suggested that Copernicus publish his work and that Bacon asserted that thorough philosophic inquiry would lead people to Christian faith. Protestants naturally emphasize the contributions of Johannes Kepler (1571–1630), who established the laws of planetary motion around the sun. Kepler was a devout Lutheran, who made many references to God in his works. Protestant schools also often emphasize Galileo Galilei’s (1564–1642) and Rene Descartes’ (1596–1650) convictions, who both emphasized in the inerrancy of Scripture.

Protestant schools also emphasize the consistency of intellectual and theological pursuits by pointing out that a number of scientists were active in writing works in both spheres, for example, Blaise Pascal (1623–1662) and Robert Boyle (1627–1691). Evangelical Protestant churches highlight the conservative religious views of Isaac Newton (1642–1727) and Michael Faraday (1791–1867), whose discoveries in mathematics, physics, and magnetism represent some of the finest examples of scientific genius in history. These schools are also quick to point out that

the vast majority of these scientists were creationists, including Lord William Kelvin (1824–1907), who is one of the most influential physicists of all time.

Protestant schools, more so than other traditions, spend time examining the personal faith practices of these scientists, including Nobel Prize-winning quantum theorist Max Planck (1858–1947), a church warden, and Gregor Mendel (1822–1884), a monk. They point out that even Albert Einstein (1879–1955) stated, “I want to know how God created this world” and “Science without religion is lame, religion without science is blind.”

Relevance to Science and Religion

The Protestant world is open to science and is very interested in the area called “science and religion.” Much of this interest surrounds the theory of evolution. A myriad of Christians believe that evolutionary theory is misguided and built on myth and wishful thinking, rather than scientific evidence. Contrary to the stereotypes that many people maintain regarding Christian beliefs, their reluctance in embracing Darwin’s theories has as much to do with the shortcomings of evolutionary theory, as they do with adhering to the Bible’s teaching *per se*. Many Christians have three primary scientific objections to evolution, as well as several secondary ones.

First, they object to the fact that the fossil record shows virtually no potential transition forms, from one species to another. They assert that if evolution reflected the truth, there would be thousands upon thousands of these transitional forms.

Christians believe that the absence of these forms should in itself cause many to question the accuracy of the theory of evolution. Christians state that one reason it has not is because many who adhere to Darwin have an agenda to attempt to show that it is a godless universe and one dictated purely by chance. If this atheistic perspective is true, then there is no God or “higher power/authority” to whom people have

to answer. But Christians contend that it takes a far greater “leap of faith” to believe that there is no “first cause” and there is never any spiritual intervention and that rather everything is guided by pure chance than to believe that God exists. In the minds of Christians, evolutionists often cut off any need for debate on these issues because their goal is to advocate the agenda that people should be able to do anything they please. Christians do not ask that everyone share their perspective, but they do believe that evolutionists are often narrow-minded and quickly truncate or prevent any meaningful debate on origins.

Second, they question the accuracy of the dating methods that are used by evolutionists. They note that dating has often been shown to be wildly inaccurate, with some bones of bodies of those recently passed on shown to be millions of years old. In addition, scientists are well aware that accurate dating depends on the notion that the geological and atmospheric conditions of the earth have remained quite stable. The reality of a catastrophic flood, for example, is well documented, and this alone could throw off the accuracy of the dating results.

Third, they believe that the theory of evolution is inherently racist and believe it to be greatly inaccurate in this way. They affirm that if Darwinist evolution is so patently in error regarding race, then it is not logical to easily embrace its assertions on other issues. Christians believe that the writings of Charles Darwin and a myriad of his followers contributed to the growth of institutional racism and the teaching of scientifically based racist thought. They also assert that Darwinist evolutionary thought affected many nation’s beliefs about those with special needs. To a copious number of believers, these blatant inaccuracies of evolution regarding race and those with special needs raise questions about the theory’s overall veracity and how teachers should approach instruction regarding Darwin’s theory.

The pervasive nature of the racism and institutional racism that has risen from Darwin’s hypotheses is sufficiently obvious that the cofounder of the theory of evolution, Alfred Russel Wallace, found the racism and

discrimination inherent in evolutionary theory so reprehensible that he disavowed evolutionary theory and became a creationist. In the mind of countless believers, to whatever extent evolutionary theory has yielded scientifically based racism and discrimination, one has justifiable reasons to reexamine various aspects of the value and accuracy of many of the theory's claims (Gould, 1981).

The presence of racism in Darwin's writings is patent even in the title of his work that is commonly called the *Origin of Species* (1859). Actually, this is not the full title. One reason why few cite the full title is because it is offensive. The full title is *On the Origin of the Species by Means of Natural Selection or the Preservation of the Favoured Races in the Struggle for Life* (1859). The context of Darwin's writings confirms what the title asserts. Darwin states that there are certain races that are superior to others and therefore favored in the natural selection process. Darwin was quite specific in his claims, asserting that the smallest gap between ape and humankind was between the gorilla and blacks. Darwin (1871, p. 201) states, "The break will then be rendered wider, for it will intervene between man in a more civilized state, as we may hope, than the Caucasian, and some ape as low as a baboon, instead of at the present between the Negro or Australian and the gorilla." Not surprisingly therefore, Darwin predicted that the darker a group's skin, the faster members of that group would go extinct.

Hence, while many Christians have a very positive view of science, they have some major reservations about evolutionary theory.

Sources of Authority

In one sense, the Bible is the most authoritative book within Protestant education. The Bible is recognized by scholars around the world as the most influential book in the history of humanity. William Shakespeare alone cited the Bible over 1,300 times. And beyond this, a large portion of the authors who wrote before the early 1960s on four continents assume the readers have a strong working knowledge of the Bible. Understanding

the Bible is also vital for comprehending world history. Protestants value a wide variety of other books on various topics, especially those that are among the finest in their field that integrate Christian faith with the finest books on academics.

Ethical Principles

Love is at the heart of the Christian religion. God identifies His essence in I John 4:18, where it is declared that, "God is love," (Holy Bible, NIV). Moreover, when Christ is asked what the two most important commandments are, He declares that they are love of God and love of neighbor. The esteemed German sociologist Max Weber elucidates on how this translates into academic achievement, by asserting what he terms a "Protestant ethic" that emerges from the emphasis that God has a loving purpose for one's life. Weber declares that Protestants work hard, demonstrate sacrificial love to help others, and are cognizant of a calling from God upon their lives that keeps them highly motivated. Weber asserts that while Protestantism emphasizes love, grace, and God's purpose, which results in highly motivated followers, other faiths are less likely to create this level of academic creativity. In contrast, Weber avers that Islam emphasizes submission and Buddhism presents Nirvana as an ideal, neither of which is especially conducive to individual academic effort. Similarly, Weber states that Hinduism emphasizes fate via its insistence on a caste system and includes the judgmental orientation of karma, which is not conducive to individual academic creativity and effort. Weber believes that, in contrast, the Protestant's emphasis on love, grace, and purpose is conducive to high levels of scholarly output.

Key Values

Protestant educators desire to produce people of character who are highly learned people. The commitment to scientific learning by people of faith is evident in the fact that the world's finest

universities tend to be founded by Christians. In the United States, Christians founded 121 out of the first 122 colleges. Christians also ran many of Europe's first and finest universities. They all saw it as consistent with their faith and the pursuit of God's truth. And indeed when the Puritans founded Harvard and Yale and when other groups founded Princeton and most of the other early schools, it was with the teaching of spiritual truth that these people were most concerned. Nevertheless, the attitude of the Puritans toward education was very forward-looking. They believed that since all of God's creation represented His truth, education in a more general sense was a worthy goal. When they arrived in Massachusetts, the Pilgrims elected Deacon John Carver to be governor. Carver died only a few months after being chosen. His successor, William Bradford, was a strong believer in supporting an intelligent gospel. Bradford, like many of the Puritan leaders of the time, owned a prodigious number of books in his library for the time (400). The fact that the Puritans kept records of the number of volumes owned by the leaders demonstrates the emphasis that they placed on literacy. The Puritans set the stage for centuries of an academic orientation both in western and northern Europe and in the United States.

Conceptualization

Nature/the World

God is viewed as above the world, and He has entrusted human beings, as those made in His image, to be caretakers of the world. Therefore, God wants His people to be concerned about preserving the environment. In addition, the Bible states that the righteous should be concerned about the needs of animals. However, God is grieved when people have compassion for animals more than they do for human beings. Protestants, especially Evangelicals, tend to believe that *life* begins at conception and that people ought to care for the welfare of all human beings, including those in the womb. Christians also view *death* in a more complex way than secularists generally do. They

distinguish between physical *death* and spiritual *death*. To be spiritually dead is not to know Christ as one's personal Lord and Savior.

Human Being

The Bible views all human beings as made in the image of God. On this basis, in the views of many Christians, human beings have inherent value and have some element of the divine both in terms of their worth and their potential. They believe that this emphasis on the "divine spark" encourages people to live up to their full potential and often brings out the best in them. They believe that it only follows that if humans are viewed as mere animals, they will tend to succumb to their animal instincts and behave in a less loving and more primitive fashion. In the mind of Christians, the Bible's assertion that "God is love" (I John 4:18, Holy Bible, NIV) has important ramifications for the way the people should be treated. The highest quality we can show when dealing with other individuals is to love them, even as God does.

Protestants often view evolution and the racism that accompanies it as a dehumanizing influence. For example, Darwin believed that "some humans were incapable of civilization" (Anderson, 2007, p.157). Jackson and Weidman (2004, p.69) declare that to Darwin "the gap in intelligence and moral sense between civilized people and animals was a great one." But one could look to the lower races, which in his view were those darkest in hue, to fill the gap (Alland, 2002). To Darwinists, "savages" of Africa and South America represented the "missing link" between lower animals and human beings. Darwin and his followers instigated this brand of racism by propounding an evolutionary rubric of a chain of being that portrayed some of the features of nonwhite races as being animallike. Protestants view humans much more favorably and believe that all people are equal before God.

Reality

Christians believe that reality exists at many levels and that there are some of these levels that are more discernable by human beings than others. Christians believe that just as human beings can access only a small part of the light

spectrum and the auditory spectrum, the same thing is true of the spiritual spectrum. Christians believe that it is naïve and ignorant for secularists to assume that if one is unable to see a certain item it, therefore, does not exist. Christians believe that sound waves, electricity, radar detectors, and light waves often involve frequencies that cannot easily be discerned by normal human senses, and yet each of these realities can be powerful. Some Christians point to ultraviolet and infrared light pictures yielding unusual patterns when people are praying for healing and the fact that there are a plethora of phenomena that humans simply are unable to explain, as evidence of a largely unseen spiritual realm.

Knowledge

Christians view knowledge differently than many other individuals. There are several ways in which this is the case. First, the Bible declares that, “The fear of the Lord is the beginning of knowledge” (Psalm 111:10; Proverbs 1:7, Holy Bible, NIV). Christians believe that God is omniscient and that He is the ultimate source of knowledge and *truth*. In contrast, Christians believe that human beings are small and finite and have very limited knowledge compared to what God possesses. Therefore, if these people want to have true knowledge, they need to seek God to obtain that information. Second, Christians believe that the most vital form of knowledge and *truth* is spiritual *knowledge* and *truth*. They argue that from spiritual knowledge proceeds character and a more complete intellectual insight. Christians believe in the assertions of Cicero and Martin Luther King that the most dangerous person in the world is someone who is very intelligent, but who lacks morality. Third, they believe that mental knowledge is important and worthy of pursuit, but such a venture is undertaken in the context that by doing so, one will understand more about God and His universe.

Perception

Christians believe that the accuracy of a person’s perception is dependent on one’s relationship with God. They believe that the more one matures

in the Christian faith, the greater the likelihood that one will develop what the Bible calls “the mind of Christ” (I Corinthians 2:14–16, Holy Bible, NIV). Christians believe perception can exist at the physical, emotional, and spiritual level.

Time

Protestants believe that students in schools should use their time well, because to the degree that they are God’s children, they are called of God and should use their time well. In terms of history, the Bible really does not specify the time of the origins of the earth and the universe.

Consciousness

The Bible is filled with references to various levels of consciousness, and based on the Scripture, Christians especially respect what can occur in one’s dreams and during one’s sleep. Christians feel most comfortable though with numerical research and are less trusting of theories based on personal experience and what they view as wild conjecture, with little scientific evidence. Although the work of Sigmund Freud is perhaps the best example of this, some believers also think that Jean Piaget’s theories, which were based primarily on the observations of his own children, were embraced much too readily without adequately testing them.

Rationality/Reason

Christians are strong believers that God gave human beings a mind that can be used to produce much good. What is vital, in the Christian way of thinking, is that Christians “be transformed” by the renewal of one’s “mind” (Romans 12:2, Holy Bible, NIV). Christians believe that a corrupt mind will cause people to be blind to reason and common sense and will cause them to engage in many counterproductive and destructive behaviors.

Mystery

Protestants believe that many of the keys to understanding salvation, spirituality, and the world and universe are found in the Bible.

For example, a large number of Christian academics are quick to point out that long before humans concluded that the earth was round, the Bible referred to the earth as being round. In Isaiah 40:22 (Holy Bible, NIV), which was written approximately 700 years before the birth of Christ, the Bible has been understood as asserting that the earth was a circle. Christians believe that the Bible can provide guidance and insight into the major issues and mysteries of life.

Relevant Themes

Probably the major issue pertinent to this engagement is the extent to which issues relating to science and religion are even permitted to be discussed, particularly in American schools. Presently, most European educators are far more open than their American counterparts to examining these issues. There is a certain degree of irony to this fact because one of the main tenets of the American Constitution is “freedom of religion.” In reality, however, there are dozens of nations around the world, particularly in Europe, that probably have freedom of religion to a greater extent than is practiced in the United States. Part of this may be due to the fact that the philosophical tradition in Europe possesses deeper roots than is the case in the United States. Consequently, there is more of an understanding in various parts of Europe that religion is an important part of the overall philosophic “conversation” and that to be an educated individual, one needs to be familiar with the Bible. The American academics, on the other hand, are not as quick to understand the importance of multidisciplinary interplay. It is hoped that this will change.

Cross-References

- [Agape](#)
- [Bible as Literature](#)
- [Biblical Studies](#)
- [Christianity](#)

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Religious Epistemology

- [Epistemology, Reformed](#)

Religious Experience

- [Religiosity](#)

Religious Experiences

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Description

Religious experiences belong to the subjective experiences which have fascinated and still fascinate researchers from different disciplines. Hence, within the scope of the present article, it is impossible to do justice to all explanations. The choice then has fallen upon explanations of religious experiences coming from theologians and scholars of religious studies having a profound impact on the

issue today. The present article comprises definitions of religious experiences; religious experiences understood as a relationship, the reality of religious experiences; the differences between religious and nonreligious experiences, that is, when does an experience become a religious one, the object(s) of religious experiences; the ways in which it is possible to have religious experiences; and finally, six types of religious experiences are accounted for.

Defining Religious Experiences

To refer to religious experiences, without also referring to William James' (1842–1910) *Varieties of Religious Experience*, would be a mistake beyond correction. In his ► [Gifford Lectures](#) on natural religion at the University of Edinburgh, 1901–1902, William James defines the essence of religious experiences in terms of their specific quality or element, “the thing by which we finally must judge them, must be that element or quality in them which we can meet nowhere else.” He observes that the quality will be most obvious in those religious experiences that are “most one-sided, exaggerated, and intense.” A religious experience, he continues, is a state of mind only obtainable by religious persons and no others. However, not everybody would agree with James here:

Your whole subconscious life, your impulses, your faiths, your needs, your divination, have prepared the premises of which your consciousness now feels the weight of the result; and something in you absolutely knows that that result must be truer than any logic-chopping rationalistic talk, however clever, that may contradict it. (James 1997, 74)

Such religious experiences provide absolute knowledge. James refers to the *noetic* quality or aspect of religious experience by saying that the experiencer remembers his or her religious experience as being immediate rather than of being the result of conscious thought and inference. Furthermore, that quality is such that it has the power to completely change a person's personal and social life.

In *Economy and Society*, Max Weber (1864–1920) calls such a converting experience

metanoia and means by it that the person having a metanoia entirely changes his or her central attitude toward the value of meaning of life and the universe (Weber 1968, 163). The example he gives is the converting religious experience Saint Paul had in Damascus (Acts. 9:1–25).

Generally, religious experiences are understood as belonging to the variety of experiences human beings are able to have. In *The Epistemology of Religious Experience*, Keith Yandell argues that a human experience (including a religious one) x is an aspect of the subject of experience y (Yandell 1993, 42). Furthermore, if an item A is so related to person S that S does not exist by itself or together with some set of truths, entails A does not exist, then A is an *aspect* with respect to S (Yandell 1993, 38). He argues that every human being is an aspect with respect to her- or himself but not to another person. Our hopes and dreams, beliefs, and attitudes are aspects with respect to ourselves, but objects with respect to another person. The subject of experience is not the experiencer as one might think but is that of which an aspect relative to the experiencer is presented to him or her (Yandell 1993, 42). A human experience, religious or not, x is an aspect of a subject y and sometimes, but not necessarily, has an object “ y .” For example, there is no object in the experience of thirst. The experience of being thirsty is an aspect of the subject of experience, namely, neural signals from the central nervous system (the part of the brain that integrates the information that it receives from, and coordinates the activity of, all parts of the body). Experiencing drinking water, on the other hand, has an object, namely, water. An experience (religious or other) is a conscious state (or a state of mind in William James' words) in which a person phenomenologically seems to be aware of an aspect or object (Yandell 1993, 42). By seems, Yandell means “how things appear, whether or not they are that way or not” (Yandell 1993, 16). This means that for an experience of something (an aspect of a subject of experience with or without an object) to be recognized as an experience of that something, it does not necessarily imply that that something really is as it is experienced.

In *Perceiving God The: ► Epistemology of Religious Experience*, William Alston maintains that religious experiences are those experiences in which it seems that God appears (presents Godself) to a person in a certain way (Alston 1991, 20–23).

Hence, in *Sacred or Neural, the Potential of Neuroscience to Explain Religious Experience*, Anne Runehov observes that a significant difference between a religious and nonreligious experience lies in the context of the experience. The context of the religious experience (or what the context of the religious experience is part of or related to) is mostly (but not always) presupposed by the experiencer. In other words, there may be (but not necessarily) a specific commitment between the experiencer and the context of the experienced (Runehov 2007, Chap. 2). In *Religious Experience*, Wayne Proudfoot argues, on the other hand, that there always is a commitment between the experiencer and the context of the experienced. Therefore, ineffability of religious experiences does not mean that religious experiences are not analyzable. According to him, religious experiences always mirror the theological commitments of the experiencer. Furthermore, because religious commitments are different in different religions, the religious experiences will be interpreted differently as well (Proudfoot 1985). With this, Proudfoot does not seem to give room for experiences that do not fit within the frame of reference of the religion the person is committed to. For instance, Carl Gustav Jung maintained that religious experiences can be so powerful that they destroy the experiencer totally (both mentally and physically) if he or she does not have the adequate religious framework to encapsulate the experience. As an example of such an anxiety laden religious experience, Jung uses the religious vision experienced by a Swiss mystic by the name of Brother Klaus. It is told that he was so terrified by his vision that his face was deformed in such a way that people who met him afterward were frightened. Even if Brother Klaus was committed to the Christian religion, it was only after many years of contemplation that he concluded that what he had seen was the Holy Trinity and he painted his vision on the walls of

his room. Jung writes that “[t]hrough subsequent elaboration this vision then became the so-called Trinity Vision” (Jung 1958, 319). Brother Klaus (Nicholas of Flüe) was canonized by Pope Pius XII in 1947. The painting can be seen in the church in Sachsen.

Another difference is that religious experiences often, but not always, typically involve subjective features such as *ineffable* (unexplainable) joy and exultation, calmness, sweetness, timelessness, unification, etc. (Alston 1991, 20–23). In other words, religious experiences usually include subjective features unusually experienced in nonreligious ones. The sense of awe of a religious experience is what Rudolf Otto (1869–1937) terms *numinosum*. In *The Idea of the Holy*, Otto explains the numinosa as including both the element of fear and trembling (*mysterium tremendum*) and the element of love (*fascinatum*) in the presence of God or *Ultimate Reality* or, in Otto’s term, the Wholly Other (Otto 1970, 8–41). See further entry on Das Heilige. Such experiences, he maintains, are ineffable. Such experience, which also reflects the experience had by brother Klaus as mentioned above,

grips or stirs the human mind. The feeling of it may at times come sweeping like a gentle tide, pervading the mind with a tranquil mood of deepest worship. It may pass over into a more set and lasting attitude of the soul, continuing, as it were, thrillingly vibrant and resonant, until at last it dies away and the soul resumes its “profane,” nonreligious mood of everyday experience. It may burst in sudden eruption up from the depths of the soul with spasms and convulsions, or lead to the strongest excitements, to intoxicated frenzy, to transport, and to ecstasy. It has its wild and demonic forms and can sink to an almost grisly horror and shuddering. (Otto 1970, 12–13).

Jonathan Edwards (1703–1758) explains religious experiences in terms of a new sense of the heart. In *Treatise on Religious Affections*, he writes that genuine religious affections consist in a new sense of the heart which is analogous to our five ordinary senses apart from that it cannot be reduced to one of them. The new sense of the heart can only be grasped by experience. “Affections that are truly spiritual and gracious, do arise from those influences and operations on the heart,

which are *spiritual, supernatural and divine*” (Edwards (1959) part III). Thus, Edwards explains religious experiences in terms of direct and specific sense perception. This sense perception affects the heart, which in Western religious traditions is often associated with feelings derived from God or Ultimate Reality.

A completely different understanding comes from Robert Forman. In *The Problem of Pure Consciousness*, he claims that certain religious experiences do not have content at all; they are contentless, nonintentional, immediate, and pure. Actually, they are experiences of nothing at all but are nevertheless powerful experiences. Because one does not experience anything, such experiences cannot be embodied in culture (Forman 1990).

Religious Experiences Seen as a Relationship

All human experiences are expressions of a relationship between the experiencer and the experienced. Hence, a religious experience can be understood as an expression of a relationship between the believer and what the believer refers to as Divine, God, or Ultimate Reality. Considering religious experiences in terms of a relationship goes back to Friedrich Schleiermacher (1768–1834) to whom, in *The Christian Faith* (1830), a religious experience is a feeling (or intuition). This feeling is an immediate ► *cognitive* relation (*immediacy of awareness*) to some object giving an insight that is not mediated by any concepts (Schleiermacher 1928). In *On Religion* (1799), he explains that feeling is a person becoming immediately aware of his or her absolute dependency of God. In other words, the feeling of absolute dependency is an immediate consciousness of the relationship between Ultimate Reality or God and oneself in a way that is absolute and indistinguishable (Schleiermacher 1923).

In *The Sociology of Religion*, Max Weber maintains that Saint Paul’s conversion, for example, was not merely a vision but also recognition of the inner relationship between the resurrected Christ and the doctrines and soteriology of that time. In other words, Paul’s experience was

recognition of a relationship between Jesus Christ (earlier rejected by Paul) and the Jewish conceptions of ► *salvation*. From this relationship, a further relationship emerged, namely, the relationship between Paul’s religious experiences and the change of his social actions (instead of persecuting Christians, Paul now became one of their leaders).

Yet, another way to express the relationship is to emphasize the religiousness of the relationship. In other words, it is not God or Ultimate Reality who/that is religious, it is not the experiencer who is religious: the real religious feature emanates in the interface between the two (Runehov 2007, Chap. 2). In other words, the religious experience emerges out of the relationship between the experiencer and what the experiencer takes to be God or Ultimate Reality.

To Alston, it is God (or Ultimate Reality) presenting Godself that is the cause of the relationship (the conscious state). The reason why Alston does so is because he wants to dissent from the idea that all experiences of God and God agents are nothing but subjective experiences (Alston 1991, 14–20). The experiencer is passive because it is the world presenting itself to the experiencer (Alston 1991, 28).

According to Yandell, the experiencer is active and the cause of the religious experience is the recognition of the religiousness by the experiencer.

The Reality of a Religious Experience

Regardless of whether it is the sender, the receiver, or the relationship in between that is responsible for the experience (or conscious state), the experience will be real to the experiencer. For example, one of William James’ informants said, “Everything else might be a dream, but not that” (James 1997, 64). Also, anthropologist Eugene d’Aquili (1940–2001) argues that the religious experience they called *Absolute Unitary Being* (the ultimate or experience, the experience at the most intense moment of meditation, which some also call pure consciousness, or the highest state of consciousness)

is real – so real do these experiences appear when recalled in baseline reality that they have the ability to alter the way the experiencers live their lives [...]. “[T]he word real is not here used poetically or metaphorically. It is used in the same sense as in the utterance ‘This rock and this table are real’” (d’Aquili and Newberg 1999, 192). Neither James nor d’Aquili and Newberg maintain that the object of the experience exists, but regardless of whether it exists or not, the experience of it is real. For example, assume a person who is afraid of snakes and sees the tail of a cat wagging from behind some stones. The cat tail seems to the person to be a snake. The person will be frightened as though the snake was really out there. In other words, the persons’ experience of fear is real (Runehov 2007, Chap. 2).

When Is an Experience a Religious One?

Keith Yandell also argues that an experience is a religious one if it is *doctrinally* and *soteriologically* central to a religious tradition (Yandell 1993, 15). In other words the experience needs to be in accordance with the theory of faith and of salvation central to a religious tradition. Yandell wants to exclude those religions and religious experiences that are implausible and even evil (Yandell 1993, 15). Yandell distinguishes in addition between *de facto evidence* and *effective evidence* and maintains that an experience *x* is *de facto* evidence for a claim *c* if the experience *x* meets the relevant conditions (those conditions making the experience legitimated) (Yandell 1993, 44). An experience *x* is *effective* evidence if it is both *de facto* evidence and accepted as such by the experiencer. For example, person *A* seeing a cross on the water draws his experience to the attention of person *B*. Assume that person *A* recognizes the cross on the water to be a Christian sign (*de facto* evidence) but argues that the sign is formed by the sunlight reflecting on the water (*no effective evidence*). Person *B*, on the other hand, also recognizes the cross to be a Christian sign but tells her friend *A* that seeing the cross gave her an experience of ineffable joy, as if she was touched by the Divine. Hence, person

B’s experience will also be effective evidence, while person *A*’s is not. Person *B*’s experience has fulfilled the criteria to be a religious experience, person *A*’s has not done so.

Following Alston’s thinking, there is the possibility that even though a person does not recognize the evidence for his experience, his experience might be evidence for another person (Alston 1991, 11–12). Moreover, one may actually be experiencing God without even being disposed to identify the object of the experience as God if the question arose, just as one can see a cyclotron without realizing that what one sees is a cyclotron. Indeed, how many people actually know what a cyclotron looks like (Alston 1991, 11–12)? Moreover, it may also be the case that the person refuses to recognize that it was God presenting Godself to him or her (e.g., the Pharaoh in Exodus).

The Object of Religious Experiences

Because religious experiences are subject to all religions and not to, for example, the Christian religion only, the understanding of God, the Divine, or Ultimate Reality needs to be broadened. For instance, in *A Pluralist View*, John Hick intends with the Divine, God, or Ultimate Reality as “absolutely real, [and] which corresponds sufficiently to the Sanskrit *sat* and the Arabic *al Hagg*” (Hick 1996, 47). In *A Concise Encyclopedia of the Philosophy of Religion*, Anthony Thiselton understands God as “the Ground of Being” (Thiselton 2002, 307). Runehov completes and means that the Divine, God, or Ultimate Reality is the absolute ground of everything that is and ever will be (Runehov 2007, Chap. 2). The advantage is that if we understand God as the absolute ground of everything that is and ever will be, then God could present Godself to a person in a way that nobody has ever experienced and no religion has yet thought about. That perceptions of God are possible is defended by Alston by way of his theory of appearance, dictating that “the notion of *x*’s appearing to *S* as so-and-so is fundamental and unanalysable [...]. For *S* to perceive *x* is simply for *x* to appear to *S* so-and-so.” We should

understand unanalyzable as “not analyzable in terms of conceptualizations, beliefs, takings or anything else of the sort” (Alston 1991, 55–59). Alston also maintains that the theory of appearance allows for the possibility that what is perceived in an experience may diverge from what it actually is (Alston 1991, 55). As an example, Alston mentions Moses’ experience of God in a burning bush (Leviticus 3:3–10).

Are Psychical Experiences Religious Experiences?

According to what William Braud says in his article “Brains, Science, Nonordinary & Transcendent Experience,” psychical experiences are not religious experiences, because according to him, psychical experiences are those experiences that people use to influence the world around them using other than the common five senses (Braud 2002, 124). The most common (or known) psychical experiences are:

1. *Clairvoyance*, which roughly is a way of mind-to-object communication or interaction. It implies to have sudden knowledge of some objective event, usually at a distance (Braud 2002, 124).
2. *Precognition*, which is about having accurate knowledge of future events that have not yet occurred and that could not have been predicted on the basis of rational inference nor accounted for on the basis of chance coincidence (Braud 2002, 24–25).
3. *Telepathy* is a way of distant mind-to-mind communication or interaction (Braud 2002, 124).
4. *Psychokinesis* is known as mind-matter interaction in which one’s attention and intention may directly influence other persons, other living systems, or inanimate physical systems usually from a distance (Braud 2002, 125).

According to Runehov, the borderline between religious and psychical experiences is not always very clear, that is, religious experiences may also be manifested by way of, for example, clairvoyance (which in Christian traditions probably would be regarded as a *vision*) and

precognition (which in Christian traditions probably would be considered as *prophecy*).

Ways of Experiencing Religiously

There are different ways in which a person could have religious experiences.

In *Reason & Religious Belief, an Introduction to the Philosophy of Religion*, Michael Peterson’s theory is that we have experiences in which we actually *participate* (like playing chess) and those in which we take part as *witnesses* (Peterson 2003, 16). Keith Yandell distinguishes between *perceptive* experiences in which we are aware of an object relative to us and *introspective* experiences in which we are aware of an aspect (of the subject of experience) relative to us (Yandell 1993, 42–43). However, introspection, as Yandell defines it, should not be understood as the act of looking into one’s own thoughts and feelings. Rather, an *introspective experience concerns aspects rather than objects* (Yandell 1993, 43, 38, 280). William Alston makes a division between having *sensory* and *nonsensory experiences*. His idea is that in sensory experiences, something is literally presented to us in contrast to nonsensory experiences where there is a specifiable mode of consciousness through which something is perceived (Alston 1991, 19–23). Contrary to Yandell, Alston’s *nonsensory concept* can be understood as a *looking into one’s own thoughts and feelings*. Since God is pure spirit, God will probably present Godself in a nonsensory experience rather than in a sensory one, for example, loving, powerful, or good. A sensory religious experience would be experiencing Jesus in human form: “[A]ccording to the Christian doctrine, Jesus of Nazareth is both man and God; so that to see him, even in human form, is to see God” (Alston 1991, 20).

Out of Peterson’s, Yandell’s, and Alston’s theories, Runehov constructs six adequate ways of religious experiencing (Runehov 2007, Chap. 2):

1. The participating perceptive sensory way of experiencing
2. The participating introspective sensory way of experiencing

3. The participating introspective nonsensory way of experiencing
4. The witnessing perceptive sensory way of experiencing
5. The witnessing introspective sensory way of experiencing
6. The witnessing introspective nonsensory way of experiencing

Examples

Reading the scriptures is a good example of a *participating perceptive sensory way of experiencing* because one participates in the experience, the experience clearly has an object (the scripture), and it involves one's senses (eyes).

A religious experience obtained by way of meditation in which the meditator repeats and concentrates on a mantra would be an example of a *participating introspective sensory way of experiencing* because such experiences need the experienter's participation, but the experience is introspective, it has no objects; nevertheless, one of the five senses are needed to have such an experience.

A religious experience obtained by way of *via negativa meditation* act would turn the experience into a *participating introspective nonsensory way of experiencing*. The experience is participating because to concentrate on something (emptying one's mind of all thought) needs one's participation. It is introspective because the idea of the *via negativa* meditation technique is to empty one's mind of all thought and the experience is nonsensory for the same reason.

Watching and witnessing (but not participating) in a mass would be examples of a *witnessing perceptive sensory way of experiencing*. You witness how the preacher preaches without participating yourself. The experience involves objects, and it hence is perceptive in kind, and you have to use some of the five senses.

Experiencing God in nature would be an excellent example of a *witnessing introspective sensory way of experiencing*. One witnesses the beauty of nature and recognizes God in it. The experience is clearly introspective, and it is sensory because you see the beauty of God in nature and not merely in your thoughts.

Finally, we find a distinguished example of a *witnessing introspective nonsensory way of experiencing* in Marcel Proust's *A la recherche du temps perdu* (*Remembrance of Things Past*). In this frequently quoted experience, Proust does not participate in the sensation which the eating of the petites madeleines arouses, but instead witnesses his past. Therefore, there is no object involved (he experiences merely the memory of his aunt Léonie dipping the madeleine cookie in her tea cup). Furthermore, it is a nonsensory way of experiencing because, even though it was the smell and taste of the madeleine cookie that triggered the experience, these are not the experience itself. Observe that this witnessing introspective nonsensory experience has evolved from a participating perceptive sensory experience (the cookie's smell and taste are merely the channels that lead him to the experience of his past). A religious experience of this kind would be remembering the ceremony in church on a later occasion, triggered or not by something.

Types of Religious Experience

There is a tremendous variety of religious experience. Alston, for instance, writes that "[i]n the widest sense, 'religious experience' ranges over any experiences one has in connection with one's religious life, including any joys, fears, or longings one has in a religious context" (Alston 1991, 94); to name some: feeling thankful toward God or Ultimate Reality, feeling guided by God or Ultimate Reality, seeing God or Ultimate Reality in nature, feeling a sense of ecstasy, experiencing pure consciousness, experiencing universal love, having visions or revelations, experiencing a union with God or Ultimate Reality, etc. In *The Existence of God*, Richard Swinburne collects all religious experiences in five main types which he classified from the perspective of the experienter and which he considers to be mutually exclusive and totally exhaustive of the possibilities (Swinburne 1979, 250–251). His categories are:

1. A religious experience obtained through a perfectly ordinary nonreligious object
2. A religious experience obtained through very unusual public objects

3. A religious experience obtained through certain sensations private to himself or herself that are of a kind describable by normal vocabulary used for describing the sensations which result from the use of our five senses
4. A religious experience obtained through private sensations not describable by normal vocabulary
5. A religious experience obtained without sensations

Examples

Religious experiences obtained through a perfectly ordinary nonreligious object (Swinburne 1979, 250). Among other possibilities, this might include experiencing God or Ultimate Reality in a beautiful sunset or in a piece of Gregorian music. The sunset and the music are the channels through which God or Ultimate Reality is experienced.

Religious experiences perceived through very unusual public objects (Swinburne 1979, 250). Swinburne gives the example of the burning bush which Moses claimed to be God appearing to him in a fire out of that bush.

Religious experiences mediated through certain sensations private to himself [or herself] and sensations of a kind describable by normal vocabulary used for describing the sensations which result from the use of our five senses (Swinburne 1979, 250). Good examples are experiencing God in a dream, in a vision, or during a trance. A specific variant of this type of religious experience could be experiences of God or Ultimate Reality in near-death and life-beyond-life experiences.

Religious experiences mediated through private sensations, yet these are not a kind describable by normal vocabulary (Swinburne 1979, 251). An example of such a religious experience, experienced in a witnessing introspective sensory way, comes from Saint Teresa of Avila who was completely aware of Jesus sitting next to her and was talking to her, even though she did not see him.

Religious experiences obtained without sensations (Swinburne 1979, 251). For example, this could be experiencing God or Ultimate Reality intuitively and immediately. One intuitively knows that it is God or Ultimate Reality that one

experiences. Nicholas of Cusa maintained that he “perceive[d], not with [his] flesh eyes, which look on this icon of [God], but with the eyes of [his] mind and understanding, the invisible truth of [God’s] face” (Peterson 2003, 19).

One religious experience is however not covered by Swinburne’s classification but is presented in *Visions of Jesus* by Philip Wiebe (1997, 74–82): *religious experiences with observable effects* (Runehov 2007, Chap 2. inspired by Wiebe 1997, 74–82). These are experiences in which more than one person is affected. It may happen that two or more persons take part in the same religious experience that they really saw the same thing, or that one person undergoes the experience while another (or others) felt a tactile sensation. In Wiebe’s example, John shared his room with Nathan who came down with a virus and stayed in bed to recover. As John was praying for Nathan one night, he opened his eyes to look at his friend. He was shocked to see someone standing over Nathan’s bed, but facing and looking at him. John immediately identified the person as Jesus, in part, because of the sense of awe that the appearance of the person evoked. John was about to tell his sick friend what he was seeing when Jesus reached over and placed his hand on Nathan’s forehead and disappeared. At that instant, Nathan leaped out of bed and ran down the halls of the dormitory shouting, “I’ve been healed, I’ve been healed.” Nathan later said that although he did not see anyone, he felt something touch his head (Wiebe 1997, 76).

At least since the 1970s, religious experiences have become of increasing interest for neuroscientific studies. This has entailed the meaning of religious experience changing from being a hard to grasp abstract description of some mental state (only of interest for a limited group of philosophers and theologians) to becoming a measurable function of the brain (of interest for both researchers and laymen). Even if *sacred or neural, the potential of neuroscience to explain religious experience* engages in the problem’s causes by neuroscientific studies on the issue, and the explanation of these studies is left to the neuroscientists themselves.

Cross-References

- [Consciousness](#)
- [Experience](#)
- [Meditation](#)
- [Neuropsychology](#)
- [Neuroscience](#)
- [Religious Experience](#)
- [Revelation](#)
- [Spirituality](#)

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Religious Faith

- [Faith and Belief](#)

Religious Practice

- [Practical Theology](#)

Religious Ritual

- [Fire-Walking](#)

Religious Sociology

- [Catholic Sociology](#)

Religious Studies

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Description

Religious Studies is an academic discipline that studies the complex phenomena of religion from a variety of perspectives. It is usually classed in the division of humanities. Typically, a university will have a stand-alone Department of Religious Studies, hosting positions held by

specialists in subfields, though the subject is also sometimes housed in Departments of Philosophy. The distinction between “Religious Studies” and “religion” is an important one. Reference to “religion” will sometimes be taken automatically to imply adherence to a specific religion. But “Religious Studies” refers to the disinterested, academic study of religion that assumes a secondary position, at a step removed from the actual beliefs and practices of a given religion. Academicians in Religious Studies study the various aspects of religion, such as its belief systems, ritual forms, the role it plays in peoples’ lives and in society at large, and so on.

In the West, religion was one of the first areas to become the object of serious study. Many of the original universities in Europe owe their beginnings to religious orders. The traditional model of “religious” schools, whose program of instruction involves the promotion of a particular religious belief, still survives today in the form of seminaries and schools of ► [theology](#). Students in these institutions are typically interested in ordination or a career in religious service. Their programs of study vary in important ways from the curricula of modern Religious Studies departments which do not promote belief in any religion.

The academic study of religion is grounded in the same ► [enlightenment](#) norms which produced the critical, “scientific” method of examination of other subjects in the university. Religion is examined in the light of reason following the principles of ► [critical thinking](#). ► [Enlightenment](#) rationalism produced a methodology called “secular humanism” which approached the Bible from a “secular” point of view, that is, unaffiliated with any religion’s ► [theology](#), and considered the Bible to be a work of human hand, containing human error. This naturally produced waves of reaction, as those who viewed the Bible as the unquestioned holy word of God, attempted to counter the arguments of Biblical scholars.

Religious Studies might be said to have originated in the mid-nineteenth century, with the groundbreaking work of German scholar Max

Müller, who is sometimes referred to as the father of the “science of religion.” He was also among the first to open up to the West some of the great works of Eastern religions, such as the *Vedas* and *Upanishads* of India. This had an enormous impact on Western scholarship, when it was recognized that the subject “religion” had been held unconsciously to be synonymous with Christianity, or at its broadest range, “Judeo-Christian” traditions. In the wake of Müller’s influence, scholars began to turn their attention to all the other religious traditions of the world. Because early researchers concentrated on the question of the origins of religion, they focused on religion in primal or indigenous societies. Among the most prominent of the earliest researchers were E. B. Tylor, (*Religion in Primitive Culture*, 1871), James G. Frazer (*The Golden Bough: A Study in Comparative Religion*, 12 Vols. 1911–1919), Claude Lévi-Strauss (*The Savage Mind: Introduction to the Science of Mythology*, 1912), Lucien Lévy-Brühl, (*Primitives and the Supernatural*, 1935), Bronislaw Malinowski, (*Magic, Science and Religion*, 1935), and Max Weber (*The Sociology of Religion*, 1922).

Due to this early emphasis on the study of “primitive religion,” many of the earliest scholars on religion came from anthropology. But soon, scholars from other fields began to address the subject of religion including sociologists (Max Weber), psychologists (Sigmund Freud, Carl Jung, Abraham Maslow), and literary scholars and critics (Robert Graves, Northrop Frye). Because of this background, Religious Studies has suffered from a chronic case of identity crisis. Is it a subsection of anthropology as it was for Tylor, Lévy-Brühl, and Malinowski, or is religion more properly an issue for psychologists to explore? Some contend that Religious Studies has not really developed its own methodologies, but borrows these from other disciplines. Some have even suggested that Religious Studies should disappear as a separate field and the various lines of the discipline be absorbed back into those parent disciplines. Other scholars struggle to develop methodologies that are unique to Religious Studies.

Because of its very nature, religion must be approached within a multidisciplinary framework. It is so widespread that to date, no society has been found anywhere in the world that does not have religion. Religion is a multifaceted phenomenon, with a public dimension, involving social norms and overarching worldview. On the private side, religious experiences are among the most profound an individual can have. Religion has inspired powerful institutional forms and literary and artistic works throughout history and across the globe. The degree of interaction between a religious tradition and its host society makes it essential to consider for a genuine understanding of that culture.

Because of this extraordinary degree of overlap with other disciplines, a kind of “dimension” or “subfield” approach to the subject of religion has emerged. These include ► [theology](#), philosophy of religion, ontology/metaphysics/cosmology, ethics, history of religions, psychology of religion, anthropology of religion, sociology of religion, the sociopolitical dimension of religion, myth and ritual studies, religion and literature, and religion and art.

Developments in the field include this ongoing debate over the definition of our core term “religion” and what methodologies could/should be used to study it. In addition, each subfield hosts its own vigorous debates. We might mention two exciting new developments as representative of the robust scholarship in the field: first, in the area of New Testament studies, the convening of the “Jesus Seminar” by Robert Funk, beginning in the mid-1980s, whose work continues to impact the discipline profoundly. The Fellows of the Seminar, a collection of some of the most respected scholars in the world in this field, closely examined the traditions assigned to Jesus in the text of the New Testament. One finding of the Seminar is that Jesus probably never said some 80 % of what is attributed to him in the New Testament. Second, the exciting work of the “Pluralism Project,” spearheaded by Harvard professor Diana Eck, represents an attempt to take the pulse of the growth and significance of religious pluralism in contemporary American society.

Self-Identification

Science

Max Müller, one of the founders of the modern discipline of Religious Studies entitled his endeavor, the “science of religion.” What he meant by “science” is informed by the ► [enlightenment](#) norms of “► [critical thinking](#).” The extent to which the discipline of Religious Studies is founded on and continues in that vein with twentieth and twenty-first century challenges and modifications is the extent to which Religious Studies could be considered a “science.” Included in these “scientific” norms of scholarship are careful attention to sources of information and their legitimacy, weighing of possible alternative explanations, grounding in evidence, consistency and validity of argument as a basis for sound conclusions which always remain probabilistic and not absolute or colored by personal bias, and sensitivity to the meta-questions, that is, what criteria are to be used and by whom to determine the validity of any answers offered to these questions?

Religion

Religious Studies is the academic discipline that studies the phenomena of religion from the perspective of critical analysis. As an academic field, Religious Studies does not profess religion as such, so it could not properly be called a “religion” itself. However, what may be relevant here is the dilemma for many in the field, of functioning as an academic professional in Religious Studies, and following one’s own religion or spiritual path. Here, the waters can get murky. In some subareas within the discipline, adherence to a religion and studying it academically are explicitly intertwined. Many scholars in the field of Islamic Studies today, for example, are themselves practicing Muslims. In fact, some institutions will require a professor in their program to adhere to a specific religious perspective, as in the explicit mission statements of Evangelical, Catholic, or Rabbinic institutions. The majority of these self-identify as theological schools. In programs that do not specifically identify with a religion, academics often walk a fine line. In general, the attitude of the discipline is that

if individual scholars do hold any specific religious beliefs, such views remain their own private business and are not to be put forward as a basis for instruction in their classes or in their published work. The discipline places prime importance on avoiding any semblance of advocacy of any specifically religious point of view.

Characteristics

The extent of the overlap of Religious Studies with so many other disciplines is due to the many dimensions of religion itself. Yet no matter whether the approach is historical, philosophical, social, or political, there is still something in the mixture that makes it “religion.” This religious element itself is the focus of Religious Studies, whereas for scholars in other disciplines, “religion” is a subset of their primary interest. The proof that Religious Studies really constitutes its own field is seen when we focus on the specifics. Religious Studies overlaps with anthropology and owes its origins, in part, to their ranks, but that discipline only focuses on the cultural aspects of religion, not the psychological or philosophical. Nor would the subject of European religious history be a traditional topic in the field of anthropology. This might belong more to a history curriculum, yet the historian’s interest in religion will not typically extend to the cosmological and philosophical questions themselves. Whereas metaphysics and ethics clearly overlap with the subject of philosophy, studies of shamanism, or religious ritual, do not appear to belong naturally to a philosophy curriculum. Each discipline will represent a piece of this multifaceted “thing” we call religion. Yet all these are traditionally recognized topics within Religious Studies.

What it is exactly that makes something “religious” is a question that fuels great debate in the field. The referent of “religion” is the sacred, the divine, and is itself ineffable, beyond description, so that it will always elude precise definition. It cannot be properly “defined” because something like “the sacred” is not a category that is itself “definite” or “finite.” The factor that makes

something “religious” is finally a *je ne sais quoi*, as the French would have it, an “I don’t know what.” Seemingly always present in the “religious” is the quality of awe, the experience of numinosity, around which “religious” teachings and institutions evolve. Here, the “religious” overlaps with the “spiritual” and is taken to convey the qualities of awe, numinosity, meaning, value and recognition of the sacred and of the operation of conscience and consciousness. It is Religious Studies’ engagement with this central factor of awe/numinosity that makes it distinctive from other disciplines.

Relevance to Science and Religion

It might seem at first blush that science and religion are enemies of a sort in the postmodern world. Some religious believers feel science is somehow denying truths that they live by, but which cannot be empirically demonstrated. Those who speak for science in public debate often claim that “science” is a methodology that asks certain kinds of questions, how’s not why’s. Science can only speak in the language of empiricism, so it claims to have no way to legitimately arrive at answers to “religious” or “spiritual” questions and thus ultimately should not be relevant to “spiritual” matters. “Religion” becomes an “enemy” to scientists in cases when “religion” influences school boards to prohibit the teaching of the theory of evolution in public schools. The pressure the “religious right” exerts on this issue and others, such as the development of stem-cell research, which stands poised to introduce the next revolution in medical science, becomes problematic for scientists who want to see their work grow in these areas unfettered by religious bias. “Science,” for its part, examines physical phenomena using empirical methods to derive data and draws tentative conclusions about these data, in order to add to the sum of human knowledge about our world. “Religion” involves “belief,” whereas “science” deals only with observable “fact.”

However, religion scholars point out that when examined in depth, at its foundation,

“science” also entails “belief” and operates on unproven, because unprovable, presuppositions that finally must be taken on “faith.” One such scientific axiom is that our senses do report accurate information about our world. This ultimately is a philosophical question, to which there is no absolute answer. This very assumption is called into question by early twentieth-century scientist Werner Heisenberg’s “Uncertainty Principle” and the theories in quantum physics of the “participating observer” who inescapably distorts whatever “facts” are observed.

Thus, in the debate over definitions in Religious Studies, “science” itself could be understood as a kind of “religion.” The two bear an underlying affinity because both of them are essentially worldviews. “Science” and “religion” ask some of the same questions: Who are we? How did we get here? Why are we here? The answers to these questions that a given individual accepts, whether they are “scientific” or “religious/spiritual,” will constitute that individual’s “worldview” and his or her vision of the universe and place in it. Both “science” and “religion/► spirituality” function as paradigms and models through which experience is filtered. They clash head-on only when considered from the point of view of rigid approaches of both scientific methodologies and absolutist religious dogma.

But these very public “culture wars” by and large are being waged by the most extreme representatives of “religion.” When one looks beyond the raucous public display of hard-line animosity into the academic study of religion, a very lively and much more sympathetic conversation has been shared between “religion/► spirituality” and “science.” Their points of intersection find perhaps no better illustration than in the example of Albert Einstein, one of the most influential figures of the twentieth century. Einstein was a “scientist,” who initiated a sea change or “paradigm shift” in his own field of physics. Yet he was also a “philosopher,” who eloquently articulated a “spiritual” orientation toward the universe that could be called “cosmic consciousness.” We need an interdisciplinary approach that encompasses “science” and “► spirituality” just to

appreciate the work of Einstein, let alone the phenomena toward which he pointed.

The new paradigm shifts from viewing things as mechanical objects toward perceiving them as complex, interacting systems with emergent properties. It regards the older scientific paradigm as reductionistic of phenomena that are far too complex to be adequately represented by quantifiable data alone. The centerpiece of the new paradigm is the recognition of active (even “conscious”) holistic systems interacting on subatomic, physical, biological, psychological, social, environmental, and spiritual levels. The emerging paradigm in the sciences has led to exciting new developments such as relativity theory; chaos theory; string theory; quantum physics; theories of strange attractants, synchronicities, nonlocality, and interconnectedness; and phenomena that are quite familiar in a “religious/spiritual” context.

In environmental science, the paradigm shift has produced the Gaia model of the earth as a superorganism biosphere central to sustainability studies, representing a reemergence, in modern scientific dress, of ancient mother-earth worldviews. The emerging paradigm is an eco-paradigm that self-consciously invokes a sacred earth/sacred cosmos worldview.

In the medical sciences, the paradigm shift has produced a wave of holistic, complementary, and alternative medical practices that use non-Western spiritual healing techniques which have been inherently holistic since their inception. Models for bringing issues in health care and spirituality together are being incorporated in medical curricula across the country, as in the University of Massachusetts Medical School’s “Center for Mindfulness” and the University of Pennsylvania Medical School’s “Center for Spirituality and the Mind.”

Proponents of the new paradigm posit that meaning/value/awe/conscious (“spiritual”) dimensions are at work in physical, biological, environmental, psychological, social, and health phenomena (science). These dimensions call for open-minded dialogue and broad interdisciplinary overview that avoids the compartmentalizing of the old paradigm. So in the end, appearances

are deceiving. “Science” and “religion” really do intersect with each other to a far more profound extent than one might suspect on the surface. These developments in cutting-edge science have produced an exciting arena of discussion and cross-fertilization between “science” and “spirituality,” leading to a dizzying array of works by scientists, such as Fritjof Capra’s *The Tao of Physics*, Brian Greene’s *The Elegant Universe*, and Gary Zukov’s *The Dancing Wu Li Masters*.

Sources of Authority

Religious Studies maintains a rigorous academic review program, including a range of over 200 scholarly journals and international professional societies, such as the American Academy of Religion and the Society for Biblical Literature. Scholars of religion do not assume an authoritative voice on any of religion’s great imponderable questions; they only examine the answers that religious systems themselves have offered. Sometimes, a scholar’s theories will gain a wide credence across the field and become normative for other scholars. Examples might include the “documentary hypothesis” in Old Testament Studies, in which nineteenth-century Biblical scholar Julius Wellhausen discerned at least four separate authors from different time periods of the Torah, the first five books of the “Old Testament.” In New Testament studies, it is the mid-twentieth-century scholar Rudolph Bultmann who set the standard; his students dominated this field for decades. Another example might be cited in the “history of religions” school founded by Mircea Eliade at the University of Chicago’s Divinity School, a tradition carried on by his students and colleagues, Joachim Wach, Joseph Kitagawa, and others.

Ethical Principles

Academic norms apply to Religious Studies in the area of “ethical principles” as well. These principles include professionalism, courtesy,

acknowledgement of the work of fellow scholars, respect for all points of view, and the importance of treating each individual with dignity. This basic ethic of respect and empathy can be quite difficult in an area like religion, where intense emotions can at times reach fanatical levels. Respect for the atheist, as only one example, can sometimes prove too much of a challenge for some religious zealots. The discipline of Religious Studies insists on such basic ethical principles as mutual respect and courtesy.

Key Values

As an academic field of study, Religious Studies places prime value on the norms of ► [critical thinking](#) that inform all scholarship. Yet, due to the ineffable nature of the referent, the object of religion, scholars cannot ignore the extra or nonrational aspects of their subject. Value is also placed in this field, on intuitive faculties, depth of feeling, and experience. The extraordinary value religion places on “the sacred” is held in high regard by academics who study religion. Whereas religious adherents sometimes accuse academic “critics” of “attacking” what to them is “holy scripture”; in fact, Religious Studies scholars place tremendous value on the religious texts, works of art, rituals, and traditions of the various religions they study, for the wealth of information they afford, as well as for their profound beauty and elegance of expression of humankind’s deepest longings and most gripping experiences.

Conceptualization

Being an academic field of study, Religious Studies is a step removed from the beliefs and practices of religion itself and as such does not take a specific position on what constitutes any of these terms, each of which is a core modality of religion/► [spirituality](#). Because of this second-level removal, each of these terms will be “answered” by providing

examples of the kinds of perspectives religious traditions themselves have assumed toward them. In the case of each term, meanings and values cover a spectrum:

Nature/World

From the “ensouled universe” of many primal religions that envision spirits, nymphs, and fairies to enliven natural features of the environment to the nature as the living body of God, as viewed by pantheists; to the world as a prison-house in which we sojourn as aliens, of the Platonists; and to the fallen world which has been plunged into sin by human disobedience against God for the Christians, for whom the physical world is the testing ground for earning one’s way back to one’s “true home” in heaven.

Human Being

From the dignified seat of the sacred and kin to all other living beings characteristic of Native American and other indigenous religions; to flawed sinner who is redeemed only by the savior Jesus Christ for Christians; and to the “Atman,” the true or higher self in Hindu yogic traditions, that is “indivisible,” identical with “Brahman,” Godhead.

Life and Death

From that which is infused with “ruach” in Hebrew, “pneuma” in Greek, or the “breath,” or “spirit,” of God in the Jewish and Christian perspectives, as life’s origin is described in Genesis: God breathed into all life the breath of life, and they became living beings; to the continuous unfolding of divine energy as poured into the material plane in Hinduism; ► **death**: from the “wages of sin” and victory of the Evil Lord of the Christian and Zoroastrian perspectives, yet the saved among humanity will earn eternal paradise after dying, with a corresponding damnation in hell for those not saved, as in the Christian and Islamic traditions; to the concept of “samsara” in Hinduism and Buddhism, the “stream” of continual reincarnations after death until the deliverance of enlightenment can be won by one’s own spiritual efforts.

Reality

From the basic observable world of the senses of the atheist (whose perspective must be included somewhere under the rubric of Religious Studies, which studies topics in theism and atheism), to the unfolding of the Tao, the Way of nature, which arose from the interaction of yin and yang, negative and positive energies, in the Taoist tradition, and to the concept of “maya,” characteristic of classical Indian religion, that the physical world is an illusion, a “mayic/magic” show, while true reality is entirely unseen but ubiquitous, its true nature, divine.

Knowledge

For Religious Studies proper, knowledge is the product that is built up by academic methods of investigation, study, and analysis of religious phenomena. For some of the religions themselves, true “knowledge” shows its significance by reference to its etymological kin: it is “gnosis” in Greek and “jnana” in Sanskrit, which point to the mystical, direct apprehension of the divine in Platonic and Hindu traditions.

Truth

Another key technical term in the field of Religious Studies, taken variously to apply to the “real” nature of the universe, as opposed to its oblique appearance to the senses, that it is infused with the divine in many spiritual traditions; to the hidden nugget of existence that once grasped will deliver its bearer from suffering as in the Christian adage, “you shall know the truth and the truth shall set you free”; and to the truth of the atheist that the world is devoid of any spiritual entity or aura, no matter how much religious believers want to imbue it with such. For Religious Studies scholars, knowledge always remains tentative and hypothetical, subject to modification as new data emerge, so no academician can finally pronounce what is “true.”

Perception

A faculty of apprehension which is one of the “skandhas,” the “aspects” that constitute the human being in Buddhism that will misdirect its owner to cling to the object of perception and thus

end up in a condition of suffering and to the individual's determinant of reality for the quantum physicist who studies the effect of perception on reality. For Religious Studies scholars, perception entails the manner in which a given scholar views religious phenomena. Such perception can be colored by religious or antireligious bias, whether the scholar is aware of it or not.

Time

Viewed in two primary ways across religious traditions, first is the cyclical concept of time, characteristic of the annual festival sequences of Paganism and indigenous traditions, and the complex cosmological system of Hinduism that counts cycles within cycles of never-ending time in trillions of year blocks; secondly, the concept of linear time, often said to have been introduced by the ancient Jews, who reckoned time as having begun with God's creation of the universe and has progressed through events, from past to future, and in apocalyptic thought of late Judaism, Zoroastrianism, Christianity, and Islam, will culminate in an end of time when the dead will be raised and the saved will inherit the "kingdom of heaven."

Consciousness

Another of the key terms in Religious Studies that is ultimately ineffable. It covers a range from the concept of the network of consciousness posited by some quantum theorists, a membrane that allows communication across molecules and cells, to the core principle of primal energy symbolized by the "kundalini" in the Hindu tradition; its focus will determine if an individual manifests power or sexual consciousness, appetite, compassion, and artistic or spiritual consciousness, crowned by the achievement of transcendental or God consciousness.

Rational/Reason

This is the core method of approach assumed toward religion in the academic field of Religious Studies, inherited from the eighteenth-century European ► [enlightenment](#) model of dispassionate, unbiased examination of religious phenomena in the light of reason. Conclusions drawn

about any object of study must be based on demonstrable data and sound argumentation and be responsive to criticism.

Mystery

Another core category approached by academics in Religious Studies. Religion/► [spirituality](#) is the product that flows out from the wellspring of the core mystery of existence. Religion's texts and rituals provide the believer a mechanism for direct experience of the numinous and bring one into encounter with the essential mystery of existence, characterized by foundational religion scholar Rudolf Otto, as the *mysterium tremendum et fascinans*. Engagement with this essential mystery of the universe is the very stuff of religion.

Relevant Themes

Owing to its grounding in ► [enlightenment](#) rationalist perspectives, and its promotion of courtesy toward, and empathy for all religious and nonreligious points of view, the "scientific" academic study of religion has been of enormous service to contemporary society. In this era of religious posturing, fanaticism, and terrorism which bases itself on religion, it is more important than ever for scholars to offer a sound education in this volatile subject, religion.

Cross-References

- [Buddhism in the West](#)
- [Consciousness, the Problem of](#)
- [Cosmology](#)
- [Ethics](#)
- [Faith and Belief](#)
- [Humanities](#)
- [Meaning, the Concept of](#)
- [Philosophy of Religion](#)
- [Psychology of Religion](#)
- [Religion, History of](#)
- [Religion, Sociology of](#)
- [Religion, Theory of](#)
- [Religiosity](#)
- [Religious Experiences](#)

- [Ritual](#)
- [Science and Religion Dialogue and the Interreligious Dialogue](#)
- [Theism, Classical](#)
- [Truth](#)
- [Worldview](#)

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Religious/Spiritual Marketplace

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The term usually refers to the plurality and variety of religious offers in culture. In addition to traditional and institutional religious communities, today, new “competitors” enter the marketplace where the individual can choose from whatever offer caters best to his/her religious needs. Media, for example, books, television, films, websites of religious communities and new religious movements, is one place where this religious or spiritual marketplace becomes manifest.

Religiousness

- [Religiosity](#)

Reproductive Success

- [Biology of Religion](#)

Research Design

- [Methodology in Psychology](#)

Research Methods

- [Methodology in Psychology](#)

Residual Vision

- [Blindsight](#)

Respiratory Medicine

- [Pulmonary](#)

Respirology

- [Pulmonary](#)

Restoring Health

- [History of Medicine](#)

Revealed Knowledge

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Knowledge that cannot be attained through philosophical, or the merely human, powers of

reason and inquiry, but through God's revelation in Scripture. Unlike Catholic Medieval theologians, the Protestant Reformers insisted that the attainment of all "higher" knowledge depends on the illumined understanding gained through a close and consistent reading of Scripture. Religious traditions and ancient authorities are not on a level of parity with this kind of knowledge.

Revelation

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Related Terms

[Christian faith](#); [Philosophy of religion](#)

In theistic religions, especially the Abrahamic religions of ► [Judaism](#), ► [Christianity](#), and Islam, God is often thought of as a God that reveals. Yet ideas about divine revelation are not as clear as might be expected given their prominence in many religious discussions. It is important to be aware of some of the chief ways divine revelation has been conceived in order to better understand some of the main discussions. Therefore, we will look at different models of revelation in the first section and then two broad categorizations of it in the second. It is also commonly thought among religious people that any divine revelation that takes place is intentional. God is in full control and sees to it that we are able to see or come to know what is required to flourish as persons by not only letting us discover things, but also by revealing things to us. This idea of intentional divine agency will mainly be taken up here by talking of views of revelation that stress God's agency. In talking about action there is an act-object ambiguity that it is important to be aware of. This will be discussed in combination with the different models of revelation. In the third section, we will then proceed to

talk about propositional content in order to bring some clarity into what role such content might play in revelation. Then, before summing up, we will discuss different ways revelation is related to truth.

Models of Revelation

Various models have been put forward for divine revelation. Avery Dulles has a categorization of different models of revelation that has received much attention in numerous discussions of revelation (Dulles 1985). Dulles distinguishes between five main models of revelation. The models are abstractions, so in practice the different models can overlap each other. Since many people have found Dulles' categorization of models to be helpful, it is worth presenting them here. The five models are revelation as doctrine, history, inner experience, dialectical presence, and new awareness.

1. *Revelation as doctrine* is essentially a model that focuses on speech acts and their content. A catch phrase for this model is "The God who speaks." God's speaking to people can be revelation. (See Mavrodes (1988) and Wolterstorff (1995) for a discussion of this type of model.)
2. *Revelation as history* is essentially a model that emphasizes that divine revelation takes place in history. So the phenomena that do the revealing or manifesting are historical. A catch phrase for this model is "The God who acts" and it is meant by this that God acts in history. (See Baillie (1956) and Mavrodes (1988) for a discussion of this type of model.)
3. *Revelation as inner experience*, also emphasizes the acts of God, but here the phenomena that do the manifesting are not external to the self, but internal. Friedrich Schleiermacher, for example, emphasized people's feeling of absolute dependence on God. The main focus in this model is on people's inner religious experience (See Schleiermacher (1963) for an example of this type of model).

4. *Revelation as dialectical presence* emphasizes an encounter with God. If one does not encounter God and realize that this places certain demands on one (divine imperatives in Emil Brunner's terminology), then no divine revelation has taken place. This is so because *all* divine revelation is encounter with God. The focus in this model is on God's initiating an I-Thou encounter (See Brunner (1964) for an example of this type of model).
5. *Revelation as new awareness* emphasizes subjective awareness and human agency in contrast to divine agency. People find meaning for the ultimate questions of life through their shared reflection on the world and themselves. The focus is on our arriving at a new consciousness or awareness by correlating ultimate questions with the meaning that can be found in religious sources. God comes into the picture as a ground for this meaning. (See Teilhard de Chardin (1971) for an example of this type of model).

Several things should be pointed concerning these models before going on. First, it is important to be aware of an ambiguity called the "act-object ambiguity." If, for example, one talks of Martin Luther King's famous speech "I have a dream," one can mean the datable activity of speaking or the content of what was said. The speech-content is easily obtainable. The speech-activity is no longer available, it being a historical event – even if recordings of the event may be available. So in talking of King's speech one can be concerned with the activity, the content or both. This act-object ambiguity applies to many acts and their content including revelation. So both the act of revealing and its content may be referred to as revelation.

We can also note concerning these models that religious sources support more than one model. For example, it is easy to find support for both of the first two models in biblical sources. For instance, there is this passage: "Now Samuel did not yet know the Lord, and the word of the Lord had not yet been revealed to him" (1 Samuel 3.7, NRSV used here and hereafter). Furthermore, one has passages like this one: "The secret things belong to the Lord our God, but the revealed

things belong to us and to our children forever, to observe all the words of this law" (Deuteronomy 29.29). Such passages are seen as assuming that God speaks, but that it is not always clear that God is doing this, yet that it can be made clear and that it is then important to live in accordance with what is said. This supports well the revelation as doctrine model in which the focus is on a "God who speaks."

At the same time we can see that the bible uses "revelation" for open divine activity in the historical arena. For instance, one can read, "Thus says the LORD: Maintain justice, and do what is right, for soon my salvation will come, and my deliverance be revealed" (Isaiah 56.1). What is revealed here is the deliverance, so it is the *content* of the revelation. Yet at the same time the deliverance is apparently not only the content of the revelation, but also the *activity* that reveals. So this is arguably a case of revealing something by doing it openly. One can often reveal that one can do something by doing it openly or that one is in the process of doing something by doing it openly instead of secretly. In this passage, it may well be that God is even then in the process of providing deliverance – even though not as openly and strongly as would soon be manifested. Something more than openness is meant, though, when it is said that help will soon be revealed. It is not only that God's deliverance is under way before it dawns on us, but also that when it dawns it will come with the intensity of a sunrise on a bright summer day. Hope in such deliverance can make biblical authors say such things as, "I consider that the sufferings of this present time are not worth comparing with the glory about to be revealed to us" (Romans 8.18). All this supports a view of revelation in which God is a God who acts in history – even if a part of history is still in the making.

Note though that all of the above models except for the new awareness model have spoken of God's agency to some degree: through God's speaking, through God's acting in such a way as to be experienced in history or in inner religious experiences, or through God's initiating an I-Thou encounter. The new awareness model, in contrast, has spoken of people's coming to a new

consciousness of religious answers by correlating them to life's ultimate questions. So even though the answers have a religious content to them, it is persons who do the correlating of the answers with the questions.

In thinking of the dialectical presence model of revelation it is important to think of it in the right way. One should not, for example, ask how can one grasp a revelation, if there is not already an existing revelation waiting to be grasped. This would misrepresent the view by making it look incoherent. To help understand this model, one can draw an analogy with the planting of seeds. On the one hand, there are various models of revelation that see (or at least leave it open whether it is possible to see) revelation as the spreading of seed that can have, as a consequence of the nature of the seed and its nurture, a fruitful harvest in people's lives (understanding in the case we are talking about). This model, on the other hand, sees the fruitful harvest as revelation, the spread seed having become fruitful by being nurtured or taken in productively. Revelation in this model can also be seen on the analogy of something's turning out to be persuasive, such as a credible argument. Just as a credible argument must persuade someone in order to turn out to be persuasive, something that is intelligible and has the potential to be revelation must be grasped by someone in order to turn out to be revelation.

Now it is time to continue to two other major categorizations of revelation: general and special revelation. These categories are ones that all the above models can use.

Revelation: General and Special

It is common to employ two major categories of revelation: general revelation and special revelation. In order to be properly classified as *general revelation* a purported revelation must be generally available by general means. As noted above, some people claim that there is no revelation that is not grasped. If this is assumed, then what is made available and called "general revelation" above is at most the continuous possibility of

revelation that is found in creation and the course of history. It becomes (general) revelation only when understood (generally). To be properly classified as *special revelation*, on the other hand, a purported revelation, while not being generally available, must be available for some person or other through special means and at some particular time. Or, again, if one claims that there is no revelation that is not grasped, then what is called "special revelation" above is simply a unique possibility for revelation. It becomes special revelation when grasped by a particular person.

It should be noted that traditionally it was believed that something could be divine revelation even if not grasped as such. A central reason for this is the concern to speak of a general revelation of God even if not grasped generally and this would be impossible otherwise. Modern theology has been more prone to deny that something could be revelation if it were not grasped as such. This has led some modern theologians to deny that there is any general revelation, since this would require them to affirm that there is a revelation that has been grasped generally and not all modern theologians have been willing to make such a claim when so many people deny that there is such a revelation. Of course, this does not mean that these theologians have no use for the concept of general revelation. It just means that they deny that there is anything that satisfies the concept. But where might general revelation be found, if it is there to be found?

General revelation might be found in nature, including the nature of persons, and in general history. Thomas Aquinas, for example, claimed that it is possible to see purposefulness in the world and that the world is contingent on a first cause, God. Many have claimed that by considering persons and their moral beliefs one can see that a ground for morality is needed, again God. It is also claimed that by looking at history it is possible to see, despite all the tragedies, that there is providence at work in it, that there is a God who provides.

Special revelation might be found in particular historical events (such as the biblical account of the experience of Moses at the burning bush), in

divine discourse and in the life of Jesus Christ. There are also sacred writings that, if not merely taken to be stories or records of revelations, are often taken to be a type of revelation. They are selective in what they present as their main purpose is considered to be relational – acquaintance with God and “his-story.”

Here it should be pointed out that whether sacred writings are revelation or not might have to do with the act-object (or process-product) ambiguity spoken of above. It was said earlier that if someone reveals something, then the word “revelation” could be used either for the act of revealing or for what was revealed, or both. So if particular sacred writings are the object or content of God’s revealing activity, then it is possible on an object-interpretation to say that they are revelation. They are a product of the process of revealing.

Still, there is another objection to calling the sacred writings revelation, which is much discussed. It is claimed that in divine revelation people relate to God not to propositions or sacred writings that are propositional. This is the propositional versus personal revelation debate. We now turn to this issue.

Revelation and Propositions

Propositional revelation has often been distinguished from personal revelation. And it has also often been claimed that in divine revelation it is a person – God – that is revealed not propositions. Propositions are seen as impersonal. One does not want propositions; one wants a God who acts. At the same time it has been argued by others that the issue is not so much whether revelation is propositional or not, but rather the important issue is what function propositions have. A weakness in many of these discussions is that very little is said about how the word “proposition” is being used. Not a whole lot will be said here either. Yet, since the word “proposition” is rather technical compared to a word like “personal,” something should be said about how it is being used here before proceeding.

Sometimes propositions are identified with the statements (either in the *act* or *object* sense). Such an identification has caused much confusion in discussions of propositional revelation. It is true that propositions are expressed in statements, but they are also expressed in many other types of speech acts. In speech acts such as requesting, promising, and ordering one says something with a propositional content. Propositions are also the content of many different attitudes that we have, whether we express these attitudes in speech or not. Propositional attitudes such as believing, doubting, desiring, fearing, and hoping have propositional content. So propositions are not to be identified with acts of stating or for that matter with mental attitudes such as belief. They are rather the *propositional content* of speech acts and propositional attitudes.

Propositions are often expressed by using that-clauses and many different attitudes and speech acts can share the same propositional content. That we can share what we believe or wonder about and what we desire or approve of and many other thoughts is vital for communication and translation between language communities. Propositions involve *reference* (or supposed reference) to something that is *presented in a certain way* for thought. A state of affairs is presented for thought. In the following examples of propositional content, the same proposition is used throughout to show how it can be shared by different speech acts and attitudes. The proposition is (*that*) *David cut the grass*. So David is referred to and presented as cutting the grass. Let us call the proposition *p* in the following examples.

1. Hanna desires *p*.
2. Hanna asked *p*.
3. Hanna wonders if *p*.
4. Maria doubts *p*.
5. Maria asserts *p* anyways.
6. David knows *p*.
7. Dan does not care if *p*, but he cares that Hanna asked *p*.

Propositions can serve all these functions and many more. It is quite a reduction to identify propositions with the assertion of them, seen in the light of this analysis of them. (See Searle’s

analysis of propositions in Searle (1969) for more on this).

It is important to note that typically the propositional content is only a part of what is said – not the whole content. So, for example, the entire content of a speech act that is a statement *that David cut the grass* is not just the propositional content. If the propositional content were all that we had to go on we would not know if this proposition were expressed as part of a question, an order or another type of speech act. If we only said *that David cut the grass* without expressing it with any force (i.e., as an assertion, request, etc.) Then all we have is the expression of a thought of David cutting the grass and nothing more. This would be quite unusual, but I cannot see that it is impossible. But if we were asked what was said in the above case, we could reply that it was stated that David cut the grass. So what was said, its content, was a statement with the specified propositional content. And in that case, as in most if not all cases, the propositional content is not the whole story. The full content does include, but also goes beyond the propositional content. Similar conclusions hold for our thinking as well as they do here for speech acts. (See Alston (2000) for more on propositional content as only part of the content of what is said).

In light of the foregoing, it is possible to see that the propositional view of revelation does not deny that revelation has to do with God and his acts merely because it stresses content. Rather, it is typically argued in this view that *speaking and expressing thoughts* are central types of *acts* of God and that these types of acts express propositional content. As noted above, people use propositions to say something about something; we refer to someone or something and predicate something of that person or thing by using propositions. This applies not just to statements but also request and other types of speech acts.

Furthermore, a principal trait of persons is that they speak and so this view can hardly be criticized for being a view that is not personal. Of course, speakers can be impersonal, but that usually is not because they speak at all, but because they speak in a certain manner: rudely, at the

wrong time and so on. Would not criticizing someone for the mere fact that they spoke when one wanted to get to know them be like saying, “Please do not express your thoughts to me or speak to me – I want (to know) you, not your thoughts”? To claim that one must choose between propositional and personal revelation is to treat the two as mutually exclusive. But there are good reasons for thinking that personal revelation would include the communication of content.

Revelation and Truth

It is true that propositions present states of affairs that either do or do not obtain, but it is not true that all propositions are expressed in the making of truth-claims. If this is right, as argued above, then the question of truth does not arise in the same way as might be supposed if one identified propositions with the asserting of propositions. Nonetheless questions of truth are still quite relevant to speech acts other than assertion. So in familiar contexts Daniel’s proposal to marry Margarreta would typically have something to do with whether it is true that Daniel and Margarreta are not already married and that it is possible for them to get married. And if Margarreta accepts the proposal, then she is making a commitment that also has to do with the truth of these things. Requests, promises, and other familiar speech acts besides assertions have something to do with how things are in the world. So questions of truth are still relevant.

Just how truth enters the picture is another story. Note the following. Even though promises ought to be sincere, one can make a promise even if it is not true that one intends to do what one promised. One can give an order even if it is not true that one has the authority to do so. One can express gratitude even when one is not thankful. And, of course, a lie is an assertion even though one ought to tell the truth. What this shows is that even though these speech acts are subject to norms that require that certain conditions obtain in the world for proper performance, the conditions must not actually obtain to perform the

speech acts. William Alston has done much innovative work that shows this (Alston 2000, especially p. 34ff). The idea of normativity plays a central role for Alston in explaining why one can do things: What is necessary is certain conditions that one is *subject* to even if one need not *conform* to the conditions in order to perform a given speech act. Promises and expression of gratitude ought to be sincere and assertions ought to be true even when they are not. So in the performance of speech acts certain things ought to be true for correct performance. But even if they are not, one can have performed the speech acts nonetheless. Much more could be said about this, but this is enough for us to see how this might be applied to divine revelation.

We can begin by asking whether God can lie and make insincere promises. People like you and I can, but should we also say that it is possible for God to do this? This does not seem so to be a promising way to go. It is more common to conceive of God as being incapable of lying or of making commitments with no intention of keeping them. And even if God could lie, the very concept of revelation implies that if one reveals something, what one reveals is a truth or a fact. One can assert falsehoods, but one cannot reveal them, though one can reveal *that they are* falsehoods. It may appear to be the case that in the case of divine revelation the distinction between subjecting oneself to speech-act norms and conforming to them does not play such a central role, since any norms God may be subject to God necessarily conforms to. This would be true even if it were the case, as some argue, that God is not subject to norms. For in that case God is not subject to any speech-act norms. But do we want to say, then, that God is not required to, for example, keep promises? Even if it may be true that God is not subject to any external norms, still it is quite common to conceive of God's own character requiring certain things. God's character, it is argued, requires that God keep promises and does not lie (See Wolterstorff (1995) (Chapter 6) for interesting discussions of being character-required and other related topics. See also Sluys (2000), p. 65ff.). It is only when divine revelation is *about* persons who are capable of

missing the mark in some way, such as by lying or making insincere promises, that the distinction between norm-subjection and norm-conformity plays any practical role. But, since purported divine revelations report on normal human persons like you and I who are capable of such things, the distinction has a role to play. The speech acts reported may be deficient in some way, but that in itself does not make the report of them untrue or deficient.

So far so good, but now we can ask whether God could command persons to do things that God has no interest in their doing. It is usually considered one of the conditions for making the speech act of a command that one issues one's utterance as subject to the norm or rule that one has some interest in people doing as one has commanded them to do. But is this just a matter of statistics? As Alston interprets the rules, they are not just *descriptions* of how we usually act, but rather *norms* that guide what we should do. If that is how things are, then there is something wrong with issuing an utterance as a command when one does not want what is commanded done. It is incorrect to break the rule, if indeed it is a rule for the correct performance of issuing an utterance as a command. So if this is a requirement for commanding, then it seems to be the case that God must meet the requirement in order to issue a command correctly.

A problem arises for this view in that most people who hear the story of God's commanding Abraham to offer his son Isaac do not believe that God would actually desire that Abraham do such a thing. At the same time, we have the rule-formulation above that requires that one only command something if one has an interest in it being done. So it seems that either the rule must go or one's interpretation of God's commanding Abraham must go. I think that there are good reasons for rejecting the truth of the rule-formulation, rather than the interpretation of the story. For we know that it is possible to command persons to do things that we do not want done for a variety of reason, even good reasons. We could, for example, command a person to do an impossible task, which they think is possible, in order for them to come to the realization that it is

not possible. We need have no interest whatsoever in getting what was commanded done; rather it is not getting done serves the purpose of teaching someone something. So even if we were to use a command for another purpose than what commands normally would be used for, this does not mean that this use would be an *incorrect* use of a command or that it was not a command at all. So if God revealed to Abraham that he was commanding him to sacrifice his son, this does not mean that it is true that God wants Abraham to actually do so. The command is believed by most to have served another function than that. (This is in line, for example, with the interpretation of the story in Wolterstorff (1995, p. 22) when Wolterstorff discusses the relationship of commanding to revealing (that they are distinct from one another)).

One last issue concerning truth has to do with sacred writings (I am indebted to Evans (2005) for detailed discussions of the issues discussed in this paragraph). One might think, for example, that if God dictated scripture and God could not be in error, then the scriptures are inerrant. Yet most Christian theologians deny that God dictated the scriptures. Though it is true that other religious traditions, such as Islam, can claim that God dictated sacred writings, still even if not dictated, one can think that the writings are inerrant because in some way God inspired the writings. This is quite a common view actually, but is usually qualified in some of the following ways. We have copies and translations and not the original writings and errors have crept into the copies and translations. Furthermore, the writings use ordinary language, phenomenal language (i.e., the language of appearance), and rough approximations rather than scientific language in communicating, so we should not expect scientific precision. Some limit inerrancy to religious and moral matters excluding historical and scientific matters, since they believe that God only intended to communicate such truths. Others think it important that historical claims are still included such as that Jesus actually rose from the dead. Wherever the limit goes, if there is a limit to the inerrancy, all seems to be in agreement that whenever God makes a truth-claim or

a commitment to something being true, what God is committed to is true. But where no claim or commitment to truth is made there can be no error either. If, for example, one use phenomenal language and makes no commitment to the truth of the proposition that the sun rose when one says, "The sun rose," then one is not in error if it did not rise but only appeared to.

Summary

Some of the conclusions that have been drawn are the following. In looking at different ways to construe divine revelation none of Dulles' models alone seemed to do justice to the way many religious people construe revelation (and Dulles does not claim that they do). In many religious people's eyes, God initiates encounters with people *and* acts in ways so as to be experienced in inner religious experience *and* in history *and* God does all this sometimes through speech *and* sometimes not. Furthermore, we took note of an act-object ambiguity that can lead to confusion if not taken notice of, since sometimes it is the activity that we are concerned with and sometimes the content. We also noted that a personal revealing need not exclude an exchange of ideas, but, on the contrary, normally includes such content. Such content includes propositional content and, therefore, personal revelation does not exclude propositional revelation. We discussed many different ways that revelation is related to truth-claims. One main conclusion here was that in speaking of error one has to pay considerable attention to what it was that was being attempted. One cannot be making an error in regard to some truth, if one has not committed oneself in some way in regard to it.

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Revelation in Judaism

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Related Terms

[Jewish science and revelation](#); [Science and revelation and the Jews](#); [Science and revelation in Jewish culture](#); [Views of revelation in Judaism](#)

One of the three primary acts associated with God as the active agent is “to reveal” (galah). The other two are “to create” (bara) and “to redeem” (padah). Creating is what God does to originate the universe and redeeming is what he does to conclude it. Between these two poles, one the origin and the other the end, is “this world” (ha-‘olam ha-zeh) of entities moving in time through space. The act that God performs among them and in between them is “revelation.” In the narrative of the Torah, what he reveals is his law. The divine laws, which are

the counterpart in the Hebrew Scriptures of the laws of nature, are commandments by which everything in this temporal world is directed to behave and is judged for its behavior. They are in most respects like natural law, only they are personal (commanded “face to face”) and moral, for they are the rules by which we humans can come to know (to the best of our abilities) how God rules his creation but also to know how God judges his creatures.

Those through whom God directs this communication are called “prophets.” Prophets come in all sizes and shapes, from every class of people within the nation as well as from nations other than Israel. There seem to be no rules for who can or cannot be a prophet, from kings to female servants and even to animals. But there is a sharp distinction made between true and false prophets and the penalty for confusing them by following the wrong prophets is death. Time and again, the nation finds prophets who interpret God’s speech and the people follow the prophet’s interpretation. When the interpretation of the true prophet is right, God prospers the people, and when it is wrong, God punishes the people for disobedience. More often than not, the nation Israel will choose a wrong interpretation.

This tendency of the nation Israel (perhaps of all nations) to make the wrong choice is the foundation of the destruction twice within the history of God’s chosen people. Perhaps the Hebrew Scriptures emphasize this causal account in order to justify the lengths that the subsequent early rabbinic Judaism goes to regularize and control what do and do not count as acceptable (i.e., true) instances of prophecy. Increasingly through this post-biblical literature, direct appearances of God to the people become restricted, so that in the end they almost entirely disappear. “Almost entirely,” but not completely. God continues to appear and to teach lessons about reality to the Jewish people, but these appearances cease to have legal moral authority. In the place of direct divine communication, the rabbis establish a series of institutions (viz., courts and academies) whose members bear the formal title “sage” (chakham) or “master” (rab) through whom new applications of the now

established laws of the Torah are applied in accordance with formalized rules of legal precedence. In all of these cases where new applications of the law are formulated, God is said to be present at the deliberations to guide the rabbis to divine approved judgments. As God functions in this indirect role of political guidance, he is associated with a “holy wind/spirit” (*ruach ha-kodesh* in Hebrew) and said to be the “presence” (*shekhinah* in Hebrew). Ever increasingly, the God of revelation is identified by the rabbis primarily as this *shekhinah* (presence).

Late Hellenistic and medieval Jewish philosophers tended to associate the words of the Hebrew Scriptures not only with divine revelation but also with a general notion of “wisdom” (*chakhmah*). That the words of the Torah are wisdom has its source in the biblical text itself (e.g., in Proverbs), but increasingly the two terms, Torah and wisdom, came to be used more or less interchangeably. Now “*chakhmah*” (wisdom) is also the term for what we today would call “science,” so that increasingly all of revelation was closely associated if not identified with science. Hence it comes to be assumed, by Jews as well as Christians as well as Muslims, that any truth of the Scriptures and their tradition of interpretation is science and (conversely) all science can be found in the Scriptures if you know how to read them. Revealing how to read the Scriptures became the primary task of the medieval Jewish philosophers, from Philo and Saadia through Moses Maimonides and Hasdai Crescas.

The “science” in terms of which the medieval Jewish philosophers interpreted the Scriptures reflected the best science of their day, notably a mixture of the world and life views of Platonists, Aristotelians, and even Epicureans, but unfortunately the best science of that day could no longer be accepted as truth by the dawn of modernity. This problem applies not only to philosophical interpretations of moral issues; it applies equally to philosophical interpretations of physicalist issues. So, not only does the medieval literalist interpretations of political texts that endorse, for example, the institution of slavery, become problematic, but so too do non-literalist

interpretations of physical events taken by the rabbis to be the texts’ true meaning. For example, in terms of cosmology, the laws of the heavens are not different from the natural laws of the earth and there is no watery ring (the “*raqiyya*”) that separates space from the atmosphere of the earth, and this universe is billions of years old and not just thousands of years old. Similarly, in the light of contemporary neuroscience, there is no ethereal entity called a “soul” that directs the voluntary motions of human beings and animals, and, in the light of modern evolutionary biology, there is no radical difference between human beings and animals. Rather they are all part of a single chain of beings that extends through the centuries.

There remain circles of contemporary traditional rabbis who continue to read the Hebrew Scriptures according to the interpretations of medieval rabbis, but there are other more liberal rabbis who reason, why should a medieval interpretation whose sources are in the ancient sciences of the Platonists and Aristotelians be more authoritative than the literal meanings of the Scriptures themselves. Hence, in their use of the holy texts, they go back to uncover original simple (*peshat* in Hebrew) interpretations. But they do not claim that these interpretations are true. Rather they claim that for religious Jews they are “authoritative.” What these modern Jewish interpreters mean by “authority” varies. Of these readers perhaps the most radical was Martin Buber who claimed that what the Scriptures reveal is limited to God’s presence but that the content of the texts is itself not revealed. Hence the Scriptures function not as a national divine constitution, but as a testament to the ancient and continued “presence” of God to the Jewish people.

Of the three central Jewish theological claims about God (*viz.*, creation, redemption, and revelation) only revelation is commonly given this extreme heterodox interpretation. Creation and redemption come to be understood in accord with mathematical notions of origin and end respectively, and as such are independent of temporal-spatial claims. While anyone who interprets these terms literally (and in general the

traditional rabbis never interpreted them literally), such interpretations seem radical, but to anyone who knows the writings of the medieval philosophical rabbis, they are not extreme. (See “Judaism: Scientific Views of Creation” and “Judaism: Scientific Views of Redemption.”) These two core concepts are seen to have content. However, to interpret revelation as Buber and other modern Jewish philosophers like him do seem to have no connection to rabbinic tradition whatsoever.

The response to this objection is two-fold, one based on rabbinic texts and a second based on modern science in a very broad general sense. With respect to the second factor, modern sciences raise a number of distinct troubling questions, as we have already seen, and the more evasive the answer is to these questions, the greater the inclination to free revelation from the burden of being content dependent.

With respect to the first factor, it is an established rabbinic tradition that the *Song of Songs* is the primary biblical text for interpreting God’s revelation to Israel, and this biblical poem talks only about forms of human love and says nothing directly about revelation. In this context, the Hebrew term for revelation, “galah,” literally and physically means an act of revealing oneself or (to say the same thing) uncovering oneself. In revelation, as in love, especially in physical love, the lovers make themselves naked to each other. In this sense, revelation is not about content, but is rather about the quality of the act, an act of maximum intimacy, especially (in the case of rabbinic theology) between God, the lover, and the people of Israel, the beloved.

Combining the two factors, the first from the revealed texts themselves and the second from the examination through reasoning by scientists of nature, yields a content-less conception of revelation which places prime importance for religious faith on noncognitive factors of experience and leaves cognitive judgments to the sciences. Needless to say this dual track understanding of religion and science has more consent among Jewish scientists than among modern rabbis.

Cross-References

- [Creation in Judaism](#)
- [Judaism: An Overview](#)
- [Kabbalah in Judaism](#)
- [Natural Sciences in Judaism](#)
- [Philosophy in Judaism](#)
- [Redemption in Judaism](#)
- [Redemption in Judaism](#)
- [Revelation in Judaism](#)
- [Theology in Judaism](#)

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Risk Analysis

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Risk analysis is actually one step in the overall process of risk management. However, in Barry Boehm’s original Spiral Model the entire endeavor of risk management was called risk analysis and was depicted as lying in the second quadrant of the spiral.

For a better understanding of risk management, in general, we list its four major stages as

described by Ian Sommerville in his 8th edition of *Software Engineering*.

1. Risk identification: The development team lists possible risks in the categories of project, product, and business.
2. Risk analysis: The development team assesses the list of risks by determining the likelihood of each risk and its consequences.
3. Risk planning. The team constructs plans to avoid the risks or to minimize their damage.
4. Risk monitoring. Risks are continually assessed throughout the project. During this process, risks may be resolved or mitigated.

Rite

► [Ritual](#)

Ritschlianism

► [Liberal Theology](#)

Ritual

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Related Terms

[Celebration](#); [Ceremony](#); [Rite](#); [Ritualization](#)

Description

All attempts to define ritual or even to classify the different theoretical approaches to ritual will be heuristic. The problem of definition lies in the fact that Catherine Bell is cautious to point out: ritual is a construction and nothing to be found “out there” (Bell 1997). As the study of ritual and

the discipline *ritual studies* have evolved, each researcher has created his or her specific way to understand “ritual” and has related this word to different sets of phenomena found in diverse cultural contexts. This has led to the development of numerous definitions of ritual and a number of ritual theories and models. Among scholars outside the ritual field, “ritual” is often used simply as a label for senseless routine. Within the ritual field, on the other hand, narrow definitions conceptualize ritual as a specific, distinctive activity, whereas broader perspectives point out the congruity between ritual and other forms of human action. Ritual has also been a topic for many different scholarly disciplines, with their different viewpoints and interests. Thus, it is possible to find ritual theory within approaches from, for example, anthropology, phenomenology, ethnology, political science, psychoanalytic theory, sociology, theology, ethology, and fine arts. To complicate the picture even further, many ritual theories unite ideas from different perspectives and disciplines, making it even more difficult to classify different ritual perspectives.

This exposé will start out with a historical perspective, following some of the trends that have appeared in the study of ritual by introducing scholars of great importance to the field. This will lead to some notes on scientific approaches to ritual as well as the interactions between the scholarly study of ritual and ritual practice.

Ritual Theory

Ritual theory is interesting to study from a theory of science perspective since the development of the field in many respects reflects the changing self-understanding among Western scholars. When research in this area began in the nineteenth century and scholars wanted to focus on what they thought of as activities and behavioral patterns accompanying mythical and religious systems in the colonized world, ritual emerged as a concept. Evolutionary perspectives dominated the field, and the early discourse on ritual differentiated between “ritual” and “liturgy” where the former was understood as a more primitive form, related to magic

and superstition. The confidence in industrial development made it easy to assume that all cultures followed a similar route and that both technological and religious development would lead to ever higher and better forms of human life. As cultural awareness and political climate changed, so did the understanding of ritual, and evolutionary perspectives were successively replaced by functional and structural understandings. Global injustice, accelerating pollution, and arms race made human development seem less of a linear process, and modernity was put under question. When modern culture could be described as inhuman and technocratic, ritual could be presented as a natural spiritual and emotional resource. The early understandings of ritual as a part of a primitive and static tradition have thus in some of the later theories been countered with the image of ritual as potentially revolutionary and liberating.

The early ritual theories from the late nineteenth century struggled with the quest to find the origins of religion. Was ritual or myth the origin – had religion primarily developed from practice or thought? Within what has been called *the myth and ritual schools*, scholars argued for the primacy of ritual, whereas the phenomenologists saw myth as the primary source. The former school was informed by anthropologists like Edward B. Tylor (1832–1917) and Sir James George Frazer (1854–1941) and linguists like William Robertson Smith (1846–1894). Myth developed from ritual practices, these theorists argue, and is as a primitive way of reasoning that can reveal insights on human cognition. Religion, and cognition, is here seen as a part of evolution, and these theorists argue for a developmental line from primitive magic to the “high religions” of Judaism, Christianity, and Islam. Phenomenologists like Rudolf Otto (1869–1937) and later Mircea Eliade (1907–1986) argue instead that myths are much more stable than rituals, although they are interrelated and dependent upon each other. From the phenomenological point of view, religious experience is understood as universal and irreducible, and the study of religious myths or rituals must therefore focus the experience of the “wholly other,” trying to find structural similarities.

Although the debate between myth and ritual eventually faded away, these early theorists paved the way for the coming ritual perspectives, where the relation to cognition and structure, to different degrees, continued to be important objectives. While the functionalistic and structuralistic perspectives that emerged emphasize society and predominantly understand ritual as a cultural reflection or enforcement of it, the culturalistic, linguistic, performance and practice perspectives on ritual rather stress culture as the primary level of meaning and understand social organization as shaped by it. The classic example of a functionalistic theorist is Émile Durkheim (1858–1917). He describes society as the basis and origin for religion and ritual. Through ritual, Durkheim maintains, the social structure is sacralized as a collectively projected image. Rituals work as rules of conduct that make communal identification possible and that strengthen the bonds between the individuals in a society. In order to achieve this, rituals arouse experiences of passionate intensity that ties the participants together. Alfred Reginald Radcliffe-Brown (1881–1955) and Bronislaw Malinowski (1884–1942) are other examples of important functionalistic ritual theorists. Sigmund Freud’s (1856–1939) perspective can also be sorted among the functionalistic approaches. Freud’s quest is to unfold the hidden purpose of ritual and the “unconscious myth.” Phylogenetically, Freud describes religion and ritual as safeguards against those impulses of aggression and lust that are hidden and buried in the ritual form. Ontogenetically, Freud points out the similarities between ritual actions and the activities of the obsessional neurotic. Through his work, Freud begins a psychological scholarly tradition of associating ritual and religion with pathology. In all the early functionalistic theories, the evolutionary perspective lingers. Evolutionism is apparent both in the works of Durkheim and Freud. As humanity develops, Durkheim argues, the need for rituals will be surpassed, and science will enter in its place. In Freud’s perspective, the mature individual will sublimate his wishes and thus make ritual superfluous. René Girard (b. 1925) presents a perspective on ritual with many resemblances

to Freud's theory; although it is not strictly Freudian in its outline. Girard also relates ritual to primal violence and the need to restrain destructive impulses and desires – albeit not sexual. The need to curb human violence, Girard holds, is the very source of society and culture, and this is managed through the ritual sacrifice of a scapegoat, a surrogate victim. Through the original murder, the group simultaneously becomes conscious of itself as a group and unconscious of the desire and violence that made the sacrifice necessary. Ritual, in Girard's sense, is thus a means of substituting a “good,” contained form of violence for free-floating revenge.

In the neofunctionalistic approaches, religion and ritual are no longer seen as caused or influenced by one single force. Instead, an interaction of multiple systems results in different religious and ritual forms. What is universal according to these different theories is the function the ritual act is thought to hold; however, its form and expressions will vary in accordance with historical context and physical environment. Roy Rappaport (1926–1997) is perhaps the most prominent and well-known neofunctionalistic theorist. According to him, ritual regulates both the relationships in society and between society and its environmental resources. Thus, ritual is able to create an environmental balance. The function of ritual is not conscious to the participants, Rappaport maintains; however, this mystification is for the good of the society. Through the claims of traditional and divine roots, the ritual works as a much more effective maintainer of the social system than any economical or ecological regulations would do (Rappaport 1999). In Mary Douglas' (1921–2007) functional-structuralistic approach, ritual is explained through the concepts *grid* and *group*. While *grid* refers to the level of organization of human relations through rules, roles, and formal positions, *group* refers to how tightly knit a society is. Ritual, Douglas holds, reinforces both *grid* (through its maintenance of structure) and *group* (through its enforcement of solidarity and social connection). Arnold van Gennep (1873–1957) develops a neofunctionalistic stress on context. Van Gennep argues that ritual has no intrinsic meaning, but needs to

be seen in relation to the cultural context. Van Gennep devotes his work mainly to the form of rituals he labels “rites of passage.” Functionally, these rituals work as a help to order chaotic social changes – mainly when there is some kind of individual change in status because of age, education, or maturity. The passage rituals are described as important for the well-being of the group during these precarious moments. Van Gennep's functionalistic perspective is also connected to a more structural outlook, and what he is most known for is a description of three decisive ritual stages or phases. Through the structural set of separation, transition, and incorporation, the potentially dangerous move of a person from one status role to another can be safely performed, van Gennep holds. Although he started out from a nonuniversalistic point of view, van Gennep's focus on structural comparison and a presupposed general ritual pattern led to a more universalistic perspective van (Gennep 1960).

For a number of ritual scholars, the structural setup has been the main focus, and here the influence from linguistics has been crucial. The anthropologist Claude Lévi-Strauss (1908–2009), as a central example, builds his theory on the perspectives developed by structural linguists like Roman Jakobson and Ferdinand de Saussure. Lévi-Strauss argues that all social phenomena, like ritual, are symbolic systems of communication and as such shaped by cognitive structures in the human brain. Contrary to Durkheim's understanding, Lévi-Strauss holds that it is the cognitive structures, visible in ritual, that shape social relations. Social organization is thus understood as secondary. Lévi-Strauss compares ritual and symbolic action with language and argues that it is possible to decipher ritual or mythical systems with the help of linguistic rules. By decoding the underlying grammar, often organized in binary oppositions, the unconscious infrastructure of ritual and symbols can be revealed (Lévi-Strauss 1966). Stanley Tambiah (b. 1929) and Edmund Leach (1910–1989) are other ritual scholars within the linguistic tradition. Another important scholar within the culturalistic and linguistic tradition is Clifford Geertz (1926–2006),

who views religion as a cultural system. In ritual, he argues, the participants are presented with a model *of* the world (how things are) and a model *for* the world (how things should be). The world as lived and the world as imagined thus fuse in ritual, Geertz holds. Within contemporary ritual theory, Lawson and McCauley continue the cognitive-structural approach to ritual, combining insights from cognitive and developmental psychology, linguistics, and cognitive science. Their perspective is described further below.

Some neofunctionalistic psychological theories stress the ability of rituals to release harmful thoughts and feelings and thus fulfill some form of cathartic function. Gluckman (1911–1975), who focused on social systems rather than individual positions, modifies Durkheim's theory in this direction. Ritual, Gluckman argues, does not mainly express and enforce social unity. Instead, it is the tension inherent in each society that makes ritual so important. Through ritualized rebellions, Gluckman continues, these tensions and conflicts can be channeled, albeit not solved. This has a cathartic effect since it relieves the society of the threat of “real” rebellions. In the end, ritual functions to restore social equilibrium and maintain status quo (Gluckman 1963). Gluckman's perspective widens the field for ritual research and understands ceremony as any kind of activity that is conventionally formalized and ritual as the specifically religious version of ceremony. Victor Turner (1920–1983) develops a kind of synthesis of van Gennep's and Gluckman's works. Turner understands ritual in terms of social dramas. Social structures are not static but dynamic, Turner holds. They need to be constantly created anew. Rituals, therefore, have the function of recreating the unity of the group by legitimating but also modifying the social order. Turner agrees with Gluckman's thesis of a needed rebellion allowed within the ritual form, and he gives this rebellion a more specific form by a reworking of van Gennep's three-stage sequence. Turner recasts the transitional stage in van Gennep's theory into a more fundamental idea of disorder. People need a chance to get away from social structures, Turner maintains;

therefore, rituals play with the dialectic between structure and antistructure, order and chaos. During the transitional stage of “liminality” and “communitas,” status roles and ordinary structures are relieved, and a sense of equality and belonging is enforced. By allowing these inversions of social order, rituals give form to and dramatize both the society's dominant values and its inherent conflicts. Social order is, through this ritual function, both legitimated and reformed, and the community is thus not simply restored by their rituals, but redefined, renewed (Turner 1967).

Through his understanding of ritual as a social drama, Turner also paved the way for performance theorists who developed their perspective during the 1970s combining the neofunctionalistic perspective with drama theory. Ronald Grimes is the most well-known scholar in this field (Grimes 2000). Rituals are described, by performance theorists, as events rather than as expressions or enactments of values and symbols. The emotional aspects of ritual are underlined, and an interest in the ritual role of the body evolves. The physical and sensual aspects of rituals are stressed, and although performance theories are varied, they generally agree that the ritual functions through its physical character and not only through its relation to either tradition or cognition. Within the performance approach, ritual is not understood as a kind of literal communication but as a physical event. It is furthermore seen as an event that includes or gives the possibility to individual transformation. In other words, a ritual achieves something; it is an act that constructs a new situation. The performance approach also brings a new perspective on the ritual participants as active in their role of both designing and interpreting ritual. Performance theorists have furthermore underlined that the efficiency of ritual depends on its specific “framing” (see Gregory Bateson below). The ritual frame helps people understand what kind of an act they are taking part in. The announced beginnings and ends, a stylized form of speech, ceremonial costumes, etc. all work as signals for the ritual performance.

Performance theory has also brought an interest for modern-secularized examples of ritual, outside the formal religious ones. Practice theory has

a similar bodily focus as the performance approach, but with its roots in Marxist theory. Practice theory also moves away from the intellectualistic concentration on mind and focuses on the concrete and immediate aspects of human activities. What distinguishes the practice orientation from the performance approach is, firstly, a greater interest in developing generalized theories about cultural activities and, secondly, a discussion on power and domination. Pierre Bourdieu is the most prominent contributor to this theoretical school; however, he never treated the ritual topic more than briefly. Catherine Bell, can be placed within this line of thinking, and her theoretical perspective on ritual is one of the more influential today. Bell, as many performance theorists, rather speaks of ritualization than ritual. This is to avoid the sense of ritual as a ready-made and stable unit. Instead, Bell argues, ritualization should be understood as a circular practice. Through ritualization, a ritualized agent is created – a person that embodies the flexible cultural schemes that the ritual involves. The body is primary in this process, Bell maintains; it both defines the world through its actions and receives a worldview through its experiences. The ritualized agent can deploy this knowledge both outside the ritual situation and in new ritualizations. The circularity of ritualization also includes a specific analysis of power. With the help of Foucault, Bell describes how the power of ritual works in two directions. The ritual forms the participants, while, at the same time, the participants have the possibility to both resist this power and make use of it in their own idiosyncratic ways (Bell 1997).

Bell's definition of ritualization is original in that it does not include references to specific ritual features, like formalism or repetition – features that many influential ritual scholars have singled out as specific for ritual activities. This is the case with, for example, Frits Staal, who speaks about the meaninglessness of the ritual act and for whom ritual “consists in the precise execution of rules.” Many ritual definitions also include repetition, formalism, and invariance – like those of Victor Turner, Evan Zuesse, or Roy Rappaport. Thus, idiosyncratic, improvised, or unique activities have mostly been understood

as contrasts to the commonality, formalism, and repetition of rituals. In contrast to this, Bell argues that what is specific with ritualization is that it makes a distinction by privileging certain activities. What strategies are used to privilege the event depend, Bell points out, on the cultural context and what practices the ritual distinguishes itself against. In other words, when ritual form is related to the cultural context within which it occurs, ritual features cannot be understood as universally determined. Bell's perspective thus makes spontaneous or individually performed rituals conceivable. This is an advantage in relation to contexts signified by individualization and religious change since it enables the researcher to track people's ritual needs and practices beyond the institutional forms of religiosity. However, opening up the ritual field for studies of individual ritualization makes it important to consider the aspect of intention. Many definitions of ritual also specify some aspect of intention, consciousness, or voluntariness. This makes it possible to avoid including phenomena that might have some aspects in common with rituals, but that are not considered to be rituals by those that are involved. In the *Encyclopedia of Religion*, Evan Zuesse defines ritual as “conscious, and voluntary, repetitious and stylized symbolic bodily action that are centered on cosmic structures and/or sacred presences.” One of the front figures of ritual studies, Ronald Grimes, also stresses the importance of intention, and he does so through a distinction between ritualizations and rites. The latter refer in his understanding to acts that are culturally acknowledged as rituals within a specific tradition. Ritualizations, on the other hand, are ritual-like activities that need not be intended as rituals by the performers. A ritualization is, with Grimes' rather vague words, an activity that “is not culturally defined as ritual but that someone could interpret as if it were” (Grimes 2000). Another perspective, building on Bell's concept ritualization, is Maria Liljas Stålhandske's model of privileged bodily praxis (PBP). This model outlines different PBPs in relation to two different axes. The first axis refers to intentionality, implying that a privileged mode of praxis can have a more or less formalized privileging intention – it can be more or less consciously

designed and referred to as a ritual or ceremonial activity. The other axis is related to the existential dimension: shared or individual approaches to the questions about the meaning, value, and purpose of life and death. This axis amounts to the degree to which the praxis is related to the existential dimension. The model thus gives room for four different types of PBPs: *celebration* (a PBP that neither has a formalized ritual intention nor explicit references to the existential dimension), *ceremony* (a PBP consciously designed and thought of in ritual terms, but without explicit references to the existential dimension), *ritualization* (a PBP explicitly related to the existential dimension, but without a formalized ritual intention), and finally *ritual* (a PBP that has a formalized ritual intention and that is explicitly related to the existential dimension). If used as flexible, heuristic categories, open for change and development, Stålhandske argues that the model can work as a tool to analyze ritual activities in a late modern context, signified by religious change and individualization (Stålhandske 2005).

Caroline Humphrey and James Laidlaw present a fully elaborated ritual theory with many resemblances to Bell's perspective. Similarly to Bell, Humphrey and Laidlaw argue that ritual is a quality of the action, not a specific content or idea. There is no underlying meaning of ritual; instead, the participants ascribe the meaning of each ritual. Thus, Humphrey and Laidlaw refer to ritual as nonintentional. The ritual participant does not need full knowledge about the ritual or the cultural or religious context of which it is a part, but creates his or her own idea of what the ritual is about. The ritual process is thus much more complicated than a reproduction of cultural consensus. However, ritual is closely related to cultural conventions. To do something ritually, according to Humphrey and Laidlaw, is not primarily to believe in something but to act in a specific, culturally defined way. In line with Bell's circular approach to ritual, Humphrey and Laidlaw describe rituals neither as expressions of personal intentions nor reproductions of cultural consensus. Instead, the individual makes use of the culturally formed ritual and interprets the meaning of it out of his or her own knowledge and need (Humphrey and Laidlaw 1994).

Ritual Theory and Science

From a scientific perspective, ritual has been an interest for a number of disciplines, primarily ethology, neuroscience, and cognitive science. For ethologists, ritual is not a topic in itself, but a concept used to understand animal and in extension also human behavior. Julian Huxley (1887–1975) and Konrad Lorenz (1903–1989) are the most well-known scholars in this field. Through observations of animals, ethologists identify formalized patterns of behavior in, for instance, mating and grooming. Ethologists argue that these ritual-like activities promote clearer and more efficient communication and reduce damage among the own species. Ritualized animal behavior, ethologists conclude, is dependent upon formalized codes or signals. In the work of Gregory Bateson (1904–1980), both biologist and anthropologist, the idea of *framing* and *metasignals* is developed. When metasignals of “play” or “ritual” are clear and well developed, animals can, for example, communicate domination without lethally harming each other. For ethologists, ritualization among animals has both genetic and social roots and is a question of adaptation and survival. Being mammals, human beings also ritualize behavior, and ethologists argue that rituals of humans and animals can be considered as siblings in the biological evolution. Some ethologists also further discuss human ritualization, and Huxley criticizes modern society from his ethological perspective, arguing that much of the problems related to modern civilization have to do with deteriorating ritualization among humans.

Another attempt to conjoin ritual theory with a scientific approach is presented by Charles Laughlin and Eugene d'Aquili, through their theory *biogenetic structuralism*. Laughlin and d'Aquili's attempt is to merge Lévi-Strauss' structuralism with neurosciences. Ritual is one of their main concerns due to its role in controlling cognition and experience, and Laughlin and d'Aquili also compare animal and human behavior. They argue that invariant patterns of human behavior must be lodged in the nervous system. Their ambition is to develop a theoretical

perspective that is nondualistic in the modeling of mind and body, that is nonreductionistic in the positivist sense, and that is informed by data about human consciousness and culture. Thomas Lawson and Robert McCauley present perhaps the most influential scientific perspective on ritual. They introduce a cognitive-structural approach to religious ritual and include insights from cognitive and developmental psychology, linguistics, and cognitive science. Lawson and McCauley's aim is to develop empirically testable claims about religious ritual, arguing that participants understand ritual on basis of universal conceptual systems. In contrast to the contextual understanding of ritual meaning, where ritual can be understood only from the perspective of its specific cultural frame, they argue that ritual competence rests on universal cognitive abilities. The cultural dimension of ritual is thus downplayed, and the cognitive aspects are underlined. However, the ritual participants are pictured as developing ritual competence in the same intuitive way that they learn their natural language – the learning of ritual is social, not biological or psychological. Through this perspective, Lawson and McCauley can describe the religious ritual as a social action that invokes roles present in all human actions. Since these roles are a universal part of human cognition, there is no need for specifically theological or religious knowledge to understand ritual, or to conclude if it is successful or not. Focusing solely on religious ritual, Lawson and McCauley include “nonnatural consequences” and “superhuman agency” in their definition of ritual. A religious ritual is thus an act where (1) someone (2) does something (3) to someone or something (4) in order to bring about some nonnatural consequence (5) by virtue of appeal to a superhuman agency. The primary conceptual tool in their theory is what they call the *action-representation system* – a conceptual system thought to operate in any kind of action, religious and nonreligious. Central to this system is actor (*agent*), action (*instrument*), and object, or the part receiving the action (*patient*). The structure of the ritual is analyzed through a linguistic focus on syntax as well as an analysis of the symbols and how they

are interrelated. The postulated superhuman agency can appear at all levels – as agent, instrument, or patient. For a ritual to be successful, the intention behind the religious ritual is of greater importance than its exact execution, Lawson and McCauley hold. However, it is mainly through the correct performance that the intention can be made visible (Lawson and McCauley 1990).

The relation between ritual and science can also be described from another perspective. The relationship between “research” and “reality” is intriguing, when it comes to ritual studies, since the ritual field to a great extent has been influenced by the political and cultural climate surrounding the different ritual scholars. Catherine Bell refers to the changing understanding of ritual in the late twentieth century as “ritual romancing” (Bell 1997). From the view on ritual as outdated and primitive, ritual began to be seen as something vital for the health and well-being of modern people. It was argued that the use and function of ritual had been lost through modern development and that this was a cause of many social and individual problems. This inclined a number of scholars to portray ritual as a powerful means to be relieved from the bonds of civilization. This understanding also altered the relation between the scholar and the field – the distance between ritual scholars and practitioners decreased. The positive view on ritual promoted by scholarly authority also influenced people to return to ritual and to request guidance in their newly (re)discovered ritual practice. Ronald Grimes, Tom Driver, and T. J. Scheff are examples of scholars who have promoted the liberating possibilities of ritual and who, to different degrees, have offered their knowledge to develop practical ritual competence through tools for ritual criticism and improvement. The loss of “scientific detachment” is of course not peculiar to ritual studies, but a conundrum is present in all fields where postmodern theories and constructionism have relevance. Ritual scholars, as all scholars within the field of human behavior, have to conclude how they conceive the relation between research and reality. What is special with the ritual field is perhaps the close interaction some researchers have

developed toward the practitioners. This can have a positive effect on ritual and religious communities, and if based on a conscientiously developed epistemological perspective, need not be problematic. However, one problem that Bell points out is that when scholars construct ritual as a basically good praxis lost for modern people, this is done at the cost of excluding examples of contemporary ritual forms that work in service of modernity. Moreover, the power of academic perspectives is considerable, and when the views of scholars start to form the world they are exploring, there is always a risk of cultural subordination.

To conclude, the concept ritual, like religion, offers multiple possibilities to analyze human behavior from structural, functional, cultural, and scientific perspectives. The many different options and associations related to ritual make the field both interesting and creative, but also bring many challenges that demand each scholar to make conscious and sensitive theoretical choices.

Cross-References

- [Landscape](#)
- [Pilgrimage](#)
- [Theater](#)

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Ritualization

- [Ritual](#)

Robot Embodiment

- [Robot Programming](#)

Robot Emotions

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Related Terms

[Computer science](#); [Emotional robots](#)

Description

The field of Robot Emotions aims to integrate principles of human emotions, emotionally enriched communication, emotional decision making, and behavior control in design and control of ► [autonomous](#) and/or interactive robotic systems. It is as such strongly interdisciplinary, integrating technological, psychological, and neurobiological aspects. The main objectives are to make human-robot communication and interaction more natural, intuitive, and efficient and/or to complement cognitive control of robot

behavior. Target applications are manifold and range from edutainment, to improved assistance in humans' daily lives, to therapy. While emotional robots are a regular topic in literature and movies, the field of Robot Emotions is concerned with robots that *seem* emotional, rather than robots that *have* emotions in a psychological or philosophical sense. Nevertheless, the synthesis of emotions in terms of models and their impact on behavioral control are core topics. Further areas of interest in the field are concerned with emotion expression, emotion-integrated ► [cognitive](#) systems and control architectures on individual as well as on group/social levels, recognition of (human) emotions, and acceptance and social integration aspects. To whom it may concern, control architectures denote modularized concepts and/or implementations of computational algorithms, which produce actions in response to perceptual inputs comprising means of memory.

Expression of robotic emotions is predominantly based on principles of facial expressions connecting activation of facial muscle groups, and the corresponding robotic mechanical elements, to emotion states perceived by an observer and body postures, which is covered by methodical frameworks from psychology. Facial expressions as well as peripheral physiological data such as skin conductance, heart rate, and pupil dilation are usually used for recognition of human emotions by robots. However, the connection of such measured signals to real human emotions is still not sufficiently understood. To date, architectures for robot behavior control based on inner "emotion" states of the robot have only been addressed weakly. So have system models considering group interactions of several agents (human or robotic) on an emotional level. Control approaches are mostly concerned with selecting appropriate emotion expressions in the context of a communication or interaction with humans. Only few works cover psychological or neurobiological modeling of (human) emotions and transfer to robotics, which typically use algorithmic descriptions of emotional state progressions as a function of various input modalities (e.g., visual and/or auditory perception),

situational and interactive context in combination with some form of short- and long-term memory.

While emotions have been a topic of intensive research in software agents for several decades now, for example, in computer games or military training simulations, this intensity is not visible in robotics yet. The main reason may be the lack of their availability to the general public and therefore the lack of data on long-term interaction between humans and robots. However, there is already a current commercial trend of low-cost implementations in the form of "emotional" pet robots. Moreover, to date, public acceptance of emotive robots is ambivalent due to the tension between complex interactive behavior and natural interactivity versus the apparent loss of control by humans (Fig. 1).

Robot head EDDIE; animal-like features complementing human-like facial elements for improved emotion expression (Kühnlenz et al. 2010).

Self-identification

Science

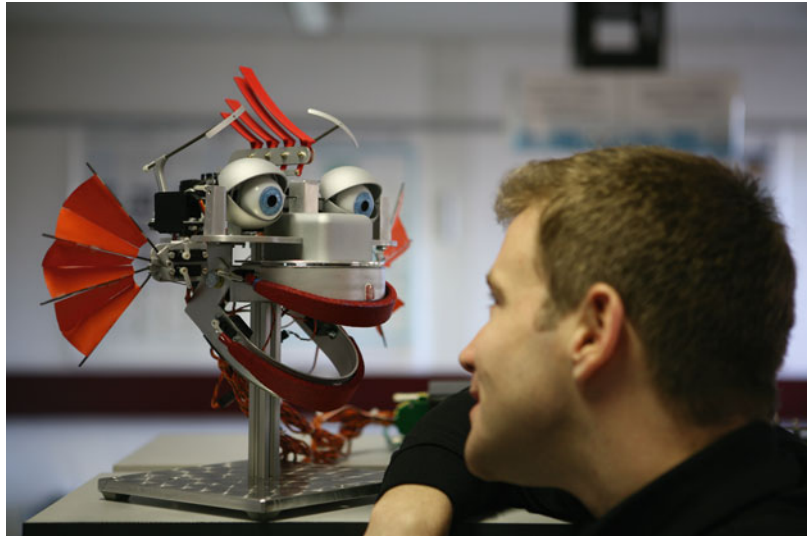
This discipline/subdiscipline does self-identify as a science. Scientists in the field aim at transferring models of human emotions, emotion expression, emotion recognition, emotionally enriched communication, decision making, and action control from psychology and neuroscience to technology in order to develop robots that can interact in a natural and intuitive way with humans. They also aim to develop behavior control mechanisms which complement conventional cognitive control capabilities of robots. This means that the robots have the ability to select appropriate actions in response to perceptual input incorporating learning and knowledge/experience.

Religion

This discipline does not self-identify as a religion. Most scientists working on the field would consider their work as focused on nonreligious topics. However, in a more general cultural context, there may be religious aspects

Robot Emotions,

Fig. 1 MIT's Kismet, a robot "that mimics and responds to human emotions." (<http://web.mit.edu/newsoffice/2001/kismet.html> as of October 10, 2012.)



involved in the motivation for emotive robots, for example, the adscription of life to inanimate structures. Moreover, similarly to Artificial Life, the limits between technology, philosophy, and religions are blurred in this field. Typical borderline questions are how to prove existence of emotions in robot, what is needed to make a robot emotive, whether a robot that behaves emotionally will be inherently emotional, or even whether artifacts will ever have emotions.

Characteristics

Robot Emotions sets itself apart from the broader disciplines/subdisciplines robotics, human-robot interaction, and cognitive robotics by in-depth consideration of motivational and affective aspects in design and control of robots. It is implicitly strongly interdisciplinary, involving engineering, computer, psychological sciences, and philosophy.

Relevance to Science and Religion

There is no major interest of scientists working in Robot Emotions in "Science and Religion." Religious implications of borderline questions like

"Does a robot that behaves emotionally really have human-like emotions?" or "Will artifacts ever have human-like emotions?" are typically not considered.

Sources of Authority

Typically, experimental evaluation, benchmark measures, a measure with sufficient generality in order to facilitate comparative evaluations of different systems or processes, mathematical proofs, empirical data and statistical analyses with significance and effect measures, experimental or simulative verification/falsification. Also, publications in journals, conference proceedings, and books with quality assessment based on a peer-review process.

Ethical Principles

Disclosure of methods and data in order to facilitate reproducibility of results. Compliance with ethical guidelines in experiments involving human participants, particularly, depersonalization of data, participation on the basis of free will, (de-)briefing of participants, and implementation of controls for ethics compliance verification.

Key Values

Improve living conditions of humans, in particular, assistance and therapy, such as support of human-human socialization of the elderly or the autistic.

Conceptualization

Nature/World

Matter/energy and (psycho-)social relations in space-time.

Human Being

A cognitive, emotional, and social life-form

Life and Death

There is no generally acknowledged concept of life and death among scientists in the field. However, in contrast to biologists, many of them would consider a definition of life that generalizes to artifacts. In this context, typical phenomena considered by biologists to be exhibited by living organisms may also generalize. Among those, reproduction could generalize to creation of child agents, and homeostasis to self-regulation in terms of a balanced technical system state, for example.

Reality

What can be perceived/measured or be subjected to individual perceptual embodiments and measurement methods and that can be changed in response to actions by individual embodiments of actuators.

Knowledge

Information gain/learned information by observation or interaction.

Truth

What is proven, verified/falsified, tested are usually models as approximations of the truth. Truth itself is considered not attainable.

Perception

The acquisition of data and limited processing for information extraction in a process that

depends on the means of acquisition, and as such is subjective and possibly erroneous. However, borders between perception and cognition in Robot Emotions and robotics in general are blurred.

Time

A physical unit as defined by the *Système international d'unités*.

Consciousness

A higher mental state. It is usually not explicitly considered in the field of Robot Emotions, but it is, however, tightly linked to emotion, for example, self-conscious emotion.

Rationality/Reason

Scientists in the field would consider rationality and reason fundamental concepts of cognition and scientific research. In particular, rationality/reason is regarded as complementing or rationalizing emotional decision making.

Mystery

Scientists in the field would consider a mystery as not being explainable with currently available scientific methods.

Relevant Themes

Work on emotions is commonly based on biological principles. Developing emotive robots implies the development of life-like artifacts and even artificial humans, which gives rise to questions regarding social and religious implications. Similar to questions raised by the field of Artificial Life, one may ask what distinguishes an individual (robot/human) showing emotional characteristics from one, which/who actually experiences emotions, as well as whether artifacts will ever be capable of experiencing human-like emotions. Social integration of robots into human groups and communities is also an issue of interest with religious implications tightly linking the field to the field of robot societies.

Cross-References

- [Affective/Emotional Computing](#)
- [Algorithms, Computer](#)
- [Brains, Artificial and Computational](#)
- [Control Theory \(Cybernetics\)](#)
- [Intelligences, Multiple](#)
- [Philosophy of Science](#)
- [Religion, Sociology of](#)
- [Robotics and Religion](#)

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Robot Languages

- [Robot Programming](#)

Robot Programming

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Related Terms

[Computer science](#); [Machine learning in robots](#);
[Robot embodiment](#); [Robot languages](#)

Description

Robot programming is the process of developing software that will control a robot. At the most basic level, a robot is nothing more than a collection of sensors, actuators, and computers. Programming a robot is, therefore, similar in many ways to programming a desktop computer. The primary difference is the incorporation of online data collection via sensors, and of the ability to manipulate the environment using actuators. The ► [computer languages](#) used to program a desktop computer are equally applicable to programming a robot.

A typical robot contains programs developed using a mixture of languages – ranging from low-level assembly typically found in firmware (a small control program similar to a software program), to mid-level languages, such as c, c++, or python, which typically handle most, if not all, of the logic programming, to high-level languages, such as the Task Description Language (TDL) and Charon, which have been designed specifically for robot programming.

Most robot programming is done by engineers and scientists. Hobbyists have recently become active developers as hardware has become cheaper and more readily available. A nontrivial amount of skill and experience is required to program a robot. Professional software engineers who write code for use on robotic systems typically have degrees in computer science, software engineering, or electrical engineering. Accompanying their education is years of hands-on experience, which provides them with the ability to choose and implement algorithms for a particular task and robot configuration.

A robot typically goes through a series of programming iterations before it can become operational. Historically, the first robots were built and programmed from the ground up by a small group of talented individuals. Now, many people with diverse backgrounds all help to program a robot. The first programming step is performed by the manufacturer of the physical structure or embodiment of the robot. This physical structure through which a robot interacts with

its environment may take many forms, from simple wheeled devices to complex humanoids. It is needless to say that the range of behaviors that a robot can achieve is limited by its embodiment. During this stage firmware is added that provides software access to the various sensors and actuators. At this stage, the robot is still not completely functional. It has the necessary code to move and receive data from its environment, but nothing is in place to decide what actions to take and when to take them.

Building on top of this minimal functionality, mid-level programming languages are used to create a convenient application programming interface (API). This software provides methods that abstract away the details of the robot's hardware, and provide a general interface for robot programming. This middle-ware facilitates rapid prototyping, encourages code reuse, and creates a common platform around which many different applications can be designed. Examples of such middle-ware include Robot Operating System (*ROS*), *Player Project*, and *Carmen*.

The final step is to imbue the robot with intelligent behavior. This step involves the use of either a mid-level or high-level programming language. It is at this step where a robot gains the ability to interpret sensor data such that it can make intelligent decisions. Usually this step involves significant testing, debugging, and analysis. As a result, significant time is spent here, and tools have been designed to aid programmers in their task.

These tools typically consist of one or more ► [simulators](#) designed to recreate the robot, its capabilities, and its environment. By using a simulator, a programmer can constrain problems by manipulating the artificial robot's environment. This can take the form of slowing down or speeding up time, altering the complexity of the environment, and changing the physical structure of the robot. As a result, ideas can easily be tested, and problems can be debugged without the bottlenecks associated with using the scarce resources of a physical robot.

Robots are being designed to aid humans in a wide range of tasks, including inherently

dangerous scenarios, such as search and rescue, making our lives more comfortable through household robots, and improving precision, accuracy, and speed as seen in assembly line robots. As robots are expected to perform even more complex tasks, engineers and scientists need to imbue these machines with more intelligence. This is being tackled through the use of algorithms designed to let a machine learn. These algorithms span a wide range of fields including computer vision, natural language processing, pattern recognition, and bioinformatics. This field of machine learning has witnessed great advances and is currently at the point where machines can learn to walk, fly planes and helicopters, drive cars, interpret human speech, and identify a wide range of objects. Machine learning involves creating a program that when executed can learn something new based on data from sensors or databases.

Building off of machine learning is a relatively new field of study called learning from demonstration, or programming by demonstration, that redefines how a robot acquires knowledge. The central principle behind learning from demonstration is to improve knowledge transfer by giving a robot the ability to observe and learn from human behavior. This can take the form of direct guidance through manipulation of a robot's actuators, imitation where a robot observes and repeats human actions, or tel-operation where a person drives the robot using a joystick. In each situation, the robot makes observations about itself and its environment during the demonstration. This data is then used to generate a control policy. The robot programmer has only to implement the means by which a robot can observe a teacher, and learn appropriate policies. While this is no small feat, it does allow a robot to program itself with a potentially arbitrary number of policies.

There is no one set method in which a robot can be programmed. In many instances, a hand-generated finite state machine is sufficient. In others, machine learning is used due to the complexity of the task and environment. However, all robot programming still relies on

a human to create an application using one of the many programming languages available today.

Self-identification

Science

Robot programming by itself is not considered a science, but rather an engineer task that requires problem solving, critical thinking, and experience. However, programming is an important part of the scientific processes. Computer scientists and engineers rely on robots and programming languages to test theory, and implement new algorithms.

Characteristics

Robot programming is a unique form of software programming since the programs being created must control a physical structure that operates within a dynamic world. Other types of programs are designed to operate on a device that cannot automatically gather information from its surroundings and change its environment. As a result, programming a robot requires the engineer to consider issues, such as sensor properties, motor control, safety, how to best handle error conditions and unforeseen events, and in what environmental conditions will the robot fail. A notable outcome that is often encountered is emergence, where interactions with the environment cause a robot to behave in an unexpected and beneficial manner. See further entry on Theories of emergence.

Relevance to Science and Religion

The discipline of robot programming is not concerned “Science and Religion.” The closest question related to religion that a robot programmer may have to consider is the possibility of creating an artificial life, and what implications it has on society. However, at this point in time the possibility of creating such an entity is remote at best.

Sources of Authority

There is no one person or group that can be looked upon as providing an authoritative perspective on robot programming. Over the relative brief history of robots, there have been numerous papers published on robot control architectures, and the results from these have guided many people in their efforts. However, every robot is different, and designed to perform different tasks. Furthermore, this young field experiences rapid advances in technology and algorithms. As a result techniques are rapidly eclipsed by ever newer approaches.

However, there has recently been advances made by a variety of groups to create software tools designed to reduce development time, increase code reuse, and improve the process of research and development in robotics. These projects enforce, or strongly encourage, a general guideline for robot programming and can be looked upon as being a pseudo-authority in robot programming.

Ethical Principles

Robots are extremely useful tools that can aid humans in many different ways. The military views robots as the next great advancement in warfare. A robot on the battlefield or performing reconnaissance does not put a human directly in harm’s way, and can perform some tasks much more efficiently. A robot does not have emotions, can operate in adverse conditions, will obediently perform any action, and can be controlled remotely. Proponents of robotic warfare claim that robots will reduce casualties, and save lives. However, machines that are designed for war can have horrific effects, and many researchers and engineers abstain from development of these robot warriors. While a robot essentially puts its corresponding human counterpart out of harm’s way, it is this ability that could make robots a dangerous weapon to deploy. By limiting the loss of life, the cost of war decreases. This, in turn, could potentially increase a population’s willingness to engage in war.

The current trend shows that robots are being rapidly developed for use by the military, and only time will tell if this was a wise decision.

Recently, there has been a strong push to use robots as tools to aid the elderly and people with disabilities. Concerns of privacy and safety necessarily come to the forefront. Some of these problems will naturally be solved as people become more comfortable with artificial entities operating with and around them. In other instances, assurances will have to be made that a robot will repeatedly operate correctly. In much the same way as the drugs and food must go through testing and gain government approval, also robotic systems and their software will probably one day be regulated to ensure no harm will come to end users.

Conceptualization

Nature/World

This is the environment in which the robot operates. Robots are typically sized between a small animal and a human, although great advances have been made with nanorobots. A robot can collect data from and interact with the world, but lacks the human concept of nature.

Human Being

Human beings are dynamic objects in the world that can program a robot, and interact with it. A robot cannot understand that a human has created and programmed it. The extent of a robot's knowledge about humans depends on the amount of knowledge it has been programmed with.

Life and Death

Robot programming could potentially lead to the generation of artificial life; however, this is speculation especially since the concept of life is ill defined. Since a robot is not considered to be alive it cannot die. A robot is often said to have died, however, when it becomes nonfunctional due to hardware or software failures. However, the use of the term death in this context is not equivalent as when applied to living things.

Reality

Robots operate in the real world and as such are governed by the laws of physics. From a programmer's perspective, the control code for a robot must take into account their kinematic and dynamic constraints and capabilities. From the robot's point of view, reality depends on its sensors, and its ability to process data from these sensors. A robot does not have a concept of reality, but just the ability to gather information from its environment, and perform actions based on this data.

Knowledge

Information from humans is transferred onto a robot by means of programming. Knowledge can also be gained by the robot automatically as it collects data from its environment. Without some minimal information, a robot is incapable of performing meaningful behaviors. The most minimal knowledge a robot should have is how to interpret sensor information and control its actuators. The complexity of the knowledge required by a robot scales proportionally with the complexity of the desired behavior.

Truth

Truth in robot programming is based on laws governing the physical world. Data from a robot's sensors is derived from interactions (passive or active) from the surrounding environment, and must be taken as truth, with some amount of noise.

Perception

A robot's view of the world is defined and limited by its sensors. This in turn constrains how the robot is programmed, and the tasks it can accomplish.

Time

Time is viewed by the robot in much the same way as it is viewed by humans. The primary difference is that a robot can operate at a much faster rate than a human. A robot programmer will often deal with time scales of a few milliseconds or smaller to minutes and hours. This wide range of time can often lead to unexpected outcomes and errors.

Consciousness

The current state of art in robot programming does not incorporate the ability to be self-aware. A robot is, therefore, not considered to be a conscious entity. There is belief that robots could one day become conscious, but the path to achieve this goal is not well understood.

Rationality/Reason

Robot programming requires rational thinking and problem solving. One must understand complex interactions that sensors and actuators can have with the robot's environment, and how best to implement control logic that minimizes the weaknesses of a robot and improves robustness and efficiency.

Mystery

There is very little mystery associated with robot programming. A mysterious error or unexplained problem may appear when programming a robot. However, these can always be explained after careful analysis of the robot and its environment.

Relevant Themes

There is a long-standing stigma surrounding robots, starting with Karel Capek's play "Rossum's Universal Robots." Books and movies have historically portrayed robots as evil, and as a result many people have apprehensions concerning robots. The concept of being evil requires that a robot is capable of making moral judgments, and is a sentient entity. This also requires that a robot has been programmed to be evil. While nothing is certain, the possibility of robots designed and programmed in such a way is extremely minimal.

If one day an artificial life form is created, this will raise interesting moral questions for us as a society. In particular, we will have to decide how such an entity will fit into our society, and what kind of rights they would or should have. On a more personal level, a robot programmer may have to decide how his beliefs fit in with his ability to create another form of life.

Cross-References

- ▶ [Computer Science in Human Learning](#)
- ▶ [Control Theory](#)
- ▶ [Software Engineering](#)
- ▶ [Space and Time](#)

Robotics and Religion

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Related Terms

[Alchemy](#); [Computer science](#); [Golem](#);
[Homunculus](#); [Kurzweil](#); [Robot singularity](#)

Description

Although many of the optimistic predictions made by early cyberneticists and roboticists remain far from fulfilled, the rapid progress of robotics and artificial intelligence (AI) in the late twentieth and early twenty-first centuries has inspired reflection on the religious implications of intelligent robots. Faith in one or more religious visions of robotics has percolated through modern culture, inspired by experts in technical fields, theologians, and the lay public. Interestingly, the science of robotics both emerges out of and critically engages religious practice, despite the fact that only a minority of roboticists or AI researchers engage the subject. Naturally, some observers object to (possibly) hyperbolic expectations for robotics, and feel that the advocates of such positions stand outside of science (properly understood) and perhaps in opposition to traditional religions. As a result, at present there is neither a "science" nor a "religion" of robot faiths that clearly stands out as a source of authority in the field, although the scientific approach appears to be more prevalent. Meanwhile, enthusiasts across a wide variety of disciplines tend to fall

in one of three camps: robotics will (1) allow us to complete the divine creation or create partners for humankind, (2) create gods worthy of our worship, and/or (3) provide humankind with immortal salvation. In the case of robotics and religion, it is transparently clear that no simple dynamic of conflict or cooperation dictates how observers will integrate the two.

The twin sciences of robotics and artificial intelligence developed out of ► [cybernetics](#) research in the mid-twentieth century, and subsequently became part of a wide array of technological practices, from hobbyist to professional. See further entry Control Theory (Cybernetics). The majority of roboticists and AI researchers see nothing religious in their work, but simply engineer solutions to technical problems. At present, robots and AI systems are used in assembly lines, inventory management, stock trading, search processes, the military, video gaming, and private homes, to name but a few sites they occupy. Simple robots vacuum floors or engage children, but more sophisticated versions also watch over soldiers and carry weapons. Some robots are humanoids capable of running, dancing, and conversing with people; others are cars that can drive across the USA unassisted. As researchers take advantage of increases in computing power and solve hardware problems (such as having adequate battery power), robotic applications will become even more widespread, perhaps triggering a revolution in how we live. In addition to laboring on our behalf, robots may become sufficiently intelligent that they become our partners, our friends, or our betters.

According to roboticists who engage the question of consciousness, thought is a process enacted by a material substrate, but is not dependent in any essential way upon the constitution of that substrate. In principle, argue roboticists, there is no reason why a robot could not be as intelligent (or more so) than a person, as there is widespread agreement in the field that in important ways human beings are simply very sophisticated machines. Consciousness appears to be a by-product of massively parallel computation, not tied to the hardware in which it takes place (brains and bodies), and can be mimicked in

a machine. If this is true, then a sufficiently powerful robot could become our equal, and take on a life of its own.

As a corollary, advocates for intelligent robots believe without doubt that such machines will be “alive.” Various definitions for life exist, and most commentators consider it base chauvinism to deny that robots could possess it. By necessity, many advocates of machine intelligence, such as Hans Moravec and Ray Kurzweil, claim that biological life is evolving into machine life (Kurzweil 2005; Moravec 1988).

The desire to build artificial life was not born in the twentieth century; rather, robotics and AI extend a millennia-long exercise deeply tied to religious thought and practice. Particularly in the West, religious groups have looked upon the creation of life as the ultimate in *imitatio dei* (imitation of God), a tradition that extends across Judaism, Islam, and Christianity (though with more ambivalence in this last). In Judaism, for example, stories of learned and holy rabbis creating ► [Golems](#) trace back to the Babylonian Talmud, and were adapted into the legends of two early modern rabbis: Elijah of Chelm (d. 1543) and Judah Loew of Prague (1525–1609). Across the same time span, Muslims and Christians developed parallel and intertwined practices, mostly revolving around the creation of an ► [homunculus](#), which is a magical creature, usually but not always humanoid (though smaller), produced through existed in classical Islam and in medieval Europe. Theories of the homunculus both influenced and were influenced by those of golems. Jābir ibn Hayyān (c. 721–815), known as both the father of chemistry and the “Paracelsus of the Arabs,” believed that basic elements could be manipulated and balanced to produce life. His descriptions of the ► [homunculus](#) influenced later Islamic works, such as the *Book of the Cow*, and also alchemists in Christian Europe, such as the aforementioned Paracelsus (1493–1541). Unlike Paracelsus and the alchemists, the early modern rabbis almost certainly did not attempt to produce ► [Golems](#), yet the politics of the eighteenth- through the twentieth-century Europe led Jews to develop and sustain legends of ► [Golems](#) who could

save them from persecution, and these stories subsequently had a significant impact on the twentieth-century culture, from silent films to science fiction.

Early in the robotics era, science fiction authors imagined ways in which robots might participate in the religious traditions of humankind, with a range that includes developing their own religious sensitivities. Isaac Asimov, for example, has had an extraordinary influence upon robotics, and many contemporary roboticists continue to cite his stories as inspirational in their career choices. In his collection of robot stories, *I, Robot*, Asimov uses religious themes to help explore robotic potential, as when one group of robots establishes a religion that mimics the fundamental tenets of Islam, though applied to machines. Whereas Muslims aver that “there is no God but God, and Muhammad is his messenger,” the robots in Asimov’s story “Reason” claim that “there is no Master but the Master, and QT-1 is his prophet.” In this transmutation, a space station is the Master, and QT-1 is the robot who first began to worship it rather than obey its human creators. While Asimov uses religion to write a story about the operating possibilities of robots, other authors have used robots in order to explore religious themes, such as Clifford Simak, whose *Project Pope* describes human beings and robots collaborating in an attempt to produce a universal religion. The intersection between religion and robotics is not confined to science fiction, however, but has been a crucial element in popular explorations into the potential of robotics research and predictions about the future of the world.

Critical engagement between robotics and religion began in earnest with the publication of Hans Moravec’s *Mind Children: The Future of Robot and Human Intelligence* in 1988. In *Mind Children*, Moravec argues that Moore’s Law and the pace of improvements in computer vision indicate that robots are gaining intelligence at an exponential rate, which means that robots will reach human level intelligence in the near future before sailing rapidly beyond that level. As robotic technologies improve, Moravec argues, we will solve human handicaps and eventually

copy our personalities into robotic bodies. Ray Kurzweil, a prolific and famous inventor, extended Moravec’s ideas in *The Age of Spiritual Machines* (1999) and *The Singularity Is Near* (2005), presenting them to a wider audience and supplementing them with insights from nanotechnology and other technical fields.

In Moravec’s apocalyptic vision of our robotic future, nature values technology over biology. This latter has evolved specifically to produce the former, and will eventually be transformed into it. There is nothing “unnatural” about artificial intelligence, as technology is perceived to be an inevitable outcome of biological intelligence, and machine intelligence is taken as inevitable once technology has become widespread.

Historical time, in this apocalyptic vision of robotics, progresses indefatigably toward the Mind Fire (Moravec’s term) when computation has taken over all material reality. According to Moravec, evolution guarantees that the superior thinking of machines will outcompete that of humanity. Kurzweil argues that a law of accelerating returns guarantees that the world will experience a technological ► [singularity](#) in the first half of the twenty-first century. Subjective time is speeding up, he argues, and the coming decades will include unprecedented advances that will culminate in true artificial intelligence and the merger of biology and technology.

Moravec’s ideas spread, thanks particularly to Kurzweil, and thus commanded attention from theologians whose own desires were in conflict with Moravec’s. For obvious reasons, those who believe in immortal souls were never enamored with Moravec’s plan to provide immortality by “uploading” minds from bodies into machines. Were such a process possible, it would stand in the way of an individual’s ascent to Heaven; even faith that it *might* be possible could lead the faithful astray. It is not just theologians, but lay people who see ► [mind uploading](#) as a threat to traditional religions. Mind uploading is the hypothetical process of scanning the contents of a human brain onto a machine emulating a brain, so that human consciousness can continue in the machine. Kurzweil was featured in popular venues such as the *New York Times* and *Rolling*

Stone; as a consequence, some members of the Christian laity learned of his ideas and voiced their opposition (Tamatea 2010).

Despite the criticisms leveled against ► [mind uploading](#), many Christian theologians have seen value in robotics research, suggesting that it could either contribute to the establishment of a kingdom of God or that it could be an important continuation of divine creation (e.g., Foerst 2005; Jackelén 2002; Herzfeld 2002). On the one hand, research in robotics could provide important advances in human prosthetics, perhaps helping the blind to see and the lame to walk. In addition, some theologians believe that by creating intelligent robots, we will do so in our image, and hence in the image of God. Lutheran theologian Anne Foerst has developed this idea the furthest, arguing that, to be in the image of God means, fundamentally, to be in loving relations with others (as she believes that God is with humanity). As such, producing robotic friends and companions would expand the circle of love and contribute to the outflowing of divine love in creation.

Outside of Christianity, at least one community shares the belief that robots could become partners in human life. In Japan, the only non-Western community where the relationship between robotics and religion has received any attention, many people look forward to companionship between humanity and its mechanical progeny. Early in the introduction of robots to Japan, the public embraced them, even including them in religious practices (Hornyak 2006; Schodt 1988). Early industrial robots, for example, were welcomed into factories with Shinto rituals and gifts of flowers. As a number of individuals have recognized, the traditional acceptance that nonliving objects can be *kami* (loosely translated as having “holiness”), implies that robots can be *kami*. They can have spirit. At the same time, Japan’s other long-standing religious tradition, Buddhism, also provides room for the inclusion of machines. One engineer, Masahiro Mori, attained notoriety for his claim that robots have the Buddha nature in them (Mori [1981] 1999). Many Japanese cite their affection for and acceptance of robots as a consequence of their love of *Tetsuwan Atomu* (“Mighty Atom,”

known in the USA as “Astro Boy”). The cartoon robot never threatens humanity, as do many robots in the Western world; instead, he works to save us from harm. Broadly speaking, his influence, combined with the persistence of Shinto and Buddhist ideas in the largely agnostic country, promotes a spirit of cooperation and affection between human beings and robots. As a result, many Japanese eagerly look forward to the introduction of functioning, intelligent humanoid robots.

If robots become equal to humankind, there is a strong possibility that they might develop religious inclinations. Clearly, the standard questions of meaning, purpose, and ultimate origins will be as relevant to the robots as they are to human beings. Theologians like Foerst, along with a few computer scientists, such as Edmund Furse, believe that when robots become conscious, they will join our religious congregations or perhaps create religions of their own. Kurzweil claims that machines will be more “spiritual” than human beings, thanks to their superior thinking and powers of concentration. It is highly likely that developing religious sensitivities will, in fact, be closely intertwined with any social movement to provide legal rights to robots; if robots show a religious imagination, then they will go far toward entering human circles of empathy and earning themselves the rights and responsibilities of citizens; commensurately, a universal absence of religious feeling among robots would likely be taken as indicative that they are not and cannot be true persons (Geraci 2010).

At the same time, intelligent robots will without question have some kind of moral or ethical system by which to make decisions. From a human standpoint, it is impossible to separate questions of right and wrong from the matters of free will, consciousness, and personhood. As such, ethics will be as crucial as religion to any empathy directed toward intelligent machines (Geraci 2010). Should robots become intelligent, however, and acquire some set of ethics, they will have to do so while sailing between the twin dangers of the military and capitalism. These two institutions, like Scylla and Charybdis, could swallow up any good that we might hope

of our creations. Although Moravec believes that intelligent machines will be our “mind children,” and thus retain essential parts of our humanity, the science fiction author Charles Stross rightly points out that the majority of funding for artificial intelligence comes from military and economic strongholds, neither of which has any vested interest in developing altruistic and generous machines. As we continue to develop artificial intelligence, it behooves us to keep these concerns in mind, to ensure that if we truly can develop intelligent machines, then we will create machines worth befriending.

Both Moravec and Kurzweil, the leading figures at the intersection of religion and robotics, believe that advances in robotics and AI are morally good and will result in a morally beneficent universe. Both believe that as we merge with machines over the coming century, we will bring essential aspects of our humanity, including our good will and altruism. Technology should solve human problems, they argue, and both devote considerable time in their books to exploring how technology might solve our ecological crisis, provide renewable energy, improve food production and distribution, etc. In short, the merger of biology and technology will not only make human beings more capable, it will help us to overcome our past mistakes and create a better world.

It remains possible that, upon attaining human level equivalence, robots will rapidly progress to unimaginable heights of intelligence and power; if this happens, they may become as gods unto us. If this proves true, perhaps cyborg prostheses will permit humankind to match them in power, but this seems unlikely. After all, human bodies have limits to their size, mobility, and capacity. A robot freed from such constraints could – at least in theory – grow well beyond humanity. One AI theorist, Hugo de Garis, has gained some measure of infamy for his belief that such robots, which he labels “artilects,” will indeed become gods worthy of worship. While he recognizes that such divine machines may well find humanity an unnecessary burden or unacceptable competition, he believes this is a morally valuable outcome. That is, he has suggested that humanity may fight world wars over whether to build godlike

machines, or the machines might choose to exterminate many or all human beings, but that the successful construction of one divine robot will make all human suffering worthwhile. De Garis thus reconfigures ethics into an inhuman and possibly antihuman crusade for intelligent machines, where no other species has a claim to life, freedom, or happiness.

Moravec and Kurzweil, however, believe that humanity will join the godlike robots in their cosmic quest. In their apocalyptic predictions, the world will come to an end as we know it, and humanity will transform into a race of divine machines through ► [mind uploading](#) (Geraci 2010). Every advantage held by one of de Garis’s artilects will be shared by ex-humans; thus our immortal salvation will be assured. For Kurzweil, this outcome will be spiritual in addition to intellectual: First, as human beings add computational power, they will acquire new capacity for spiritual reflection; second, as the world, the solar system, and eventually the universe are converted to thinking entities, the universe will itself “wake up” and move inexorably toward traditional Christian conceptions of God.

There are rich areas for speculation in the intersection of religion and robots. While some hope that the construction of robots will fulfill long-standing religious goals, others expect that robotics will overthrow our traditional religions, producing either gods or substitute forms of salvation. Alongside all of this, the vast majority of professional roboticists have little or no investment in any of the varying intersections between robots and religion. Rapid growth and deployment of robotics throughout the world, however, means that the expectations of people on the ground – the scientific laity – should be more carefully explored. It is particularly important that researchers collect meaningful data from observations and interviews conducted among relevant populations, and not merely draw abstract conclusions on the basis of beliefs that the researchers presume people hold. The ethical implications of our current robots, such as weaponized military robots, certainly have religious overtones and should be examined through such a lens. In addition, we simply do not know enough

about how differing religious environments will affect either the development or use of robotic technologies. While research has begun in the Christian West, this remains largely abstract and broad, with little attention to the particulars of given Christian communities. More pressing, almost no research has been done outside of that context. There have been intriguing forays into Japanese practice, but more remains to be done in that area and, especially, beyond.

Cross-References

- [Artificial Intelligence, General](#)
- [Brains, Artificial and Computational](#)
- [Consciousness, the Problem of](#)
- [Cyborgs](#)
- [Imago Dei](#)
- [Posthuman Condition](#)
- [Robot Emotions](#)
- [Robot Societies](#)

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Robot Singularity

- [Robotics and Religion](#)

Robot Societies

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Related Terms

[Artificial life](#); [Computer science](#); [Multi-robot systems](#)

A robot society is a group of robots which has the ability to communicate, interact, and to perform tasks jointly. A society is defined by its information and control structure which make possible common task planning and execution. Most of the autonomous mobile robots are operating in neither stable nor structured environments. Therefore, a major trend in robotics is going toward multi-robot systems. In many cases, the decomposition of a complex task into parallel subtasks is a possible way to speed up the performance. Sometimes, several robots work with the same subtask, increasing the redundancy of the system. Furthermore, there can be tasks where successful completion requires close cooperation among the robots. Such case is, for example, the carrying of a large object together. It requires some sort of interaction between robots, whether it is a direct communication or some sort of indirect communication through sensing the forces in the object to be transported. This kind of task as well as many other tasks normally related to multi-robot systems has clear analogy to biological systems. A group of ants solve the problem through sensing the forces and torque in the object. Based on this information they change the direction of force. Numerous similar examples can be found from nature. Tests by evolution during millions of years are proven to be feasible in dynamic and hostile environments and can thus provide valuable

information and inspiration for similar type of engineering tasks.

Artificial life represents an attempt to understand all life phenomena through reproduction in artificial systems, typically through their simulation on a computer. To attain this ambitious goal, artificial life relies on the theory of complex dynamical systems and on the power of computers. A complex dynamical system is a system that can be described at different levels, in which global properties at one level emerge from the interaction of a number of simple elements at lower levels. Global properties are emergent in the sense that they cannot be predicted from a knowledge of the elements or the rules by which the elements locally interact, given the high nonlinearity of these interactions (see the entry “► [Complex Systems](#)”). In engineering science, evolutionary robotics shares most of these characteristics with artificial life, but it also stresses the importance of using physical devices in robots instead of simulated agents.

Cooperative robots are constantly interacting not only with the dynamic environment, but also naturally with each other and with the persons who are using them. This large variety of interactions will produce behaviors that are going to be superior compared to performed by current single robots. The robots will be equipped to survive as a part of a complex system, where the cooperation is essential for their survival. Collective intelligence emerging from these interactions gives a reason to call these systems, at their highest level, “robot societies.” Multi-agent systems, whether software or hardware agent based, have to solve some fundamental problems. They must formulate, describe, decompose, and allocate tasks among a group of intelligent agents. Agents must be enabled to communicate and to interact. They must be ensured to act coherently in their actions. Further on, they must recognize and reconcile conflicts. Therefore, a model of distributed robotic systems must be defined and designed. All functions of these systems are obviously realized through their members. The members’ behaviors are results from their own needs and from the constraints set of the system, environment, or operator.

The number of distributed autonomous robotic system applications will increase as the

technology and knowledge improve. Various robot societies will move from research laboratories into everyday life. Normal applications concern everyday tasks like cleaning, monitoring, caring people in households or hospitals, etc. In the future, robot societies will be taken to distant planets, deep-sea module collection missions, and mining operations, among others. Nanosized robots will be sent into veins in search of tumors, which they will attack at close range. Just as in natural systems, the intelligence of the collective system will emerge from the multiple interactions among the members and with the environment.

In first steps of development, natural populations, for example, ant societies, were studied to find the key issues. Next steps were to design a physical society. It consists of two types of autonomous mobile robots, and the task for the society is classical, to gather stones from an unknown environment along with the mapping of the environment while operating. The society has been implemented both as a physical society and as a simulated one. A possible application is the use of a robot society inside industrial processes.

A profound challenge of interdisciplinary importance is the question how culture may emerge and evolve as a novel property in groups of social animals. The question can be solved by focusing the attention on the very early stages of the emergence and evolution of simple cultural artifacts. Therefore, one should start by building an artificial society of embodied intelligent agents as real robots, creating an environment or artificial ecosystems. Even with small populations of simple robots, a large number of interactions between robots can be generated. The inherent heterogeneities of real robots, and the noise and uncertainty of the real world, increase the space of possibilities and the scope for unexpected emergence in the interactions between robots.

The goal is to create the conditions in which proto-culture can emerge in a robot society. Robots can copy each other’s behaviors and select which behaviors to keep. Behaviors will mutate because of the noise and uncertainty in the real robots’ sensors and actuators. Successful types of behavior will undergo multiple cycles of copying (heredity), selection, and variation (mutation). With evolutionary

time, a genetic algorithmic process will grow and evolve the robots' controllers so that the emerging patterns of behavior become hard-wired into the robots' controllers.

The behavioral artifacts emerging and evolving will not be human but robotic. They will be meaningful only within the closed context of this artificial society. A significant challenge for these projects will be to identify and interpret these patterns of behavior as evidence for an emerging proto-culture.

Based on the economic ideas about cost and utility, robot ecosystems were developed. From an ethologist's point of view, robots are interesting for investigating biologically realistic issues. The emergence of cooperation can be studied by experiments with robots. For example, in a robot ecosystem, there are a few robots and a few boxes with infrared lamps. The lamps are called competitors because they (like robots) consume energy from the ecosystem. As the overall amount of electricity is limited, the robots have to compete with the lamps for the electricity. A constant but restricted influx of energy into the system limits the amount of electricity available. The robots have to push against the competitors to reduce the competitors' energy consumption.

Reducing the infrared lamps' energy consumption dims their lights. The darker the boxes, the more current there is in the charging station. The robots are equipped with the sensors whose activation levels can be coupled to motivations. If the environment is made more taxing by increasing the number of energy-consuming boxes, the robots have to exploit these sensors to produce beneficial sensor-to-motor couplings. Beneficial in this case means leading to higher available energy levels.

For example, the robots have a sensor for internal energy level. If the sensor is coupled directly with the motivation for forward movement, the robot moves more slowly when the energy is low, which makes the robot take longer to move through the charge station. The robots also have a sensor for detecting the charging station. If the sensor is inversely coupled to the motivation for forward movement, this keeps the robot in the charging station even longer. In addition, the robots have light sensors, and the

charging station is marked with a light, so they can potentially use phototaxis to approach the charging station. If the robots exploit the various sensory modalities in appropriate ways, they get an advantage in terms of energy management. This implies increasing the complexity of their behavioral repertoire, for example, better exploitation of the motor system.

When an evolutionary perspective is applied, one needs a value system. In the robot's case, it is related to energy supply: Increase in energy level is of value. The task of energy management is difficult, because the beneficial effects of certain actions manifest themselves only much later. This is a fundamental issue in reinforcement learning. The entire experiment can also be put into an evolutionary context. It would be interesting to study what sorts of value systems would evolve.

Cooperation can also be studied in this experiment. The energy influx into the charging station increases if another robot pushes against the energy-consuming boxes. In a sense, the robot that pushes against the boxes works for the one in the charging station. If the robots cooperate in this way, they can potentially draw more current from the charging station. Thus, they may be able to support more robots, because they manage to divert electricity from the competitors. This entire procedure can also be embedded into an evolutionary cycle. In this case, one can see which sensors will be exploited, given a particular environmental pressure. The fitness criterion in this case would be: How long the agents can survive?

The behavioral economics approach to autonomous agents brings in important ideas. Thinking in terms of utilities rather than specific quantities leads to plausible models of rational behavior. This framework is highly useful in understanding animal behavior and behavior of autonomous agents in general. The idea that rational behavior can occur *without* rational thinking or that the problems of thresholds can be avoided by using utilities is highly appealing. The fact that behavior is an emergent property of the interaction between robots and their environment has the consequence that simple robots can produce

complex behavior. However, it also has the consequence that, as in most dynamical systems, the properties of the emergent behavior cannot easily be predicted or inferred from the knowledge of the rules governing the interactions. The reverse is also true: It is difficult to predict which rules will produce a given behavior, since the behavior is the emergent result of the dynamical interaction between the robots and the environment.

However, the behavioral economics approach has some problems. The main drawback of behavioral economics is that the approach is more analytical than synthetic. It does not provide heuristics on how to derive the mechanisms that lead to the desired behaviors. Another difficulty is that the approach is top-down and suggests that careful prior analysis of the problem can produce optimal designs. Experience with software engineering suggests that a top-down approach may not work well in an unstructured domain. Moreover, from a cognitive science perspective, a bottom-up approach seems more promising.

Cross-References

- [Evolution](#)
- [Intelligence, Swarm](#)
- [Robot Emotions](#)
- [Robot Programming](#)

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Role of Religion in Society

- [Religion, Sociology of](#)

Roman-Catholic Pastoral Theology in Europe

- [Pastoral Theology, Roman-Catholic, Europe](#)

Romance

- [Love \(Affective, Sexual\)](#)

Romantic

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Refers to the specifically erotic type of interpersonal attraction, in contrast with the nonsexual varieties of affection. For example, the Ancient Greek texts distinguish between agapic (ideal, divine - from the word *agapē*), erotic (passionate, desire-oriented - from the word *erōs*), friendly (the Greek word for this type of affection is *philia*), parental (the word *storgē* that was used to denote it refers to natural affection), and *xenia* (the Greek word stands for hospitality) type of love.

Rule-Based Ethics

- [Deontology](#)

S

Sacrament

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An visible sign of the grace given by God and communicated to humans through participation in Christ's body – that is, the life of the church. Catholic and Orthodox churches accept seven sacraments: baptism, Eucharist, confirmation, penance, extreme unction, ordination, and marriage. While the sacraments of baptism and Eucharist are accepted by almost all Christian churches, Protestant churches generally do not recognize the latter five. Throughout history, sacraments have been integrally bound up with the spirituality of Christian individuals and communities.

Sacred Language

- [Language and Literature, Hebrew](#)

Salvation

- [Happiness](#)

Sanctity of the Individual

- [Humanism in Islam](#)

Sarvāstivāda

- [Abhidharma, Northern](#)

Sati (Pāli)

- [Mindfulness \(Buddhist\)](#)

Scalp-Recorded Potentials

- [Evoked and Event-Related Potentials](#)

Schizophrenia

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Related Terms

[Mental disorder](#)

Description

Schizophrenia is a severe and complex mental disorder that affects about 24 million people worldwide. Due to chronification, the prevalence ($\sim 0.7\%$) substantially exceeds its rather low incidence ($\sim 0.03\%$). Symptoms, which typically begin in late adolescence or early adulthood, are multifaceted and include thought fragmentation or disruption, delusions and hallucinations (“positive symptoms”), as well as cognitive deficits, poverty of speech, emotional blunting, anhedonia or the lack of interest in or pleasure from activities usually found enjoyable, lack of motivation, poor grooming, and social withdrawal (“negative symptoms”). During its often lifelong course, schizophrenia can cause major disabilities in multiple spheres of an individual’s functioning such as activities of daily living, including self-care, and social and occupational competence.

Schizophrenia research is a subdiscipline of psychiatry. It has profoundly enhanced our understanding of this major psychiatric disease and has thus facilitated the development of increasingly effective forms of treatment. During the past decades, schizophrenia research has fostered a multitietologic, so-called biopsychosocial model of schizophrenia implying significant roles of genetic, environmental, psychological, and neurodevelopmental factors for both origin and trajectory of the disease. As a consequence, treatment strategies have been developed that in many cases already enable affected people to lead a productive life and to be integrated into society. Current developments in the field comprise:

Pathogenesis

Most recently, several genetic variants have been identified that may predispose the brain to developing schizophrenia (“susceptibility genes”). Researchers hope that replication of disease-associated genetic variants across multiple cohorts in large-scale studies may pave the way toward novel gene-based therapies (Kim et al. 2011). Other avenues of current research on schizophrenia etiology follow the evidence that schizophrenia shares aberrant

neurodevelopmental and even neurodegenerative features (Powell 2010).

Diagnosis

Recent interest has focused on the identification of preclinical disease stages in at-risk populations with the intention to discover early intervention strategies. To this end, disease biomarkers are being developed using molecular genetics, cerebrospinal fluid-based markers, structural and functional neuroimaging and, most recently, combinations thereof, e.g., imaging genetics (Oertel-Knöchel et al. 2011).

Treatment

Whereas previous and current pharmacological treatment strategies largely center on the so-called dopamine hypothesis as a specific biochemical dysregulation hypothesis in schizophrenia, ongoing drug research involves different neurotransmitter systems such as the glutamate and serotonin system.

Disease Concept

It has increasingly become clear that schizophrenia is not a single disease entity, bearing rather heterogeneous etiological factors, pathophysiological mechanisms, and clinical manifestations. Thus, on the current road to new diagnostic classifications in psychiatry (Diagnostic and Statistical Manual of Mental Disorders, 5th revision), efforts have been made to deconstruct schizophrenia as an entity into component dimensions linked to unique etiological and pathophysiological processes that may yield unique treatment targets (Nasrallah et al. 2011).

Self-identification

Science

Schizophrenia research is a biomedical, psychosocial, and anthropological science. It is a subdiscipline of *psychiatry* using molecular biological, biochemical, genetic, and neuroimaging as well as psychological and socio-epidemiological methods, among many others. It generates hypotheses and theories that are constantly being

reviewed, modified, and rejected. Research on schizophrenia is a science in that it “builds and organizes knowledge in the form of testable explanations and predictions” (Science. <http://en.wikipedia.org/wiki/Science>) about its specific topic, schizophrenia.

Characteristics

Schizophrenia as a disease may, unlike other diseases, lead to profound impairment of the perception of the environment (external reality) and the affected individual’s self (internal reality) to an extreme extent due to core symptoms such as delusions, hallucinations, and symptoms the German psychopathology refers to as “*Ich-Störungen*” (particular delusions that one’s thoughts are controlled, inserted, or withdrawn by external force).

Schizophrenia research as a scientific subdiscipline of psychiatry is distinctive among other disciplines/subdisciplines in its profound and almost unique overlap of natural sciences and humanities pertaining to methods and content of research. It integrates a diverse array of scientific disciplines such as but not confined to biomedicine, molecular biology, biochemistry, psychology, anthropology, social sciences, and philosophy.

Relevance to Science and Religion

Although still not fully considered in psychiatric and specifically in *schizophrenia research* numerous relations exist between *schizophrenia* and religion in its broadest sense (from spirituality to religiousness). The impact of religion on schizophrenia “... ranges from the worst to the best, as we can observe in the history of religion in mankind” (Mohr and Huguelet 2004). It may be positive (in helping to cope with the illness) or negative (in leading to violent behavior and refusal of treatment due to religious delusions). The significance of the schizophrenia–religion relationship is shortly exemplified by the following paragraphs.

Religious Delusions in Schizophrenia

Religious content is common in schizophrenic delusions and hallucinations. Such symptoms tend to be persecutory and may lead to acts of violence against oneself or others, e.g., in the perceived need of defense (against the devil, demons, etc.). Also, delusions of grandiosity (being god or sent by him) and belittlement (unforgivable sinner, etc.) occur frequently. There is a certain diversity of such psychopathology across different cultures. It has to be considered, though, that a continuum exists from religious beliefs to religious psychopathology and that the Western medical model tends to emphasize pathology over traditions (Mohr and Huguelet 2004).

Religious Coping in Schizophrenia

Religious commitment has been related to lower rates of suicides in individuals with schizophrenia (Koenig et al. 1998). Psychotic individuals often use religion to cope with their devastating symptoms and so do families in support of their ill relatives (Rammohan et al. 2002). Coping strategies include spiritual and congregational support (help by god, a priest, etc.), religious reframing (hallucinations being a godly test, etc.), and generally religion as guidance through psychotic anxiety and terror.

Religion, Spirituality, and Individual Outcome in Schizophrenia

Spirituality as an individual resource may play a crucial role in the heterogeneity of outcomes in this disease. Religious beliefs in individuals affected by schizophrenia may come with certain identification models strengthened by the active support of the religious community which may lead to a beneficial outcome. Other individuals may be burdened and demoralized by their religious beliefs or that of others (Mohr and Huguelet 2004).

Sources of Authority

The German psychiatrist Emil Kraepelin (1856–1926) distinguished individuals suffering from hallucinations and delusions and

a long-term dementia-like deteriorating course with early onset from those classified as having episodic manic-depressive psychosis with intermediate periods of normal functioning. Eugen Bleuler (1857–1939) from Switzerland coined the term “schizophrenia” (Greek: σχιζεῖν = “to split,” φρεν = “mind”) denoting the intrapersonal and personal-environmental schisms typically occurring with the disease. The term has been internationally accepted but has led to the common misconception of a “split personality” and confusion with a condition today known as Dissociative Identity Disorder. Kurt Schneider (1887–1967) described a set of characteristic psychopathological symptoms that may guide the diagnostic process (such as audible thoughts, hearing of commenting voices, delusional perceptions, etc.). Psychopathological considerations of the named and of other famous psychiatrists have been incorporated into modern major diagnostic classification systems.

Ethical Principles

Ethical key concerns in modern management of and research on schizophrenia mainly focus on the issues of the disease-inherent impairment of the decision-making capacity and capability to give informed consent to treatment and/or scientific investigation. Regarding therapeutic decisions, the personal freedom of a given subject to refuse treatment or restraint has to be weighed against potential risks when treatment or restraint is not being installed (violence, suicidality, etc.). Regarding research studies, the risks of exposing schizophrenia patients as particularly vulnerable subjects to new forms of treatment has to be weighed against the benefit for future generations of those affected. Ethical principles that apply to treatment and research on schizophrenia are laid down in the Nuremberg Code, the Declarations of Geneva and Helsinki, the so-called Beecher Paper, the Protocol of the International Committee of Journal Editors (aka “Vancouver Group”), and the “Belmont Report” (Fischer 2006).

Key Values

Key values of *schizophrenia research* are the ethical principles as stated above, the guidelines of Good Clinical Practice (GCP) and Good Laboratory Practice (GLP), and the principles of evidence-based medicine.

Conceptualization

Nature/World

Nature is the physical/material foundation of life. Diseases such as schizophrenia are dysfunctional implementations of nature. Schizophrenia research is thus to a large extent a natural science.

Human Being

Schizophrenia affects the human being as a whole in that it fundamentally interferes with its perception of and reflection on the world and consequently impairs the affected individual’s interaction with his or her environment.

Life and Death

Schizophrenia as a mental disease is an abnormal condition of life that leads to functional impairment of the affected individual, to suffering, and often premature death.

Reality

Reality is in a very basic sense the state of things as they appear to the (human) observer based on multisensory perception. Severe impairment of sensory information processing in schizophrenia often drastically impairs an individual’s sense of reality causing misinterpretation of situations and events.

Knowledge

Schizophrenia research is building systematic knowledge of its specific field out of information gained by observation and the testing of hypotheses and applies it in order to broaden its understanding of how the disease develops, proceeds, and how it can be treated.

Truth

Truth in the context of schizophrenia research is the outcome of evidence-based scientific investigations.

Perception

Experimental studies with schizophrenic individuals have provided evidence for a profound disturbance of sensory processing, e.g., visual stimuli. Patients with schizophrenia seem to experience a rather random and fragmented than continuous sensory input pattern. This lack of consistency of sensory input may contribute substantially to the disintegration of reality which in turn leads to feelings of confusion, anxiety, and delusional states.

Time

Among other fundamental perceptual deficits, alterations of the subjective experience of temporal relations and the orderly temporal integration of internal and external information has been consistently demonstrated in individuals with schizophrenia most probably due to the impairment of various sensory input mechanisms. This perpetuates the individual's feelings of isolation and distress and may contribute to the loss of social cognition since time represents social order in daily life.

Consciousness

The symptoms of schizophrenia have been explained to emerge from an abnormal permeability of the consciousness due to impairment of the mechanism that controls and limits the contents of consciousness. As a consequence, excessive self-awareness and thinking may occur and account at least for some key aspects of "positive symptoms" and cognitive abnormality.

Rationality/Reason

Reason/rationality as the capacity of human beings to explain and make sense of things and situations in the world is largely dependent on perception and its processing in the brain which is fundamentally impaired in schizophrenia.

Mystery

Mystical experience/mystery in the sense of irrational presumptions of the world is a frequent topic in the schizophrenic perspective of reality.

Relevant Themes

Since culture is highly intertwined with religion, the cultural background is important when dealing with the issue of "Science and Religion," also in the context of schizophrenia treatment and research. Interdisciplinary cross-cultural research is beginning to elucidate how socio-environmental and cultural variables interfere with physiological pathways and genetic constitutions that relate psychosocial stress and psychotic symptomatology (Howes and Kapur 2009). Such knowledge could lead us to understand how culturally available tools such as religious practices may mitigate the disease burden and to design effective interventions for individuals with schizophrenia (Myers 2011).

Cross-References

- ▶ [Cognitive Neuroscience](#)
- ▶ [Gene](#)
- ▶ [Neurophysiology](#)
- ▶ [Neuropsychology](#)
- ▶ [Neuroscience](#)
- ▶ [Psychiatry](#)

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Science

- [Personhood and Scientific Methodology](#)
 - [Science and Scientific Knowledge, Sociology of](#)
 - [Theoretical Psychology](#)
-

Science and Catholicism

- [Catholic Church and Science](#)
-

Science and Kabbalah

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Related Terms

[Consciousness](#); [Creation](#); [Jewish mysticism](#);
[Kabbalah](#); [Microcosm](#); [Psychology](#)

Introduction

Jewish mysticism has a complex history through which various distinct phases have been identified.

The principal source for all mystical speculation in Judaism is the *Torah* and other texts from the Hebrew Scriptures. From this perspective, the origins of the Jewish mystical tradition lie in the distant past. The earliest overtly mystical works in Judaism date from the third to sixth centuries CE and treat of the “secrets” of creation and the experiences of those who explored “heavenly” realms. While this, and each subsequent, phase has its defining characteristics, there are core features which enable us to identify the generic form of Jewish mysticism. Jewish mystics believe that the Torah contains an inner wisdom transmitted from God, which treats of the nature of ultimate reality. The mystical tradition conveys knowledge of the inner workings of the Godhead, which are recapitulated in all of creation. The tradition also conveys certain details of the practices whereby mystics may aspire to a higher state of being in which closeness, or even union, with the divine is experienced.

In this article, I shall use the term “Kabbalah” to refer generically to Jewish mysticism. There is a degree of ambiguity about the term, for some apply it specifically to the traditions stemming from the creative period of the twelfth and thirteenth centuries in Southern France and Spain, while others use it to cover the entirety of the mystical core in Judaism. While we do not find the term *Kabbalah*, nor the related *mekubbalim* (“kabbalists”) prior to the twelfth century, the kabbalists in later periods certainly saw themselves as heirs to a coherent body of esoteric knowledge that constitutes the backbone of the Jewish tradition. The Hebrew root of the term “Kabbalah” means to “receive” and comes to designate the *received tradition*. In part, this reflects the notion that kabbalistic teachings had to be received orally from a teacher, but there is the further connotation that kabbalistic practices bring the individual into a deep relationship with the divine, or an agent of the divine, who imparts knowledge in a direct encounter.

The relationships between the discoveries of modern science and the insights found in the kabbalistic tradition require more than a cursory examination of both spheres. In the first place, Kabbalah is essentially concerned with the *spiritual* world, while science explores the realm of

the *physical*. A simple analysis would accordingly conclude that there can be little direct rapport between the two endeavors. As my explorations in this article will suggest, such a view is too monolithic and fails to capture the subtleties in both domains. Despite the seeming irreconcilability between their respective orientations, both Kabbalah and science are directed to uncovering the deeper structures and processes that underlie our experience of the world. While Kabbalah is essentially concerned with knowledge of God – which *prima facie* sets it apart from science – its path necessitates grasping the patterns that confront us in the outer world and in the inner realm of thought. The analysis of these physical and psychological domains is clearly within the remit of science; the question is, do the insights from the two traditions connect in any way?

A second reason for the need to dig beyond a simple understanding of Kabbalah and science arises from the dynamic nature of each. What exactly constitutes science is not an easy question to answer, and many have argued that challenges in areas like the fundamental constituents of matter, and the nature of consciousness are stretching the bounds of science as classically understood. As for Kabbalah, its language is highly codified. Indeed, becoming familiar with the elaborate system of symbols and codes constitutes an initiatory challenge for the would-be kabbalist. Moreover, its teachings have been limited by the worldview of their day. These writings hardly bring their scientific implications to the fore. Accordingly, some explication and elaboration of the original texts will be necessary in order to juxtapose Kabbalah and science.

Levels in Mind and Outer Reality

Kabbalah may be aligned with the view expressed by many quantum physicists that no rigid demarcation exists between mind and physical reality. A classical statement to this effect comes from Eddington: “The universe is of the nature of a thought or sensation in a universal Mind.” Similarly, de Broglie and Wigner, both pioneers of quantum mechanics, held that

consciousness is intrinsic to the quantum worldview. These ideas derive from the seemingly “mental” properties of elementary particles in the ways they interact and from the role observation plays in the collapse of the wave function. The quantum principle of nonlocality, for example, implies that something akin to *knowing* characterizes the behavior of micro-entities at a distance. In a recent overview of quantum phenomena, Schäfer (1997) asserts that “It is now possible to believe that the mind is the realization of *potentia*, a manifestation of the essence of the universe.”

In common with other mystical and spiritual traditions, Kabbalah views the universe in mentalist terms, which dovetail with these views deriving from quantum science. The universe is held to be the product of thought – divine thought and is maintained by God’s thought day-by-day. Moreover, a profound correspondence is said to exist between the universe and the human mind. The major text of Kabbalah, the *Zohar* (Margoliot 1978), states that the “artistry and design of the human being resemble the world” (*Zohar* 1:90b). Such statements – deriving ultimately from the biblical maxim that humankind is created “in the image of God” – apply only superficially to the physical human form: “The human soul is known . . . through the organs of the body” (*Zohar* 1:103b). It is the human soul, or mind, that is seen to be paralleled in the universe.

A central tenet of Kabbalah is that God is knowable through His emanations, termed *sefirot*, and that all things – both in the universe and in the mind – derive from the pattern of these emanations, known as the “tree” of the *sefirot*. The *Bahir*, a twelfth-century work expresses the point emphatically: “[God says,] I am the one who has planted this Tree for the whole world to enjoy. In it I spread the totality of all-that-is, and I called its name ‘All’ For All depends upon it and All goes forth from it and All need it.” (Abrams 1994).

In this sense of the *potentia* (to use Schäfer’s Aristotelian word), then, Kabbalah holds there to be no disjunction between mind and cosmos. In the words of the thirteenth-century Moses de León: “[God] created man in His pattern, in the

image of the likeness of His form. In miniature, he comprises the form of the world, which is in the image of the [sefirotic] entities.”(Moses 1988).

The fundamental pattern is discernible *par excellence* in the Torah, which – far from being merely a *book* – is effectively the *world soul*, the living essence of reality. This essence unfolds characteristically through a dance of *concealing and revealing*: “Throughout the entire Torah, we find that the revealed coexists with the concealed. So it is with the world, both this world and the higher world, everything is concealed and revealed” (*Zohar* 2:230b). Moreover “Each domain comprises level upon level, concealed and revealed” (*Zohar* 3:73a). The challenge to unearth level upon level of meaning in the Torah very much comprises the heart of Judaism. To the extent that an interpretation is “concealed” prior to its being “revealed,” the Torah can be seen to exemplify the cosmic pattern underlying all things. It is the bold assertion that *everything* manifests according to this dance of concealing-revealing that epitomizes the kabbalistic worldview. Parallels with physics and psychology are striking: quantum physics describes a similar “dance” whereby the elements of reality are continually unfolding (becoming “revealed”) from, and being reabsorbed into, the “concealed” matrix, according to whether they are observed or not, and depth psychology conceptualizes the impact of events on the life of the unconscious and the movement of thought from unconscious (“concealed”) to conscious (“revealed”).

Multiplicity and Holism in Science and Kabbalah

These parallels across Kabbalah, quantum physics, and depth psychology extend into the way we might characterize the concealed and revealed levels. The concealed level is multipotential, holographic, and infinite; the revealed is particular, discrete, and finite.

For Kabbalah, the holographic nature of the concealed is given expression in its view of the Torah, the inception of creation, and those events or entities which express contact with the

transcendent. The Torah is identified with the divine. Accordingly, just as God is infinite, so must the Torah be infinite (Idel 2002). Indeed, according to the eighteenth-century Luzzatto, every one of its letters is infinite. All the elements of the Torah – its stories and laws, each word, and every letter – can unfold into an infinite number of interpretations: “There is not a single word in the Torah that does not radiate many lights in every direction” (*Zohar* 3:202a). A division is made between what may be conceptualized as the *primordial* Torah and the regular Torah that is written on the parchment scroll. The former is written in “black fire on white fire” and constitutes the plan of all-that-is. It comprises the name of God – which, for Kabbalah means the very essence of God – in infinite permutations. The concrete Torah might be best conceptualized as the intermediary vehicle between the ultimate, and infinite, primordial Torah and the Torah existing in the minds of those who study it, where there are a fixed, finite set of interpretations. In a more complex formulation, deriving from the Lurianic school of Kabbalah in the seventeenth century, the individual soul only comes into being as a result of the specific form of interpretation that is particular to it. The soul’s very existence is dependent on the way the Torah will be *observed* by that person – a formulation reminiscent of the quantum view of the role of observation in collapsing the probabilistic wave function and bringing a discrete entity into existence.

During the primordial inception of creation, “All things were contained one within the other, good inclination and evil inclination, right and left, Israel and the nations, and white and black. All things were dependent on one another” (*Zohar* 3:80b). A further insight into the kabbalistic view of the very beginning of creation comes with the seminal idea that the Hebrew letters are the agents of the creative process. Thus, the first letter, *Alef*, itself a silent letter, epitomizes the primordial beginning – a nothingness and, at the same time, the totality that lies behind the beginning of manifestation (in turn symbolized by the second letter, *Bet*). “At the beginning of all is *Alef*, beginning and end of all the levels . . . designated as ‘one’

to indicate that, even though it contains multiple images, it itself is undivided unity” (*Zohar* 1:21a).

The letter *Alef* begins the biblical enunciation of the *Ten Commandments* and is taken as a hint that the voice which resounded forth at Mt. Sinai was itself holographic and that each soul present experienced it in a way dependent on its individual propensity. As recorded in the Bible itself, the experience was synesthetic (“and all the people saw the voices,” *Exodus* 20:18), implying a transcendence of the specificity of the senses. “All that they saw . . . they saw in one light which encompassed all the other lights” (*Zohar* 2: 146a).

These examples epitomize the view, expressed already in rabbinic Judaism and much elaborated in Kabbalah, that the concealed, inner level is holographic in form. A number of scientists have been led to similar views through their understanding of the findings of quantum mechanics. Bohm (1980) postulates the existence of two orders of reality, one *implicate*, the other *explicate*. The implicate order is the hidden basis from which all things arise; it is characterized as holistic such that “everything is enfolded into everything.” The explicate order, by comparison, comprises entities which are each located in their particular time and space. The concealing-revealing paradigm in Kabbalah is paralleled in Bohm’s model by the *enfolding* and *unfolding* which he sees as characterizing the movement from explicate to implicate levels and vice versa. In a formulation that tightly parallels the kabbalistic emphasis, Bohm asserts that this movement – the *holomovement*, as he calls – is the ultimate reality.

Schäfer infers from the data of quantum physics that reality comprises two domains: the “outer” domain includes the material things of immediate experience, while the “inner” is hidden, has the nature of undivided wholeness, and consists of “nonmaterial, nonempirical forms.” These nonmaterial forms are real inasmuch as they manifest themselves in the empirical world and act in it. Schäfer’s description of the concealed realm could be applied verbatim to Kabbalah’s view of the realm of the *sefirot*. The *sefirot* are holonomic in the sense that each is present in all others, and they constitute the

hidden pattern that is manifest in the world to those who quest to see it:

Although [the *sefirot*] are supernal mysteries that cannot be known to the worlds, their influence and effect pour down and extend to the lower world; as a result of this extension, we in this world can have perfect faith . . . in those levels, as if they were revealed, and were not hidden and concealed. *Zohar* 2:137a.

A final idea which should be included in a consideration of notions of multiplicity in science and Kabbalah is that of the “multiverse.” The notion that our universe is just one of many parallel universes has been advanced in both quantum mechanics and astrophysics. In brief, the “many worlds” hypothesis suggests that collapse of the wave function (i.e., the actualization of observable situations from the preobserved potentia) gives rise to multiple alternatives, each of which is realized in a different world. Given the large number of possibilities thus arising moment-by-moment, the overall effect of this hypothesis would be a near-infinite proliferation of worlds. Astrophysicists arrive at a similar conclusion from the *anthropic principle*; the odds against the Big Bang giving rise to the right set of circumstances for a universe conducive to life to arise are so astronomical that we must assume that ours is only one of many universes.

An echo of the concept of the multiverse is found in Kabbalah in its notion that ours is not the only universe which has been created. In early kabbalistic literature, the other creations are seen as *prior*, not parallel, worlds, a view which perhaps attenuates the link to astrophysics somewhat. Kabbalistic thinking comes closer to the many worlds hypothesis in its understanding of the infinite number of interpretations of the Torah which exist each in its own world. For the thirteenth-century Gikatilla, the diversity of interpretations of the Torah gives rise to “thousands and thousands of worlds,” and a seventeenth-century Lurianic text asserts that “just as there is an infinite number of worlds, so is the depth of the Torah infinite.”

Whatever the status of diverse worlds in its scheme of things, Kabbalah articulates its central tenet that God is the creator of all that exists

unambiguously. In this context, it is important to realize that the hypothesis of the multiverse is not the only solution to the anthropic conundrum: The alternative is to posit a creative intelligence which in some way *chose* the precise details of the Big Bang – effectively a Creator God. In this context, the interest of Kabbalah focuses on the primordial processes which unfolded prior to the events described in *Genesis*. The kabbalistic narrative of creation parallels the model advanced in astrophysics inasmuch as both describe the beginning as involving a tiny point of origin, which forms within a domain of “absence” and subsequently expands. For astrophysics, the Big Bang arises from an infinitesimally small, infinitely hot, and infinitely dense *singularity* inside a black hole. For the *Zohar*, the primal origin is “unknowable, concealed in recesses like the point of a needle” (1:21a). The Lurianic Kabbalah describes the initiating dynamic of creation as arising when God vacated a space within His all-enveloping oneness. The primordial polarity between His presence and His (relative) absence lies behind all of manifest creation. As Matt (1996) points out, the parallel here with the *quantum vacuum*, from which the explosive expansion of the Big Bang is posited to have arisen is striking.

The kabbalistic perspective on the origin of things returns us to our earlier emphasis on the oneness that comprises physical and mental realms, for the mystery of creation is “the mystery of the concealment of thought” (*Ibid*). “When the most concealed of all concealment sought to be revealed, He made first a single point, and this arose to become *thought*” (*Zohar* 1:2a). Here, we enter the enigma of consciousness. I shall consider two issues: Firstly, the extent to which kabbalistic insights relate to recent findings in the science of consciousness and, secondly, the relevance of Kabbalah to a psychological understanding of spiritual transformation.

On Consciousness and the Quest for Transformation

Whatever parallels we may find between the view of reality as presented by physics and that

intrinsic to religious and mystical systems, one crucial difference remains. Physics is necessarily silent on the potential value of the transformative path that the mystical systems describe. Describing a hidden order lying behind the everyday world of experience is not an end in itself for Kabbalah; rather knowing is the handmaiden of journeying. The mystic is enjoined to embark on a quest for the divine, to achieve self-perfection, and contribute to the ultimate task, namely, rectification of divine and human realms. To put it in terms of the hidden order mentioned above, the *sefirot* are not merely the nonmaterial forms that order our world, they constitute a two-way sequence between the Absolute “above” and mundane human consciousness “below.” From above to below, they describe the emanation of divine light through creation, and from below to above, they become the ladder of mystical ascent.

This disjunction between science and mysticism in terms of values and goals extends to the study of consciousness. A scientific account of consciousness attempts to specify the processes, most especially *brain* processes, that correlate with the presence of consciousness; neuroscience in particular has little to say about the value we might attribute to the kinds of higher states that mysticism fosters. In contrast, a kabbalistic account emphasizes the transformative dimension; it is interested in the relation between mundane states and expanded states of consciousness, between the ordinary state that it likens to sleep and “awakened” consciousness. And, of course, it sees the awakened, expanded state which brings closeness to God as a goal.

Despite this crucial difference in emphasis, there are significant points of comparison between what has been discovered about the brain correlates of consciousness and core kabbalistic teachings (Lancaster 2004). There are two key principles of the brain’s functioning which have been correlated with consciousness: *binding*, meaning the generation of coherence among assemblies of neurons, and *recurrent processing*, which refers to the impact of “descending” neural pathways on activity in “ascending” pathways. To put it simply, *conscious* mental activity only comes about when both of these features are

present; mental events are conscious when, and only when, large assemblies of neurons fire in coherent synchrony (binding) and the incoming neural activity has been modulated by the outflow of activity from the brain's higher centers (recurrent processing). The kabbalistic teachings to which these relate are those of *unification* and *reflexivity* respectively.

As far as the consonance between binding and unification is concerned, both involve harnessing diverse elements together by means of establishing coherence. In the brain, it is the coherence in oscillatory firing patterns between diverse groups of neurons that signals their integration. The analogy with kabbalistic teaching is that coherence across different levels in the created hierarchy is viewed as bringing about the highest mystical states:

"One" – to unify everything from there upwards as one; to raise the will to bind everything in a single bond; to raise the will in fear and love higher and higher as far as *En-Sof* [the limitless essence of God]. And not to let the will stray from all the levels and limbs but let it ascend with them all to make them adhere to each other, so that all shall be one bond with *En-Sof*. (*Zohar* 2:216b)

A major goal of all kabbalistic practice is to promote the unification of the divine name, a concept which focuses on binding the *sefirot* but extends more generally to include unifying all strands of thought and other mental processes.

Moving on to the fit between recurrent processing and reflexivity, both depend on activity at a "lower" level triggering activity in a "higher" level, which in turn acts back on the lower level bringing about the intended effect. In neuroscience, this system has been identified in relation to the brain's sensory processing systems, with the "lower" level comprising brain structures concerned with immediate properties of the sensory stimulus and the "higher" structures being those dealing with memory and cognitive analysis of the sensory signals. It appears that the *meaning* of the sensory stimulus is determined when the activity from the higher centers impacts on the lower regions though recurrent processing. The indispensability of recurrent

processing for consciousness cannot be overstated. Indeed, there is compelling evidence that it is the "key neural ingredient of consciousness," according to Lamme, a neuroscientist studying the brain and conscious states.

The analogous teachings in Kabbalah need some unpacking from their context in order that the parallel with these findings in neuroscience might become evident. The *Zohar* enunciates the core teaching in its poetic language:

Come and see. Through the impulse from below is awakened an impulse above, and through the impulse from above there is awakened a yet higher impulse, until the impulse reaches the place where the lamp is to be lit and it is lit . . . and all the worlds receive blessing from it. (*Zohar* 1: 244a)

The central imagery of the Kabbalah focuses on the *sefirotic* realms existing between the mundane human sphere and the Absolute. In this scheme, the "impulse from below" arises through prayer or other spiritual work and brings about resonances throughout the successive intermediary realms reaching to the top of the *sefirotic* chain. The "lamp" refers to an aspect of the Godhead which is capable of bestowing the "divine" influx or "blessings" back into the human sphere. Clearly, the imagery of the lamp being "lit" equates to the activation of this higher aspect of the Godhead.

We see here the fundamental operational pattern of the macrocosm as understood in Kabbalah. And it should be stressed that this pattern is not some peripheral concern; it constitutes the core narrative in the *Zohar* and other key kabbalistic works. It is but a small stretch of the imagination, I think, to see this pattern recapitulated in the brain systems for consciousness mentioned above in terms of recurrent processing. A sensory stimulus triggers activity in lower neural centers, which "awakens" activity in higher centers, through which the "lamp" that brings the "blessing" of consciousness is kindled. The language of neuroscience and Kabbalah is clearly divergent, but the essential pattern being described is identical.

As I stressed at the beginning of this section, the parallel between the neuroscience of consciousness and this kabbalistic narrative of

macrocosmic principles leaves out the lifeblood of the latter, namely, its concern with transformation. The mystic is enjoined to arouse the “impulse above” in order to transform themselves and the Godhead. Such spiritual work is intended to bring harmony to the realm of the *sefirot* and to manifest the divine presence in the world. Kabbalah is replete with specific practices directed to achieving these aims. Given their transformative goals, the appropriate domain for evaluating these practices is psychology and especially those subdivisions – depth, and transpersonal, psychology – that explore the mind’s involvement in spiritual and mystical states.

The Psychology of Kabbalistic Transformative Practices

Begin to combine a few letters with many. Reverse them and revolve them rapidly, until your heart is warmed through the revolutions. Pay attention to their movements and to what you bring into being through their revolutions. And when you feel that your heart has been greatly warmed through the combinations and when you have derived understanding from them – new ideas that were never disclosed through human tradition and that you could not have known through intellectual analysis – then you are prepared to receive the divine influx. . . .

The above is from the thirteenth-century Abulafia. The “divine influx” to which he refers is evident not only in intellectual stimulation but also very much in embodied ways: The body may tremble, the heart is activated, and there is the feeling as if being anointed with oil. Such effects are frequently encountered in the study of mysticism and have been explained psychophysiology in terms of activation of the right temporal lobe of the brain cortex and *ergotropic* arousal of the sympathetic nervous system. However, the specific techniques that Abulafia teaches for achieving a higher state of consciousness are distinctively kabbalistic inasmuch as they draw on the mysticism of the Hebrew language and are intellectually complex.

A key source for all Hebrew language mysticism is the *Sefer Yetsirah* (Gruenwald 1971), thought to have been composed around the

fourth-century CE. The *Sefer Yetsirah* elaborates the Jewish tradition that God created the world using the Hebrew letters as His agents. The practices detailed by Abulafia entail emulating the divine work of creation described in the *Sefer Yetsirah*:

22 foundation letters [of the Hebrew alphabet]: He [God] engraved them, carved them, weighed them, permuted them, combined them, and formed with them all that was formed and all that would be formed in the future. . . . He engraved them with voice, carved them with breath, placed them in the mouth in five places. . . . He placed them in a wheel, like a wall with 231 gates. The wheel revolves forwards and backwards. . . . How? He weighed them and permuted them: *Alef* with them all and all of them with *Alef*; *Bet* with them all and all of them with *Bet*. They continue in cycles and exist in 231 gates. Thus, all that is formed and all that is spoken derive from one Name. (*Sefer Yetsirah* 2:2-5)

For the *Sefer Yetsirah*, then, all things come into being through permutations of core elements, the “231 gates” being the number of two-letter combinations achievable from the complete set of 22 letters in the Hebrew alphabet. Stripped of its theological connotations, the logic enunciated here is commensurate with that operating within the biological sphere; permutations of the DNA code give rise to all the formations of life.

Those following traditions relating to the teachings of Abulafia and others emulate all the processes described in the above extract inwardly, that is, in a concentrative state of consciousness using techniques of visualization, breath control, chanting, etc. Thus, for example, “revolving” the letters entails bringing together pairs of letters, perhaps in the mind’s eye, or in writing, or through chanting with a range of associated vowels.

Research has shown that practices fostering *mindfulness* increase levels of well-being and help combat a range of psychological and physical conditions. Although there have been no studies examining the psychological effects of these specific kabbalistic practices, the concentrative state they foster bears similarities to states associated with Buddhist mindfulness practices. However, any serious evaluation of the kabbalistic practices must acknowledge their most

distinctive feature, namely, the central role of language in the various techniques used. As Idel has noted, these kabbalistic practices are directed to *deconstructing* language as a semantic system. Given the role of language in structuring our sense of self and the world of experience, the practices are likely to bring about a lowering of ego-awareness and changes in our relationship to reality (Lancaster 2005). To use one of Abulafia's analogies, the "knots" which bind us to our world become untied and are reconnected to the divine.

For the eighteenth-century kabbalist and Hasidic master, Dov Baer, the Maggid of Mezeritch, "transformation comes about only by passing through nothingness." In the wake of Freud, the involvement of the unconscious in psychotherapeutic change is well established. Many psychotherapeutic schools recognize that nulling the mind from ego-based thought is essential in order to encounter the more transformational unconscious content. Indeed, the Maggid developed a concept of the unconscious, understood as the link between the divine and the human mind. Late in his life, Jung acknowledged that the Maggid's scheme was a forerunner of his own approach to the transpersonal unconscious.

While the specific Hebrew term the Maggid uses denoting the unconscious dates only from the eighteenth century, early kabbalistic material is fascinated by the concealing and revealing of thought, as we saw above. God's thought that engenders creation develops from an initially concealed state through to being revealed and finally re-concealed within the outer manifest world. From the human perspective, tracing thought to the concealed place of its source brings the longed-for encounter with the *Shekhinah*, the feminine presence of God.

The various themes I have touched upon come together here, for psychology connects with physics in conceptualizing the "concealed" unconscious realm as being the multipotential ground from which the particulate conscious domain arises. The logic of time and space are evidently unknown to the psychoanalytic unconscious, just as they have no reality in Bohm's

implicate order. And from its more empirical research base, cognitive neuroscience has demonstrated that unconscious brain processing entails multiple parallel instantiations of possible meanings; the unconscious is characterized by holistic operations. Kabbalah, physics, neuroscience, and psychology seem to meet in their respective formulations of the known and the unknown.

The *Alef* resembles the brain. Just as, in the case of the letter *Alef*, when you bring it to mind you open your mouth, so with thought – when you think a thought to the infinite and boundless....
(The *Bahir*.)

Cross-References

- ▶ [Cognitive Neuroscience](#)
- ▶ [Creation in Judaism](#)
- ▶ [Kabbalah in Judaism](#)
- ▶ [Mysticism](#)
- ▶ [Names of God](#)
- ▶ [Neuroscience](#)
- ▶ [Panentheism](#)
- ▶ [Psychology in Judaism](#)
- ▶ [Quantum Theory](#)

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Science and Redemption in Jewish Religion

► [Redemption in Judaism](#)

Science and Religion

► [Creationism](#)

Science and Religion Dialogue and the Interreligious Dialogue

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Related Terms

[Interfaith](#)

The Tradition for Dialogue Between Science and Religion

Science and religion represent very complex entities. Diversity reigns on both sides. The relationship between science and religion has gone from unity over conflict and condemnation to separation. The state of separation is in many ways a natural reaction to the confrontation between religion and natural science that grew out of the controversy following Darwin in the

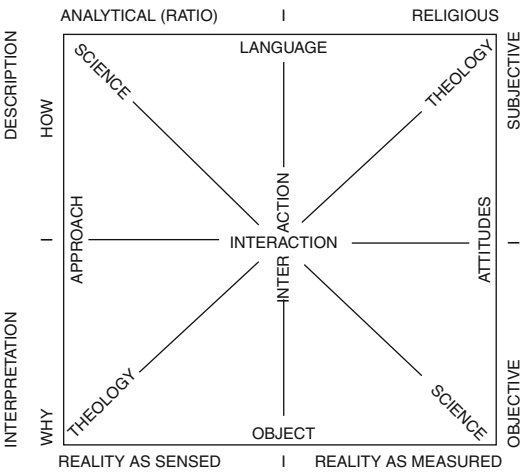
late nineteenth century. After that confrontation, the unity among the sciences was lost forever. The theological reconstruction that was necessary in order to adapt to the new situation lasted nearly a 100 years. By then, the now classical neoorthodox position had been formed: Religion and science are separate and mutually exclusive realms of human thought.

Dialogue between science and religion is an attempt to overcome this separation. The situation of separation developed so strongly because such different schools and isms as scientism, positivism, and existentialism could agree that theology and natural science belong in two different fields. The position is further strengthened by linguistic arguments (Wittgenstein's theory of language games). Defining religion as an independent autonomous language game means that religion is seen as a way of life that does not need to justify its concepts. This immunity to falsification – sometimes labeled “Wittgensteinian fideism” – threatens to isolate the religious language game from other intellectual disciplines and religious communities. An appealing way out of the dichotomy is to seek in the everyday language the common language out of which all the language games have grown insisting that there are not two languages, a language of religion and of science, but one language, ordinary discourse modified in different ways. Another way out of the dichotomy is to maintain a common meeting place that would then be a kind of metaphysics (Whitehead; K.E. Løgstrup).

Is This Science? Is This Religion?

The natural sciences can give us valid knowledge of reality. But because it is reductionist in its approach to reality, it threatens to end in an abstract spirituality in which nature is reduced to a case of general laws and an area for using technology. Other approaches as phenomenological analysis, metaphysical speculations, and religious interpretations must be maintained in order to give the full picture. Somebody have – following Niels Bohr – used the notion of

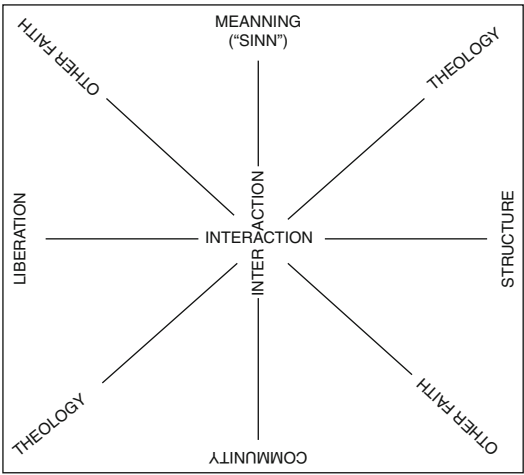
complementarity to validate different approaches to reality that each from their perspective can contribute to the common understanding. If they exclude each other, the state of separation is cemented. But reality cannot be divided into distinct areas either scientifically and technically controlled or religiously interpreted. Reality is one. This one reality can be seen in different perspectives, but the underlying unity needs to manifest itself in the way we talk about it.



Relevance for the Field Science and Religion

Dialogue is a conversation which proceeds from a commitment to one’s own stand point and a genuine openness toward the other. Dialogue means willingness to listen. The dialogical approach recognizes that there are shared areas of interest between science and religion and that each have their own distinct perspectives. Following dialogue, a fuller integration and interaction between the different perspectives will continue to develop. In a model of reciprocal interaction within the field of science and religion, the various approaches, languages, attitudes, and objects of both theology and natural science are brought into relationship with each other. The disciplines keep their integrity and follow their own inner logic, but in order to gain a fuller picture, they need to interact. This model

of reciprocal interaction can help as an orientation in a world where the religious encounter has become globalized.



The Models for Interreligious Dialogue

Interreligious dialogue involves a desire to understand those of another faith better and learn from one another, leading to an ongoing reflection of one’s own faith and practice. As it promotes mutual knowledge, the same model can be used in both forms of dialogue, the interreligious and the one between science and religion.

In the field of interreligious dialogue four different forms of dialogue have been identified:

- In the *dialogue of life*, believers of different religions encounter one another in the ordinary course of life. In order for the community to thrive, it is vital that one relates to the other with respect and attention, recognizing the basic community that incorporates all people in spite of differences.
- The *dialogue of intellectual exchange* is often an area for experts. Faith seeks understanding, and theologians and religious scholars grapple many times with issues that cut across religious lines. Through an exchange on the intellectual level, it is possible to get a deeper understanding of the different faith traditions.
- In the *dialogue of spiritual experience*, an attempt is made to share in one another’s

search for the experience of God. In such a dialogue, spiritual resources can be shared enriching the religious experience.

- The *dialogue of common action* can take place at different levels. Common human and spiritual values can be promoted; alliances can be formed in order to transform the human community.

Dialogue between people of different faiths is necessary not only for instrumental reasons. Because the deepest motivation for dialogue is the common search for truth, science has a role to play, because science is also relentlessly seeking truth. It might not be the all encompassing truth, but what is established as scientific truth not only needs to be taken into account but it must also be respected in a dialogue between different faiths. But as it is always preliminary, it needs to be complemented with the insights gained in the world's philosophical and religious traditions.

What Are the Ethical Principles and Key Values?

The dynamic interaction between different religious traditions and the sciences must be carried out in an atmosphere of mutual respect and recognition of the fact that both the sciences and the religions are pursuing their endeavors in order to obtain truth. Scientific truth must be complemented with the insights of wisdom from the age old religious traditions. The proof of the truth claims within science and religion is of a different kind, but it should also be recognized that there are ways of knowing embedded in religious traditions of wisdom. Religions order and create structure in human lives; they give meaning, foster community, and provide liberation. Interreligious dialogue is furthered by a frank and truthful exchange on how the different traditions can contribute to order and community, meaning and liberation. Sustained by faith, nurtured by hope, and carried by the love of God, all people are called to engage in dialogue and to interact in a peaceful and truthful way with the fellow human being and the whole of creation.

Cross-References

- [Existentialism](#)
- [Metaphysics](#)
- [Phenomenology](#)
- [Scientism](#)

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Science and Revelation and the Jews

- [Revelation in Judaism](#)

Science and Revelation in Jewish Culture

- [Revelation in Judaism](#)

Science and Scientific Knowledge, Sociology of

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Related Terms

[Science](#); [Social](#); [Sociology](#); [Technology](#)

Science is a social institution. Scientific work takes place in universities, academies, research institutes, and companies. It is funded by

governments, foundations, and corporations, all of which have institutional goals and interests. It is embedded in societies, with particular forms of solidarity, conflict, and inequality. For example, who is able to become a scientist depends on the broader education system which may tend to be meritocratic or may exclude on the basis of class, race, and gender. Just as sociologists study political institutions and education systems, sociologists of science study the institutional workings and social practices of science. So far, so straightforward and uncontroversial. But social life also centrally involves what people collectively believe and how beliefs are ordered and treated as true or false. The knowledge that scientific institutions produce filters through everyday life, and is employed and also contested in public. How scientific knowledge moves through society, informs political debate, and becomes subject to public controversy are therefore key concerns for the sociological study of modern societies. But does sociological explanation extend to the content of scientific knowledge itself? Is scientific knowledge social in the sense of beings shaped by social relations, values, and interests?

Contemporary sociologists of science argue that as scientific knowledge is produced in social institutions by human beings in definite social relations, its content is shaped by this context. What counts as science, what is denied scientific status, how scientific controversies are engaged and resolved, how local laboratory practices are transformed into more widely recognized truths are collective activities and accomplishments that call for sociological explanation. But the claim that the content of scientific knowledge is social has been probably the most controversial of all sociological ideas. It has been seen to threaten the special status claimed by science as the institutional embodiment of public truth and reason. In the so-called Science Wars of the 1990s, sociologists were accused of denigrating and undermining science and opening the door to a new irrationalism in which New Age mysticism and Creationism would thrive (Labinger and Collins 2001).

The sociology of scientific knowledge has its origins in the work of Karl Marx, Karl

Mannheim, and Robert K. Merton, but goes beyond these forerunners by developing a systematic sociological analysis of the epistemic content of science. Marx's dictum that "The ideas of the ruling class are in every epoch the ruling ideas" suggested that social relations of class determined what societies took to be knowledge (Marx and Engels 1972). However, Marxists have disagreed about whether this social determination of knowledge applies only to ideology, understood as false belief, or whether it is the case also for science. Orthodox Marxists tended to reserve special epistemic status for science and to treat Marxism as the highest form of science. The sociologist Karl Mannheim sought to extend the analysis of social determination beyond the critique of ideology-as-falsehood through the notion of "total ideology" put forward in his 1936 work, *Ideology and Utopia* (Mannheim 1936). Ideology, for Mannheim, formed a total worldview that was not necessarily a mere illusion. But Mannheim still held back from applying his analysis of the social determination of knowledge to science.

The mid-twentieth century American sociologist Robert Merton wrote extensively about the sociology of science. He deliberately eschewed the sociology of knowledge, insisting that the central question for sociology of science should be the "ethos" or "normative structure" of science. Merton wrote in 1942 that science was demarcated from other social institutions by its values of universalism, disinterestedness, organized skepticism, and communism (which he later renamed "communalism") (Merton 1973). These values were appropriate for the production of universal truth. In contrast with what he called the "acid quality" of the sociology of knowledge which tended to "indict, secularize, ironize, satirize, alienate, devalue," Merton's was a sociological celebration and defense of science (Merton). Sociologists of science in the Mertonian tradition studied the social conditions that would tend to promote or impede science.

However, the publication in 1962 of Thomas Kuhn's groundbreaking historical and philosophical study, *The Structure of Scientific Revolutions*, made the Mertonian demarcation of

sociology of science from the sociology of knowledge increasingly untenable (Kuhn 1970). Kuhn's rethinking of the history of science suggested the deep social commitment of scientists to a paradigm, their resistance to abandoning fundamental theoretical assumptions, and the ways in which scientific revolutions opened the boundaries of science to broader social influences beyond those of the discipline. According to Kuhn's model, scientific change could not be treated as linear and exclusively rational. For a new generation of sociologists of science in the 1970s, Kuhn's analysis opened the way for a sociology of the epistemic content of science. At the Science Studies Unit at Edinburgh University, David Bloor and Barry Barnes put forward the "strong programme in the sociology of knowledge" which insisted on the "symmetry principle" of giving the same type of explanation for true and false belief (Bloor [1976] 1991; Barnes and Bloor 1982). The sociology of knowledge would extend to science. It followed from symmetry that the sociologist should adopt a relativist attitude toward the knowledge-claims being studied, bracketing the question of truth or falsity in order to focus on the social process by which scientific findings and claims come to be socially established as "true" or "false."

A key focus of early empirical and historical work in the "strong programme" was the influence of social interests on science. For example, Steven Shapin analyzed the way in which changing class relations affected the reception of phrenology in nineteenth-century Edinburgh (Shapin 1979). In their pioneering work on the rise of experimental science in early modern England, *Leviathan and the Air Pump*, Shapin and Simon Schaffer argued that "Solutions to the problem of knowledge are solutions to the problem of social order" (Shapin and Schaffer 1985). Later work by Shapin, examining the experimental program of Robert Boyle and the Royal Society, has emphasized the dependence of scientific knowledge on relations of trust (Shapin 1994).

At the University of Bath, Harry Collins developed the "empirical programme of relativism," analyzing the social dynamics of scientific

controversies. Through participant observation of scientific work, Collins developed the concept of "tacit knowledge" coined by the chemist and philosopher Michael Polanyi (Polanyi 1964). Collins' studies show that scientific knowledge consists not only of explicit knowledge of the sort found in journal articles, but in skills and assumptions that are often embodied and implicit in practice. Tracing how tacit knowledge is shared and communicated involves illuminating the social networks of scientific communities or core-sets and the informal modes of scientific collaboration and communication. Collins also developed the key concept of the "experimenter's regress," showing the inherent problems in replicating experiments and thereby casting doubt on rationalist explanations for how scientific controversies come to be resolved (Collins 2004). A key focus for sociologists and anthropologists of science has been the thick description of laboratory practices and the mundane forms of reasoning employed in laboratory work (Latour and Woolgar 1979; Knorr-Cetina 1981; Lynch 1985; Traweek 1988; Pickering 1995).

Bruno Latour's actor-network theory challenged the primacy that the "strong programme" accorded to social explanation. Actor-network theorists provide what they regard as fully "symmetrical" accounts of scientific activity by treating nonhuman biological and physical entities as "agents" assisting or frustrating human goals (Latour 1993). Michel Callon's study of an attempted solution to the problem of the decline in the scallop population in St. Brieuc Bay exemplified actor-network theory by showing how the solution depended on a complex set of relations between the scientific researchers, the fishermen, and the scallops themselves (Callon 1986).

Feminist research has illuminated both the gendering of scientific knowledge, including the role of gender imagery in the scientific and technological domination of nature, and the way in which assumptions about gender difference are constructed and maintained through science (Harding 1986; Merchant 1980; Martin 1991).

Public controversies about science and technology, and the commercialization of science,

have made questions of governance and regulation a focus of attention for sociologists of science. Sheila Jasanoff's book, *Designs on Nature*, examines the politics and regulation of the life sciences in Britain, Germany, and the United States. The book pays particular attention to the contrasting "civic epistemologies" of these countries and argues that political institutions and political cultures are "coproduced" with science (Jasanoff 2005). Increasingly science is coproduced with capital and industry, and Daniel Lee Kleinman's book, *Impure Cultures*, demonstrates the depth to which these commercial relationships affect the practice of university biology (Kleinman 2003).

"Science Wars" accusations that sociologists were engaged in the denigration of science were based largely on casual misreadings and misunderstandings of sociological work. But viewing science as social relations can involve critique of those relations (e.g., science's military-industrial connections) and it implies that scientists should be more reflexive about the ways in which their knowledge is embedded within social relations of power and trust. Public controversies over such issues as radiation risk, BSE, genetic modification, and vaccination risks show the failure of a technocratic model of one-way communication from scientists to the public. Brian Wynne's study of the relations between nuclear experts and Cumbrian sheep-farmers in the wake of the Chernobyl disaster has been an important spur for generating a more nuanced understanding of relations between scientific expertise and other forms of knowledge and cultural values in the broader society (Wynne 1996). Sociologists of science have been involved in rethinking scientific communication as a dialogue between scientists and the public and in developing new forms of public engagement with science (Wilsdon et al. 2005).

Cross-References

- [Critical Theory](#)
- [Cultural Studies](#)
- [Cyborgs](#)
- [Epistemology](#)

- [Humanities](#)
- [Philosophy of Science](#)
- [Scientism](#)
- [Sex and Gender](#)

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Science in Buddhism

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Description

Buddhism is an Asian religion that is based on teachings attributed to Siddhartha Gautama, an upper-class male born in northeastern India in the fifth or sixth century BCE. Gautama became the “Buddha” (“awakened one”), according to tradition, upon achieving “enlightenment” as a result of engaging in a series of spiritual practices, most notably ► [meditation](#). After achieving

enlightenment, the Buddha is said to have gained a perfect understanding of the nature of the world and of human existence, and he spent the remainder of his life traveling and teaching as an itinerant mendicant. The religion of Buddhism is based largely on the teachings attributed to Gautama-Buddha.

Many authors and practitioners of Buddhism claim that not only are Buddhism and science compatible, but that Buddhism is inherently scientific. Buddhism is said to be scientific in at least four ways. First, unlike most other major world religions, Buddhism dismisses either the existence or the efficacy of supernatural deities. In this sense, some say Buddhism is atheistic. Second, Buddhism is said not to rely on blind faith, appeal to authority, or metaphysical speculation, for justification. Third, the Buddha’s understanding of reality is said to be in line with much of modern physics. Specifically, our experience of reality is illusory because though we see the world as having a stable and permanent existence, the world is actually a collection of parts that are constantly in motion as is held by the atomistic theory in ► [particle physics](#). Fourth, the Buddha’s understanding of human psychology, in particular the cause and alleviation of mental suffering, is in line with certain tenets of modern psychology, notably cognitive therapy (CT). According to Buddhism, human suffering is the result of improper thinking. Specifically, to be happy, Buddhism claims that a person must eliminate incorrect and dysfunctional thinking and replace such thinking with new habits of thought, which is achieved through the practice of meditation. Meditation is said to “tame the mind” and thereby “calm the soul.”

Inspired by anecdotal claims of meditation’s therapeutic benefits made by prominent scientists who practice meditation, a number of contemporary psychologists and medical doctors have experimentally tested this claim and obtained confirming results. This area of investigation, between meditation and neuroscience, is arguably the most active in all of Buddhism and science.

It should be noted that some scholars have recently called into question the degree to which

the Buddhism being presented as in line with modern science is in line with *Buddhism*. That is, scholars have questioned the historical authenticity of the type of Buddhism that is said to be scientific. The hypothesis is that the “scientific Buddhism” that is being presented as in line with modern science is actually a historical invention by Asian monks in the nineteenth century as a strategy of combating European colonialist claims that Asians and their religions were “backward” and in need of being “civilized” by Christianity and Europe. Regardless of its historical authenticity, though, even these scholars recognize that while constructed, this reformed version of Buddhism is now quite popular, both in the West and increasingly in Asia, and so is likely here to stay.

Self-identification

Science

Both supporters and critics of the notion that Buddhism is scientific acknowledge that “scientific Buddhism” was championed in the nineteenth century first by Asian Buddhists themselves, such as the Sinhalese ► [Theravada](#) Buddhist, Anagarika Dharmapala, but later championed by Western converts such as the American Henry Steel Olcott and the German-American, Paul Carus. Recently, prominent Buddhist leaders such as the fourteenth Dalai Lama, Tenzin Gyatso, and Chogyam Trungpa have advanced the notion that Buddhism is inherently in line with modern science. Similarly, Western scientists who practice Buddhism contribute to the self-identification of Buddhism as scientific. For instance, prominent scientists who practice or champion Buddhist meditation include psychologists Daniel Goleman and Richard Davidson, the medical doctor Daniel Siegel, the neurobiologist Francisco Valera, and the physicist Arthur Zajonc.

Religion

This is a difficult question, as the answer turns precisely on what constitutes a “religion” at all. Further, in many ways the scientific nature of

Buddhism is defined vis-à-vis traditional religion. Thus while classical Buddhism is infused with elements of traditional religion, such as ritual, devotion, and supernatural beliefs, those who view Buddhism as scientific often dismiss such practices as folk belief rather than Buddhism proper. However, there is no disputing the fact that worldwide, Buddhism as practiced by most Buddhists contains elements of traditional religion.

Characteristics

Arguably, the most unusual feature of Buddhism, in relative contrast to other major world religions, is the claim that Buddhism is an atheistic religion. However, this claim itself has been disputed as being based on a misreading of a widespread quote attributed to the Buddha: “No one saves us but ourselves. No one can and no one may. We ourselves must walk the path.” This quote can be interpreted to mean that no deities exist. Or, it can be interpreted to mean that though deities exist, they cannot provide salvation. If one assumes the former, Buddhism might be atheistic. However, if one assumes the latter, Buddhism is theistic.

Relevance to Science and Religion

Not only are many practitioners of scientific Buddhism interested in science and religion, they often see themselves as uniquely positioned – due to the features of Buddhism noted above – to be leaders of the science and religion dialogue. Buddhists regularly volunteer to be subjects in medical and scientific experiments, and an institution, The Mind and Life Institute, has been created specifically to further the dialogue between Buddhism and science.

Sources of Authority

As with all institutionalized religions, authority in Buddhism is occasionally contested. For

instance, members of the two major sects of Buddhism – Theravada and ► [Mahayana](#) – disagree over scriptural authority, monastic lineage, and so forth. Nonetheless, the most prominent figure in Buddhism and Science today, Tenzin Gyatso, is the theocratic head of the Tibetan government-in-exile in Dharamsala, India, and widely believed among Tibetans to be the fourteenth reincarnation of the Dalai Lama.

Further, scientists who champion Buddhism, such as Richard Davidson, Daniel Goleman, Daniel Siegel, Francisco Valera, and Arthur Zajonc, are seen as authoritative because of their scientific credentials and prominent research.

Ethical Principles

The ethical principles that guide Buddhism differ between monks and nuns, and the laity. Lay Buddhists are expected to follow five principles: no killing, stealing, lying, sexual misconduct, or intoxicants. However, monks and nuns are expected to follow a much larger set of ethical rules (227 for males, 311 for females) as outlined in a text known as the *Vinaya Pitaka*.

Scientists who conduct research on Buddhism are bound by the same ethical requirements all scientific researchers are expected to follow, such as not to distort the research process or fabricate data, and the ethical treatment of human subjects as outlined by the Institutional Review Board (IRB).

Key Values

The values of the Buddhism and Science movement can be said to be pragmatic empiricism whereby one should, to quote the motto of the Royal Society, “Take no-one’s word for it.” This claim is based on an oft quoted passage from a text known as the *Kalama Sutra – Anguttara Nikaya 3.65* in which the Buddha instructed:

Do not go by revelation.

Do not go by tradition.

Do not go by hearsay.

Do not go on the authority of sacred texts.

Do not go on the grounds of pure logic.

Do not go by a view that seems rational.

Do not go by reflecting on mere appearances.

Do not go along with a considered view because you agree with it.

Do not go along on the grounds that the person is competent.

Do not go along because [thinking] “the recluse is our teacher.”

Conceptualization

Nature/World

Nature and the world consist of smaller (unseen to the naked eye) parts that are in constant motion. Therefore, according to Buddhism, life is empty of any stable, permanent reality.

Human Being

Like the world around us, humans consist of smaller (unseen to the naked eye) parts that are in constant motion. Therefore, according to Buddhism, humans are empty of any stable, permanent reality such as a soul.

Life and Death

According to Buddhism, an individual’s life is the result of the transmigration of material from a previous life. At death, the material that constituted our bodies transmigrates into a new form, and that process continues on until one achieves parinirvana (via Buddhist practice). In Buddhism, parinirvana is the final stage which occurs upon the death of the body of someone who has attained complete enlightenment. It implies a release from the cycle of birth, life, death, and rebirth.

Reality

According to Buddhism, reality is not as it seems. We see reality as having a stable, permanent existence, but in fact it is constantly in flux and changing.

Knowledge

According to Buddhism and science, true knowledge comes from testing claims empirically.

Truth

According to Buddhism and science, truth can only be established through rigorous empirical testing.

Perception

According to Buddhism and science, our eyes can deceive us and therefore it is critical to test claims empirically and repeatedly to establish truth.

Time

In science, time is part of the measuring system used to sequence events, to compare the durations of events and the intervals between them, and to quantify the motions of objects. Scientists consider time to be linear in nature. In Buddhism, time is merely a feature of the mind.

Consciousness

According to Buddhism and contemporary neuroscience, consciousness is a continual series of individual moments or events. In neuroscience, however, many consider consciousness to be a product of brain function, and so “the mind is what the brain does.”

Rationality/Reason

According to Buddhism, suffering is caused by irrational thinking and that training the mind (via meditation) to be perfectly rational – and thus achieving Buddha-hood is the anecdote. However, in modern psychology there is great debate over the extent to which it is possible to train the mind perfectly. Some psychologists argue that the brain is a collection of modules that was designed by evolution to function rationally in a world that is much different from the one in which we now live. As such, we have, at best, bounded rationality, based on a mismatch between what brains are designed to do and what we need them to do in today’s environment.

Mystery

Some philosophers and scientists working in cosmology have argued that while we have solved two of the three great mysteries of life, namely why humans exist (answer: evolution) and how consciousness can exist (answer: brains), the last

will never be answered: why something exists rather than nothing. There are only two possibilities, it has been argued, and each is incomprehensible: Either the world was created (but by whom or what, and who or what created the creator?) or it has always existed (but where did it come from?). Likewise, the Buddha purportedly noted that human beings cannot know the answers to all of life’s mysteries and to try to do so is not only wasteful, it is counterproductive. Instead, we should focus our mental energies on problems we can solve, like alleviating mental suffering.

Relevant Themes

It is critical to note that Buddhist meditation is increasingly being recognized in the medical and scientific communities as having real therapeutic benefits. As such, it is safe to say that more and more scientific individuals may be looking to Buddhism as their religion of choice.

Cross-References

- [Buddha \(Historical\)](#)
- [Buddhism](#)
- [Buddhism in the West](#)
- [Buddhist Meditation Practices](#)
- [Modernity in Buddhism and in Islam](#)
- [Psychology in Buddhism](#)

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Science in Islam, Classification

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Related Terms

[Encyclopaedism](#); [Organization of science](#)

Description

The classification of science in Islam is a subject which needs to be investigated in reference to the historical and intellectual context of early Islam (Endress 2006). For about 150 years, the field of theoretic knowledge remained largely the prerogative of traditional sciences, like jurisprudence or theology, which could be viewed as grounded in the Qur'an and the traditions of the Prophet. From about 750 A. D., as a result of a large-scale movement of translation, philosophy and the rest of rational sciences (mathematics, physics, metaphysics, and logic, with their own subdivisions) as already cultivated in antiquity by the Greeks were incorporated too (de Callataÿ 2008a). One way or another, nearly all classifications in premodern Islam reflect this bipolarity between traditional (or “religious” or “Islamic”) sciences and rational

(or “philosophical” or “foreign”) sciences (Bakar 1998; Biesterfeldt 2000, 2002; Pellat et al. 1990; Vesel 2008).

Self-Identification

Science

In the same way as the page of contents in a book is part and parcel of this book, the classification of science in medieval Islam could easily self-identify as a science of its own, being a sort of natural corollary to the encyclopedic approach of reality. A typical example is the work known as the *Epistles of the Brethren of Purity*, a vast tenth-century encyclopedia of sciences consisting of about 50 epistles, one of which specifically concerned with one such classification of human knowledge (de Callataÿ 2008b).

Characteristics

What makes the classification of science distinctive among other disciplines in Islam is both its systematical and all-encompassing approach of reality.

Relevance to Science and Religion

For philosophers and humanists of medieval Islam, the organization of human knowledge served to stress the harmony between, and eventual reconciliation of, both traditional and rational sciences. In the eyes of people less favorable to the incorporation of foreign material into the building of Islamic thinking, the classification of sciences was a way to emphasize the superiority of traditional sciences over rational sciences, of revelation over human speculation, and, ultimately, of religion over science (in the modern sense of the word).

Sources of Authority

The sources of authority for the classification of science in Islam are the authors of classifications themselves, first and foremost the Greek masters,

most notably Aristotle, and then their Muslim epigones, such as Kindī, Fārābī, Ibn Sīna (Avicenna), or Ibn Khaldūn. What makes these sources authoritative is the intrinsic coherency of the classifications, along with the prestige and fame of the authors.

Ethical Principles

Some classifications of science, especially those meant to represent the traditional view, reflect ethical concerns. This is evidenced, for instance, from their rejection of a certain number of scientific arts or practices (such as alchemy, astrology, or logic) deemed to be incompatible with the “orthodox” view and therefore blameworthy.

Key Values

Coherency, comprehensiveness, and sense of hierarchy.

Conceptualization

Nature/World

God’s creation.

Human Being

An animal possessing a spiritual soul.

Life and Death

A characteristic affecting those beings in the world which are subject to decay. Biology or zoology did not exist as such in medieval classifications of science, although the distinction between the mineral, vegetal, and animal kingdoms was usually reflected by them.

Reality

What exists per se, as opposed to what has been devised. In Islamic classifications, rational sciences are sometimes called “real,” in opposition with the traditional sciences, which are assumed to have been conventionally “set up” for a certain purpose.

Knowledge

Theoretical and practical understanding of a subject.

Truth

Agreement with reality.

Perception

One of the faculties by which a human being, through the use of his senses, is able to understand the reality around him.

Rationality/Reason

Man’s ability to understand a subject by his own effort.

Cross-References

- [Philosophy in Islam](#)
- [Philosophy of Science](#)
- [Physics, Science in Islam](#)
- [Science in Islam, Transmission](#)

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Science in Islam, Transmission

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Description

The transmission of science in Islam is a subject which needs to be investigated in reference to the historical and intellectual context of early Islam. Traditional sciences, that is, those sciences which could be viewed as grounded in the Qur'an and the traditions of the Prophet, used to be transmitted by generations of experts from the very beginning of Islam (Kraemer 1986; Makdisi 1981; Rosenthal 1975; Van Ess 1991–1997). Philosophy and the rest of the rational sciences were incorporated at a later stage (from about 750 AD, roughly coinciding with the accession to power of the 'Abbasids and the foundation of Baghdad), as a result of an unprecedented movement of translation into Arabic of ancient traditions (mainly Greek, but also Persian, Indian, and many others as well) that had survived in various communities of the Near East (Endress 2006; Saliba 2007;

Wasserstein 1989). This formidable undertaking, made possible by a wide range of favorable factors (economic, social, political, cultural, etc.) acting at the same time, would not be over before the end of the tenth century when, with the exception of a limited amount of specific literature not deemed of interest by the scholars of Islam (most notably ancient Greek belles-lettres and history, and Christian literature in general), nearly all Greek sources accessible in that part of the world seem effectively to have been made available in the Arabic language (Gutas 1998). The field ranges from logic and metaphysics to ethics and politics, from medicine and the natural sciences to the sciences of the number (arithmetic, geometry, astronomy, and music) and the technical sciences. The other impressive feature is the unusually rich melting pot of cultures, races, and religions in which diverse groups of translators, copyists, and scientists were able to work with one another for more than two centuries, and this obviously in the absence of a centralized program or sponsorship, although some caliphs became quite famous for their support. Among scientists, Christians were in the majority, but there were also Jews, Persians, Arabs, and even idolaters. This multiculturalism was also to favor significantly the incorporation of sources that did not ultimately derive from Greece, but rather from India, Iran, and Ancient Mesopotamia. The succeeding decentralization of power in Islam may be viewed as having played a positive role in the development and transmission of the sciences as well, since it widely contributed to the availability of patronage, as newly arrived rulers competed with each other to take the place of the 'Abbasid caliphs as protectors of the arts and the sciences.

Self-identification

Science

The transmission of science in Islam is a cultural and intellectual phenomenon. It cannot self-identify as a science, since it was never meant to follow or obey predefined rules.

Sources of Authority

The sources of authority for the transmission of science in Islam are the authors themselves. The *Fihrist*, a monumental catalogue of the books available in Arabic (whether the result of a translation or not) compiled on every branch of knowledge by the tenth-century Baghdad librarian Ibn al-Nadīm lists about 4,000 authors, ancient or modern.

Cross-References

- [Philosophy in Islam](#)
- [Philosophy of Science](#)
- [Physics, Science in Islam](#)
- [Science in Islam, Classification](#)

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Science of Happiness

- [Positive Psychology](#)

Science of Human Strengths and Virtues

- [Positive Psychology](#)

Science of the Stars

- [Astrology in Islam](#)

Scientific Expansionism

- [Scientism](#)

Scientific Naturalism

- [Scientism](#)

Scientific Study of Religion

- [Psychology of Religion](#)

Scientism

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Related Terms

[Scientific expansionism](#); [Scientific naturalism](#)

Description

Some people seem to think that there are no real limits to the competence of science, no limits to

what can be achieved in the name of science. There is no area of human life to which science cannot successfully be applied. A scientific account of anything and everything constitutes the full story of the universe and its inhabitants. Or, if there are limits to the scientific enterprise, the idea is that, at least, science sets the boundaries for what we human beings can ever know about reality. This is the view of *scientism*.

From a historical perspective, perhaps the most well-known proponent of scientism is the French social philosopher Auguste Comte, with his attempt to create a religion based on science – the “Religion of Humanity” 1852. Another interesting and far-reaching attempt to have science take over many of the functions of religion, and thus itself become a religion, was undertaken by the German chemist and Nobel prize-winner Wilhelm Ostwald (1912: 94–112). He argued for science as an “Ersatzreligion” – a substitute religion. Yet, many different forms of scientism have emerged over the last three centuries, and during the most recent decades, a number of distinguished natural scientists, for instance Peter Atkins, Richard Dawkins, Carl Sagan, and Edward O. Wilson (1978), as well as philosophers such as Daniel C. Dennett and Patricia Churchland have advocated scientism in one form or another (Atkins 1995: 132).

But what, more precisely, is scientism? Though it is not at all easy to define, we might say that someone is a proponent of scientism if he or she believes that everything (or at least as much as possible) could and should be understood in terms of science. Be aware here that the notion of science is used in the restricted way that is common in English usage, though not in the German or Swedish tradition. Thus, the term covers only the natural sciences and those areas of the social sciences that are highly similar in methodology to the natural sciences.

Another concept that could be invoked in this context is “scientific expansionism,” and this explains quite well what the project is all about. Namely this: the proponents believe that the boundaries of science (that is, of the natural sciences) can and should be expanded in such a way that what has not previously been understood as

amenable to scientific methodology can now be brought within the scope of science. Science can answer many more questions than we have previously thought possible.

In its most ambitious form, scientism can be defined as the view that science has no real boundaries; that is to say, eventually it will answer all empirical, theoretical, practical, moral, and existential questions. Science will in due time solve all genuine problems that humankind encounters. How, exactly, the boundaries of science should be expanded and what, more precisely, it is that is to be included within science are issues on which there is disagreement. Some proponents of scientism are more ambitious than others in their extension of the boundaries of science. That is to say, they are all scientific expansionists but in different ways and to different extents.

Perhaps the most well-known form of scientism, epistemic scientism, expresses a particular idea about the boundaries of knowledge, saying that the only genuine knowledge about reality is to be found through science and science alone. The only kind of knowledge we can have is scientific knowledge. Everything outside of science is taken as a matter of mere belief and subjective opinion. Consequently, the agenda is to strive to incorporate as many other areas of human life as possible within the sciences so that rational consideration and acquisition of knowledge can be made possible in these fields as well. If one holds this epistemological view, then it is of course not difficult to understand that one would believe that everything (or at least as much as possible) could and should be understood in terms of science – because what we cannot understand and explain in terms of science is something that we cannot know anything about at all. This is not the view that science is the paradigm example of knowledge or rationality, but the view that the only genuine knowledge about reality is to be found through science and science alone.

Epistemic scientism raises an obvious challenge to the religions of the world. For example, Christianity could only give us knowledge about God, human beings, and the world if those knowledge claims could be confirmed by

the methods of the natural sciences, because genuine knowledge – according to this version of scientism – could only be obtained by such methods.

Scientism has been criticized by many scholars who have taken part of the science-religion dialogue, such as Ian Barbour, John Haught, Mikael Stenmark (2001), and Keith Ward (1996) and in culture in general by people such as Bryan Appleyard, Mary Midgley (1992) and Huston Smith. Smith even think that “the greatest problem the human spirit faces in our time is having to live in the procrustean, scientific worldview that dominates our culture” (2001: 202). Depending on what form of scientism analyzed and what understanding of religion defended, the critical responses have looked differently. The main criticism, however, is that the advocates of scientism in their attempt to expand the boundaries of science rely in their argument not merely on scientific but also on philosophical premises and that scientism therefore is not science proper, but naturalism or atheism disguised.

Perhaps the most embarrassing problem for spokespersons for scientism is that one of its central claims seems to be self-refuting. The difficulty is that the scientific belief that we can only know what science can tell us (epistemic scientism) seems to be something that science cannot tell us. How can one set up a scientific experiment to demonstrate the truth of that claim? It seems not to be possible. But we cannot know that scientific knowledge is the only mode of knowledge unless we are able to determine this by scientific means. This is so, simply because science – according to epistemic scientism – sets the limits for what we can possibly know. Hence, the claim that we can only know what science can tell us falsifies itself. If it is true, then it is false.

Cross-References

- [Epistemology](#)
- [Naturalism](#)
- [Truth](#)

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Scientist-Practitioner

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A model of training wherein practitioners in a given field (e.g., behavioral medicine, health psychology) are trained to apply the findings, processes, and principles of science and scientific investigations to their professional practice. These practitioners may also be involved in conducting scientific investigations of their own. Thus practitioners incorporate methods of treatment that have received scientific empirical support and they engage in decision making that utilizes the logic of hypothesis testing informed by research findings and clinical experience. The model was first proposed as a method for training clinical psychologists at the Boulder Conference on Graduate Education in Clinical Psychology (1949) held in Boulder, Colorado, USA, but has since been adopted by many professions involved in treating human conditions.

Screenwriting

► [Creative Writing](#)

Second Law of Thermodynamics

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There are various ways of formulating this law of nature, but generally speaking, it holds that in a closed system, disorder increases with time. For example, it is much more likely that a chimney will collapse into a pile of rubble rather than the reverse: a pile of rubble spontaneously assembling itself to produce a chimney. The fact that sometimes a pile of bricks can be assembled to form a chimney does not violate this law. In this case the pile of bricks is not a closed system. Their assembly requires input from construction workers. When “the system” is extended to include the workers, together with their breakdown of food to produce energy, etc., then the second law is seen to hold.

Cross-References

► [Time](#)

Secular

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Profane, ordinary, the opposite and complement of “sacred.” At the risk of oversimplification, it may be suggested that in Western society the realms of the sacred or religious and the secular

have historically had three different relations: (1) hegemony of the religious outlook over the whole of society comprising both the sacred and secular realms (ancient and medieval periods); (2) competition of the religious and the secular for political and intellectual hegemony (late medieval and early modern); and (3) political and intellectual hegemony of the secular, along with privatization of the religious (late modern period). The application of this schema to the topic of “secularism and Judaism” has the following consequences:

- In Biblical society, the religious authority demarcated the realms of the sacred and the profane (see Ezekiel 44:23).
- In the Middle Ages, the religious philosopher adjudicated the claims of reason and revelation in a way that preserved hegemony of the religious outlook.
- Spinoza was typical of Enlightenment thinkers in challenging the veracity of Scripture and advocating the hegemony of the secular ruler.
- By calling a Jewish Sanhedrin in 1806, Napoleon asserted the hegemony of the secular state over religion; the nineteenth-century Jewish movements complied by adapting Jewish religion to the conditions of modern civil society.
- For a time, modern secular movements asserted modes of Jewish affirmation that dispensed with religion altogether; however, the commonest modes of Jewish affirmation take a religious form – though with the individual autonomy that is one of the hallmarks of modern secularity.

Cross-References

► [Secularism in Judaism](#)

Secular Jewish Movements

► [Secularism in Judaism](#)

Secularism

► Secularism in Judaism

Secularism in Judaism

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Related Terms

Judaism; Secular; Secular Jewish movements;
Secularism; Secularization

Description

The intersection of ► [secularism](#) and ► [Judaism](#) will be considered here under four headings:

1. The place of the ► [secular](#) in classical Jewish thought
2. The impact of secular thought on the modern versions of Jewish religion, especially during the period of modernization in the nineteenth century
3. Self-styled “secular movements” in modern Judaism (such as Zionism) that conceive of a kind of Judaism divorced from religion
4. The question of positive Jewish identity and Jewish content in the lives of Jews who affiliate neither with Jewish religion nor with secular Jewish movements

The Secular in Classical Jewish Thought

Biblical Jewish thought. If by “secular” we mean “worldly,” all religion has a secular element, for all religion must include the world somehow in its map of reality. The author of Genesis 1 conceived the world as the creation of God, but also as a good in its own right. The God of the Hebrew Bible situates humankind in the world for their

benefit. He promises fertility of crops, livestock, and human progeny if people would obey His will. The pleasures of life are affirmed as good, subject to their enjoyment within lawful limits and constraints. Although worldly pomp and splendor can lead to corruption and abuse, they are affirmed as legitimate under the proper circumstances. Political rulers may exercise power if they do so justly, while acknowledging God as the supreme ruler.

Like most ancient cultures, ancient Israel posited a formal distinction between those areas of life that were “sacred,” subject to the control and governance of the priesthood, and “profane,” free for use by the laity with a lesser degree of restrictive regulation. The “profane” realm of Biblical experience foreshadows the “secular” realm of medieval Christendom, which evolved into the modern secular world.

Peter Berger (1967) follows Max Weber in characterizing the created natural world of the Hebrew Bible as “disenchanted” in comparison with the god-filled plenum of nature in the pagan mythic conception. In that respect, the Biblical outlook is perhaps somewhat more “secular” than the outlook of the Enuma Elish, the Vedas or the Nibelungenlied. On the other hand, the Biblical authors did not arrive at a systematized vision of physical nature obedient to natural law, as Greek science did. The Biblical authors recognized the exceptionality of certain miracles (see especially Numbers 16:29–30), but generally viewed the world as following an overall orderly course that is, nevertheless, subject to divine guidance and providence. In this outlook, there is not a sharp dichotomy between “natural” and “supernatural” realms or modes of causality, as would appear in medieval conceptualization of “miracle.” There is no word in Biblical Hebrew for “nature,” “natural,” or “supernatural.” Though “Heaven” is preeminently the abode of God, it is also the source of meteorological phenomena; it is the visible sky, not an invisible transcendent realm. In all these respects, though the Biblical world-outlook includes “secular” elements, it is lacking in the sharp “sacred-secular” dichotomy that characterizes the modern debate.

Rabbinic Judaism. Rabbinic thought arose at least in part to defend the integrity of the Biblically based ethos from the challenge posed by the Greco-Roman classical culture – inclusive of religious paganism, art, and philosophy. For our purposes, the following developments are noteworthy:

- (a) Rabbinic Judaism defined a normative structure (halakha) governing a wide array of domains – divine worship, civil law, marital law, eating, the work-rest cycle, and relations between Jews and non-Jews in daily life. Comprising areas like civil law under halakha was simultaneously an affirmation of the legitimacy of secular pursuits and staking the claim of sacred law to govern it.
- (b) Rabbinic hermeneutics sought to ground all normative discourse (insofar as possible) in the exegesis of sacred Scripture. In doing so, it affirmed implicitly that sacred authority holds sway over all existence, and denied the legitimacy of any radically secular domain that was free of divine governance. It similarly accentuated the radical difference between “Israel” and “the [gentile] nations,” thus affirming the ultimate value of the Jewish people who live by God’s law, and denigrating the value of the pagans and “sectarians” (i.e., Christians and Gnostics) who do not.
- (c) On the other hand, rabbinic ethics affirms a category *derekh eretz* (literally “the way of the world”) which has many shades of meaning but is very close in some of its significances to the Stoic concept of “natural law.” As such, it affirmed the validity of a secular normative standard as both compatible with and complementary to its own religious normative standard.
- (d) Rabbinic cosmology accommodated to the prevailing natural law conceptions by trying to harmonize Biblical miracles with an overall affirmation of natural order – for instance, by saying that God provided for these miraculous phenomena in the liminal time-slot between the sixth day of creation and the first Sabbath.

Medieval Judaism. Medieval Jewish philosophy (in particular, that of Maimonides) sought on

the one hand to set up a sharp opposition between the rabbinic Jewish outlook, deriving all normative assertions from the Bible, and the secular philosophical outlook such as that of Aristotle. At the same time, it tried to mediate this opposition by achieving an accommodation, in which the Jewish and philosophical outlooks would be synthesized where possible (such as in proving the existence of God), and rendered distinct where synthesis was impossible (such as on the issue of the creation or eternity of the world). Maimonides’ accommodation with Aristotelianism had the following implications for our problem:

- (a) It affirmed the validity of secular reason as a legitimate intellectual method.
- (b) It enlisted secular reasoning in support of traditional beliefs, particularly with respect to proving the existence of God and articulating a purified conception of God’s nature.
- (c) It demanded the reinterpretation of Biblical assertions in order to render them compatible with philosophical reason, particularly with respect to anthropomorphism; this left the Bible authoritative as to “word” but reason authoritative as to “meaning.”
- (d) It reinterpreted the very notion of “revelation” (i.e., prophecy) in a sense almost synonymous with philosophical enlightenment, and (in *Guide* III, 40, following Alfarabi) Maimonides offered a portrayal of the ideal prophet-legislator in the mold of Plato’s philosopher-king.
- (e) It demanded a rationalizing and ethicizing interpretation of Jewish normative injunctions, particularly in Maimonides’ interpretation of certain areas of Jewish law in his code, the *Mishneh Torah*.
- (f) On the other hand, it used the logical consistency of philosophic reasoning to solidify the definition of the demands of the sacred realm, for instance, in Maimonides’ codification of the sacred law and in his defining for the first time a definite Jewish creed as a boundary-marker for demarcating Jewish legitimacy.

In short, the Maimonidean formulation of Judaism enlarged the area of the legitimate use of secular reason, both in itself and in the service

of sacred knowledge. At the same time, it sharpened the sacred-secular distinction in new ways, which would ultimately play a part in defining the battleground of secularization in the modern period.

The Impact of Secular Thought on Jewish Religious Modernity

Spinoza. Modern Jewish thought begins, in many important respects, with Spinoza. Harry Wolfson observed that Spinoza broke apart the synthesis of revelation and reason that had prevailed in medieval thought, primarily by discrediting (in his *Theological-Political Treatise*) the Bible's claim to embody infallible divine truth. Thus, secular reason for the first time posed a potentially mortal threat to the viability of traditional Jewish faith altogether. Moreover, Spinoza proposed, in his *Ethics*, a God-concept radically different from the personal, transcendent God of the Bible and medieval theism, and (some would say) dangerously close to the vanishing God of modern atheism. Nevertheless, Spinoza's position on both these issues developed organically and dialectically out of Maimonides' compromising synthesis. One might say that the substance of the challenge of secular philosophical reason to Biblically based Jewish faith was perceived similarly by Maimonides and Spinoza, only that in Maimonides' assessment the challenge could be met through compromise and reconciliation, whereas in Spinoza's assessment it could not, and the two outlooks would have to go in their separate ways.

Nevertheless, it has been the general direction of modern Jewish religious thought to try to rescue Jewish faith from Spinoza's challenges. This has meant establishing new syntheses of faith and reason that differ from Maimonides' synthesis by conceding the force of secular reason in stronger terms than Maimonides would have allowed. Specifically:

(a) Spinoza initiated secular scholarly analysis of the Bible as a literary and historical document. Modern Jewish theologians reconstruct the narrative of Jewish history, and the

Jewish historical theology that grows out of it, based on this new scholarly foundation, which is secular in its methodology.

(b) Spinoza radically redefined God to conform to the emergent modern scientific worldview. Modern Jewish theologians may disagree with the specifics of Spinoza's theology. But they are generally agreed that Jewish theology must adapt its assertions to agree with the findings of modern science (particularly evolution, after Darwin). And the radical immanence of Spinoza's pantheism finds a modified echo in the pantheistic tendencies of many contemporary Jewish theologians. The revaluation of divine immanence may be seen as "secularizing" inasmuch as it brings God more into interaction with the world than the medieval transcendent God.

Enlightenment and Emancipation. From the eighteenth century onward, Jews of Western Europe (and later Eastern Europe) tended increasingly to adopt the intellectual ideologies growing out of the European Enlightenment, in tandem with their attempt to become integrated politically, socially, and culturally in the nation-states of modern Europe. For these purposes, they adopted ideas that had a secularizing impact on general European thought, which tended also to advance the interests of Jewish integration (See Schweid 2008). By the same token, the same ideas, when applied internally within Judaism, had a destabilizing effect on the traditional Jewish outlook and required the formulation of new Jewish religious ideologies to achieve a new equilibrium under which Jewish religion could exist in the modern age. Among these ideas (see Berger 1967; Martin 1969):

- (a) All human beings are fundamentally equal, deserving equal rights and equal treatment under the civil law.
- (b) All human institutions (including religion) are to be evaluated according to the extent to which they further human happiness, conceived in universal, nondogmatic terms (though consistent with a Deist conception of a universal, benevolent God).
- (c) Among the universal human rights is liberty of conscience; hence, all persons should be

free to choose whatever religion suits them. Religious law (whether Christian law imposed on Jews, or rabbinic law imposed within traditional Jewish communities) should never be enforced; religious compliance is voluntary and a matter of private conscience.

- (d) All religious dogmas (including the very belief in God) are unprovable. Disputation among religions is fruitless. In a tolerant, ecumenical society, all religions conducing to the public good are to be tolerated. Religious adherents should forswear triumphalist pretensions and agree to disagree amicably in the interest of the public good.

The net effect of adopting these principles was to incorporate the secular tenets of individual freedom and utilitarian measurement of success into the fabric of the modern denominations of Judaism, to a varying extent across the Reform, Conservative, and Modern Orthodox movements. Traditional Judaism had sought to exercise hegemony over all areas of Jews' lives. Modern Judaism reduced its sights to fostering a voluntary compact among its members, to adopt those portions of the Jewish religious legacy that could be justified as in agreement with the norms of liberty and pursuit of happiness that prevailed in secular society.

More generally, Judaism followed the example established by Western religion generally during the period of early modernism. Whereas in the medieval world, religion had sought to govern the tenor of life in its totality – outlook, social values, and sacred occasions, as well as maintaining a hefty political presence – in the modern world, religion is relegated to a much narrower, specialized domain. It was modern religion's business to maintain personal spiritual values and provide private moral teaching, while ceding the formation of intellectual outlook to science and philosophy, and the governance of public conduct to secular political institutions. In addition, it became the business of Jewish religious institutions to maintain Jewish identity in a new, purportedly integrated society where there was a marked tendency for Jews to assimilate and disappear completely into the general population.

The modern Jewish religious movements of Western Europe made an additional accommodation. Traditionally, Judaism was a complex phenomenon combining religious and national characteristics. In the new, modern nation-states of England, France, and Germany, there was no room for the national dimension of Jewish existence, as it competed with the national identities of the host nations. Jews had to redefine Judaism as solely a "religion" in order to be able to fit into their respective nations as "Englishmen/Frenchmen/Germans of the Jewish religious persuasion." This was a reduction of their Jewish identity to merely "religious" in order to be able to fit the secular identity of "English/French/German." Thus, paradoxically, stressing the purely religious identity of Judaism aided them in secularization.

The Rise of Secular Jewish Movements

From the 1880s to the 1920s, several movements (especially Zionism, Diaspora autonomism, Yiddishism, and Bundism) arose in Jewish life that asserted for the first time in history that it was possible to foster a Jewish group existence without religion. This period can be viewed as the heyday of Jewish secularism (See Biale 2011).

Historically, the roots of Jewish secularism may be traced to a bifurcation in the general European Enlightenment. The more religiously conservative Enlightenment thinkers – Leibnitz, Rousseau, Kant – saw a positive place for Christian faith in such an outlook. The more radical – Voltaire, Diderot, Condorcet – sought to supersede Christianity and relegate it to the unenlightened past. In the nineteenth century, advanced thinkers, such as the left-Hegelians and positivists (Comte, Mill, Spencer), progressed to full-blown atheism, a tendency that was fed intellectually by the advance of science (especially Darwinian evolutionist theory) in the course of the century.

Structural political differences between Western and Eastern Europe also fostered differences in Jewish intellectual development. Whereas unified nation-states were at least

a feasible ideal (if not quite a perfected reality) in Western Europe, Eastern Europe was dominated by multinational empires. By the latter half of the nineteenth century, the smaller nationalities within the Austrian, Russian, and Ottoman Empires were already moving toward demanding self-determination and autonomy. It, thus, made political sense, instead of demanding to be “a Russian national of the Jewish faith,” to demand “Jewish national rights” alongside and in tandem with the national rights of Poles, Lithuanians, Ukrainians, Czechs, Slovaks, Hungarians, etc.

There was happy synergy between the religious/secular issue and the national/multinational issue. Young, modernizing Jews in Eastern Europe in the 1880s tended to be secular rather than religious in outlook, and Jewish-nationalist rather than assimilationist. Thus, whereas Western European Jews tended to be French or German in nationality and Jewish in religion, Eastern European Jews tended to affirm Jewishness as their nationality, while on the religious front they could comfortably say: “no religion.”

Zionism. Classical Zionism comprised at least three distinct types: (a) political Zionism, which strove for establishment of a political Jewish state, for the protection of world Jewry, with no preconceptions as to its cultural identity or religious identity; (b) secular cultural Zionism, which sought return of Jews to their homeland and building a Hebrew-speaking society that would spearhead a Jewish cultural renaissance; and (c) religious Zionism, which sought establishment of a Jewish society in the land of Israel that would be observantly Jewish in its religious complexion. Of these, the second is the clearest example of a secular Jewish national movement in the sense we are describing (See Hertzberg 1959). The chief spokesmen of this variety of Zionism were Ahad Ha-Am, Hayyim Nachman Bialik, Aaron David Gordon, and Berl Katzelnenson. All these agreed on the following principles (which may be styled the principles of “conservative secular Zionism”):

1. Traditional religion is no longer viable as a basis of social consensus; hence, any new Jewish social consensus or group program

must proceed irrespective of religious belief or practice.

2. Though the contents of Jewish group life in the past were formulated under a religious rubric, they are not essentially religious. At least a large portion of those contents can be reframed secularly as ethical teachings and cultural practices.
3. The Jews continue to remain a group in the modern world after the decline of religion. The basis of that continuity is national and cultural.
4. The preferred national language to serve as the basis of Jewish cultural continuity is Hebrew.
5. The preferred location for Jewish national existence and cultural renewal is the Land of Israel.
6. The renewed Jewish national culture should exhibit continuity with the Jewish past (including the Biblical, rabbinic, and medieval legacies) insofar as is possible with the rejection of formal religion. Such modes of continuity may include celebrating traditional Jewish holidays in secularized form; maintaining the validity of traditional Jewish ethical models; and adopting traditional Jewish literary sources as models for inspiration of modern Jewish literature.

To the previous thinkers must be added another group, who may be styled “radical secular Zionists,” including such thinkers as Micah Joseph Berdichevsky, Joseph Hayyim Brenner, and Jacob Klatzkin. The thinkers of this group agreed with principles #1–#5 of the above list but differed sharply with #6. In its place, they would assert:

7. The renewed Jewish national culture should be free to express the existential values of present-day Jews without regard for previous Jewish legacies, with the possible exception of the Biblical legacy. Indeed, rebellion against the rabbinic and Diaspora legacies (including some of their ethical formulations) is perhaps mandatory as a prerequisite for asserting a healthy modern Jewish national identity.

The debate between the conservative and radical Zionists came to famous formulation in Ahad Ha-Am’s essay, “Transvaluation of Values”

(1898), in which he argued for the ongoing validity of traditional ethical values against the younger generation of Zionist Nietzscheans. Nevertheless, this debate was conducted on a common basis of both sides accepting the fact of secularization (Principle #1).

Autonomism. The historian Simon Dubnow formulated an ideology which he dubbed “autonomism” that agreed with points #1–#3 and to some extent with point #6 of the conservative cultural Zionist platform but disagreed with #4 and #5. Dubnow maintained, on the basis of his detailed study of Jewish history, that Jews historically exhibited the characteristics of a national group, including limited self-government (or “autonomy”), despite their lack of complete political independence or exclusive possession of a territorial homeland. In place of #4–#5 Dubnow would stipulate:

8. The Jews have historically expressed their national culture in a wide variety of languages – Hebrew, Aramaic, Judeo-Arabic, Judeo-Spanish (Ladino), Judeo-German (Yiddish), and others. Today they may continue to express it in the traditional Jewish languages still in use, as well as in the modern languages of their host nations (Russian, German, French, and English).
9. Aside from the impracticality (around 1910) of establishing a Jewish homeland in the Land of Israel, the Jews have an opportunity to demonstrate to the world the ethical superiority of a nationalism that does not require its own territory, and will therefore never need to fight wars on its behalf.

Yiddishism. In Polish-Russian Jewry from the 1860s onward, Jewish writers started developing a modern vernacular literature in Yiddish, which started from portraying traditional religious Jewish society in a mixed sympathetic-satirical vein and progressed over the next generations into a full-fledged exploration of modes of Jewish consciousness that reflected modern European and American culture on every level and with every degree of modernist secular assertion (See Howe 1976). Several of these writers (particularly Yehudah Leib Peretz and Chaim Zhitlovsky, with the collaboration of Nathan

Birnbaum who was not himself a Yiddish writer) articulated an explicit nationalist platform, which affirmed a Jewish national identity with Yiddish as its language. This platform was formally articulated in the Yiddish Language Conference held in Czernowitz in August 1908 (see Weiser and Fogel 2010). It can be formally defined as an adoption of Dubnow’s “autonomist” principles, with the additional principle:

10. For Ashkenazic Jews, growing up speaking Yiddish, the Yiddish language is (a/the) preferred language of national-cultural expression.

Bundism. In the 1890s in Eastern Europe, young Jews who had joined the socialist movement started organizing activity among working-class Jews. Initially, they used the Yiddish language for practical purposes, for purposes of propaganda. The permissibility of affirming Jewish national-cultural identity within the context of an internationalist socialist movement was first denied, then debated, and finally affirmed. At the same time, joint affirmation of a Jewish cultural legacy and universalist socialist principles evolved into an affirmation that there was some intrinsic connection between them – the Jewish legacy was selectively interpreted to support the affirmation of socialism as a modern consequence of Biblical ethical ideals. (A similar selective appropriation of Jewish traditional values took place in the socialist wing of the Zionist movement.) To the foregoing principles of Autonomism and Yiddishism, Bundism would therefore add:

11. There is an intrinsic affinity between the ethical values of the Jewish tradition (appropriated in secular vein) and the political values of the movement to which we adhere (in this case, socialist, but other secular Jews might fill in the blank with a different political or cultural ideology).

Unaffiliated Secular Jews

From the start of the Enlightenment-Emancipation period, there were individual Jews who did not identify with any of the Jewish

religious movements or secular Jewish ideologies, yet who were identifiably Jewish in their own eyes or the eyes of others, and who expressed in their creative, social, and political achievements values around whom debate has persisted, whether to call them characteristically “Jewish” or not (Principle #11 in another context). On the grid of this discussion, they may be regarded as the most “secular” of all, as they have “liberated” themselves not only of religious tenets but also of the tenet (derived similarly from Jewish tradition) that Jews ought to constitute themselves as a Jewish group for the sake of doing Jewish things together in concert. Though these Jews might agree in part with Principles #1–#2 of the secular Jewish ideology as defined above, they explicitly dissent from #3.

One of the prototypes of this ultimate “secular” Jew was Heinrich Heine. He exhibited the “marginality” praised by Isaac Deutscher (1968) in an impressive number of ways. Though associated for a while with Leopold Zunz’s *Verein für Cultur und Wissenschaft der Juden*, he maintained no further Jewish group affiliations after becoming baptized in 1825 (which he underwent for the purpose of qualifying for a law career which he thereafter did not pursue). Identifying as a German poet, he was expelled from German lands on account of his radical political stands (but he thereafter sharply criticized his erstwhile political comrades). He settled in Paris and reported on French politics for the German journals and on German philosophy and literature for the French press. In an essay on fellow-ex-Jewish radical Ludwig Börne, he defined “Hellene” and “Nazarene” as two opposing types that included religious, esthetic, ethical, cultural, and political dimensions – a typology that was later explicitly acknowledged by Matthew Arnold as one of the sources of his philosophy of “Hebraism” and “Hellenism.” Though Heine identified polemically in this and other writings of his middle period with the “Hellene” and against the “Nazarene,” he reverted to the opposite identification during his last years when he laid bedridden from a paralytic illness, reading the Bible and praising Moses as the artist par excellence who created the Jewish

people – more durable than the Pyramids – and anticipated socialism in the Jubilee law.

Deutscher expresses a common modern folklore (as well as giving vent to his own preferences) by naming Spinoza, Heine, Marx, Rosa Luxemburg, Trotsky, and Freud as exemplars of this class of “non-Jewish” Jew. Mosse (1985) shows that in the heyday of German Jews constituting a subculture of universalist-conceived *Geist* within the larger German culture, they spanned the political gamut and included such figures as the *Völkisch* Wasserman, the nonpolitical Kafka, and the esthete Aby Warburg. What they all had in common, though, was that they followed no rules except the inner rules of their own vision, which differed from one to the next. As all principles were debatable, it may be better to speak of common “themes” characteristic of this group:

12. Whether one thinks of oneself as “Jewish” or is regarded as positively Jewish by others comes and goes mysteriously, but is often worth discussing. Often the non-Jewish Jew becomes more Jewish posthumously.
13. Judaism as religion is passé; but what Judaism “really” represents beyond any formal religious definition – whether ethically, socially, politically, culturally, or esthetically – may be of intense interest (and the focus of irresolvable debates).
14. The non-Jewish Jew generally prizes universalism over particularism. This penchant for universalism is sometimes viewed as the antithesis of religious or Zionist parochialism, or alternately as the true essence of Judaism at its best. And yet – in his private moments sometimes the particularist Jewish self-asserts itself after all; Freud belonged to the Bnai Brith, and Einstein embraced Zionism (See Yerushalmi 1991).
15. Though “organized” religion is off-limits, it is certainly permissible to seek “the spiritual” under various guises – even occasionally under the name of “God” – as long as one does so nondogmatically and with openness to insight from any source, whether from science, art, literature, philosophy, or the total ensemble of the world’s spiritual traditions.

Conclusion

It should be evident from the above survey that there are an almost inexhaustible range of relations, combinations, and variations of the terms “secularism” and “Judaism” taken together. For example:

World: “Secular” by definition is world-affirming; Judaism as a religion varies from being more world-affirming or less world-affirming (more ascetic) but is rarely world-denying.

Human being: Classic religious Judaism defines the human being preeminently in relation to God; secularism defines the human being as autonomous, but religious Judaism recognizes a certain degree of human autonomy.

Life and death: Classic religious Judaism has variable notions of afterlife, but even in its other worldly variants affirms the value of this life; secularism is centered on this life. Though there is a difference of emphasis here, it is a matter of degree.

Reality: Classic religious Judaism recognizes the reality of the present world and the *real* existence of a transcendent realm; secularism recognizes the reality of the present world and the importance of transcendent values with *ideal* existence in the human mind; though there is a difference here, the possibility of translation from one to the other is evident.

Knowledge: Religious Judaism in its rabbinic and (even more) in its philosophical forms recognized the validity of knowledge from secular sources (philosophy and science), and confronted the task of mediating between it and knowledge from revealed religious sources. Secularism recognizes only the secular sources as providing objective knowledge, but in its moderate forms is receptive to religious sources, critically examined, as sources of subjective human wisdom. Also, as we saw, the secular Jewish movements were receptive to the traditional Jewish sources, approached secularly, as models for developing modern cultural Jewish identity. The chief difference here is which sources of knowledge are considered authoritative: for traditional Judaism,

the religious tradition is the primary authoritative source, and for secularism, modern science.

Truth: For classical religious Judaism, God is the primary source of truth, and the Torah the primary vehicle, but reason is an important secondary criterion, and the findings of reason and revelation must ultimately agree. For secularism, reason (and the associated tradition of science based on observation and rational analysis) is the only reliable criterion of truth; though truth may arrive from other sources, it must pass the bar of reason in order to be certified as truth.

Perception: Biblical man “sees” and “hears” the evidences of God’s revelation. For Saadia Gaon, there were four sources of knowledge: sensation, rational intuition, deduction, and revelation, all of which agreed. In modern secular epistemology, sensual perception is the base of the hierarchy of knowledge, and all depends on it; claims to revelation are suspect.

Time: The religious outlook divides all time into three phases: creation (the origin of all things), history, and eschatology (the end of days when all will be made perfect under God’s rule). Some secular outlooks (such as Marxism and the visionary forms of Zionism – Moses Hess is a middle link between the two) adopt a similar eschatological outlook, though without God. On the other hand, some traditional religious thinkers (like Maimonides) anticipated some of the sobriety of post-modernist secularism, that even if the Messiah comes, the order of nature, with life, illness, and death will remain fundamentally unchanged.

Consciousness: (1) Metaphysically, the religious outlook posits a fundamental difference between conscious, rational human existence and the inert existence of inanimate nature. The secular outlook (following Spinoza, who is a key figure in the transition to the modern outlook here) sees more continuity between conscious and nonconscious being. Contemporary religious apologists minimize the distinction between body and soul especially in Biblical thought, but it cannot be eradicated. (2) All outlooks, ancient and modern,

recognize the distinction between ordinary and heightened modes of consciousness. The word “inspiration” has a metaphorical sense for Maslowian “peak experience” or artistic creativity, and a literal sense for Biblical thought (“the *spirit* of God rested on him, and he prophesied”).

Rationality/reason: *Hokhmah* (“wisdom”) is a positive value in all the strata of the Biblical corpus, as well as in rabbinic thought. Rabbinic thought also recognized *sevara*, the power of independent human reasoning distinct from revelation. The philosophical tradition in medieval Judaism recognized the validity of secular philosophical reasoning and tried to mediate between it and the revealed tradition. In modern secularism, reason becomes the sole arbiter of truth; however, it is possible that some of the traditions of the past will pass through the sieve of that arbitration and come out validated, or prove necessary for providing cultural identity and ethical values.

Mystery: One of the interesting debates in modern Jewish scholarship (initiated by Gershom Scholem and his disciples) is to what extent the mystical tradition of kabbalah was a minor underground current in “normative/mainstream” Judaism, and to what extent it was itself an essential part of the mainstream, creating many of the typical and abiding values of Judaism. Modern Jewish theology replicates this debate in the dichotomy between theologians of a more rationalist bent (Kaplan, Soloveitchik, Levinas) and others of a more mystical bent (Buber, Heschel, Green). As for secular culture itself, one must distinguish between a tradition running from the Enlightenment through positivism and modern analytical and scientifically based thought, versus a countertradition running from the Renaissance mystics (such as Boehme) through Pascal, the Romantics, Surrealism and existentialism. Neither religion nor secularism has a monopoly on rationalism or on mystery.

The Common Legacy of Judaism and Secularism. Today’s Jew finds himself at the end of 3000+ years of Judaism and 200 years of secularization, with all the above-described variations

and combinations played out. The freedom to choose from all these varieties and concepts is by itself a part of the secular legacy, which values openness and freedom. The insistent sense of imperative – if it is present – is a part of the Jewish legacy. Ultimately it is up to each Jew – if he or she chooses – to select the combination of elements from each of the legacies to construct one’s outlook and value-orientation. If (as the foregoing seeks to illustrate) the Jewish and the secular share a considerable overlap, though with difference of emphasis, the final result of such a process may very likely end up deserving both the descriptions “Jewish” and “secular.”

Cross-References

- [Cultural Studies](#)
- [Judaic Studies](#)
- [Judaism: An Overview](#)
- [Natural Theology](#)
- [Philosophy in Judaism](#)
- [Progressive Judaism](#)
- [Secularization, Secularity, Secularism](#)

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Secularization

- [Secularism in Judaism](#)
- [Secularization, Secularity, Secularism](#)

Secularization, Secularity, Secularism

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Related Terms

[Secularization](#)

Definitions

Secularism is an attitude or political ideology aiming to eradicate religion from public and social life, or at least regulate and control religion, and especially limit its influence on state politics. *Secularity* is a condition where religion is absent from specific areas of society, e.g., state and public sphere, and/or the minds and practices of people. Secularity in specific political and public spheres may be caused by a specific politics of secularism or by the need of politics with state neutrality in terms of religion in a society with several competing religions. *Secularization* is a complex historical process, especially known from Western Europe (Davie 2002), often leading to (and partly caused by) politics of secularism. For society, secularization means that the overarching and, as it often seems, the transcendent religious system are reduced to a subsystem or a marginal dimension of cultural identity in a functionally differentiated society. For the individual, secularization means moving from a religiously authorized, integrated world to, *pace* Weber, a “disenchanted” world. Secularization often develops along with weak and broken horizons for human identity and

ambivalent interpretations of crucial experiences and the meaning of human existence. In certain areas (though so far in only a few) that may be signifying the end result, religious traditions finally disappear.

The Latin word *saeculum* means an amount of time, an age, or a century. Not least after the introduction of the clock in the twelfth century, time could be checked without listening to the religious bells of the monasteries and churches. At the Reformation, the transfer of (Catholic) church property to (Protestant) princes was called secularization. Since then, the word has been used to describe hundreds of similar processes in many areas – at state, institutional, and individual levels.

Secularism and Secularity

It has been argued that the major clash today is between religiously grounded civilizations (Huntington 1996) – or conversely between hopeful Asian, humiliated Middle Eastern, and frightened Western, especially European, cultures (Moïsi 2008). However, an equally serious clash, based on an almost total lack of mutual understanding, is that between religious and secular cultures or between secular and religious elements in the cultures of the world (Juergensmeyer 2003).

In the second half of twentieth century, the world was inhabited by (religious) Indians and ruled by (secular) Swedes as Peter L. Berger has put it (Berger et al. 1999). In spite of the personal religious commitment of various American presidents and their different religious-political rhetoric, the politics of the world in the twentieth century was governed by secular minds. In the index of former US Secretary of State Henry Kissinger’s masterpiece on statesmanship, *Diplomacy* published in 1994, the word “religion” does not appear even once. Today, such an omission ought no longer to be possible – even among secular political scientists.

Over the last 30 years, the relation between politics and religion has been changing. In the 1980s, the three Abrahamic religions became

more visible in politics, with Menachem Begin from the Likud Party winning elections over the more secular Labor Party in Israel in 1977, anticommunist Polish Cardinal Karol Wojtyła being elected pope in 1978, Ayatollah Khomeini seizing power in Iran, and the Moral Majority being formed in the USA in 1979. The fall of the Berlin wall in 1989 outdated the focus on conflicts between East and West and created space for what some have called the clash of civilizations: the September 11, 2001, attack on the twin towers in New York by radical Islamists and Muslim protests against the Danish Muhammad cartoons, published in *Jyllands-Posten* on September 30, 2005, to name but two.

Especially in the case of Denmark, it is obvious that it is not the role of religion in the life of the people that has been changed. On the contrary, what has been changed and what has caused the overheated political debate on religion is its role in the modern politics of symbols. In three major Danish newspapers, the debate on religion covered 25% of all public opinion material in 2005 – in one of the world's most secularized countries!

Much of the turbulence around the role of religion in politics – and the politics of secularism – is linked to the fact that European politics of secularism often rest on historical myths. The 1648 Peace of Westphalia recognized the principle from the 1555 Peace of Augsburg, by which the princes gained the right to determine the religion (s) of their own state (*cuius regio, eius religio*). It is a myth, however, that the European wars between 1618 and 1848 were “religious wars,” in which it was religious differences that caused the states to fight. They were rather wars through which European national states were reestablished, supporting themselves with the aid of state religions. Another myth is the idea that democracy in Europe developed after Christianity and secularization had already led to a state of secularity, even though it was often Christian conservative parties that promoted democracy (and were themselves secularized in the process). In the same way, the six countries, Germany, France, Italy, and the Benelux countries, the original signatories to the treaty of the European Economic Community in 1957, were

all influenced by Christian politicians. Democracy did not come about as a result of secularism (Christoffersen). Rather, democracy together with other factors led to the politics of secularism and the process of secularization in Europe, which, however, has not so far been followed by a similar process *outside* Europe, where many forms of rapid modernization are taking place without the accompanying secularization that has been the dominant pattern in Europe.

Where we have seen new attempts by religious leaders or religiously defined groups to take over or dominate political power in other parts of the world, not least after 1979, in Europe, the so-called return of religion in the public sphere most often resembles the old European tradition with the nation-states using religion as a tool to support and legitimize themselves. In a number of European countries, the state's legitimization of civil religion is practiced (e.g., Britain), while in other countries such as Denmark civil religious practices have become more visible (e.g., in memorial services for soldiers). As the state seems to have no heart as such, it sometimes uses churches to express popular feelings linked to certain national affairs. France, with its strong principle of separation of church and state (*laïcité*) since 1905, is at one and the same time limiting the visible presence of religion in public places such as schools, yet promoting a National Islamic Council, and this is happening in a situation where the place of religion has switched radically from a principle of heteronomy to that of politics of identity, supporting individuals and minorities in an uncertain modern society. By listening to the public voices of religious leaders and sometimes even negotiating with them, President Sarkozy and other European politicians act as secular leaders attempting to integrate religious minorities in a democratic society, though they are far from ascribing any right of domination to these leaders.

In similar ways, the politics of secularism are manifold and complicated around the world, depending for instance on the state of secularity in the population and the process of secularization – or the absence of such a process. Principles of secularism, e.g., the independence of state government from religious influence, are found

in the constitutions of religious countries as widely diverse as the USA, India, Pakistan, and even Iran (Christoffersen 2006). In all cases – and most obviously in the USA with its “wall of separation” between church and state – the actual influence of religious forces on state politics is inevitable, such as when democratic elections of MPs and presidents for secular politics depend on religious affiliations and support.

It was said of Turkish writer Orhan Pamuk when he was awarded the Nobel Prize for Literature, 2006, “in the quest for the melancholic soul of his native city (he) has discovered new symbols for the clash and interlacing of cultures.” As cultures are increasingly interlacing with one another, religions are interlacing with all sorts of dimensions of our societies in what seem unpredictable ways. For this reason, to describe the relationship between religion and its surroundings, the term *intertwinement* has been coined as being more appropriate than *separation*. Religion is adoptable, adaptable, and potentially everywhere available. Religion may mean and do almost anything, including absolutely nothing. It is often hard to *include* religion in the discourse, but it is also often hard to *exclude* it. What may be achieved in the politics of secularism is at best a *regulation* of the ways in which religions function in our societies.

Secularization

There are no metaphysical laws determining the historical process of secularization. If we take secularization to mean a process leading to *secularity* as a condition where religion is removed from specific areas of society, e.g., the public sphere, then secularization is promoted and more or less determined by state politics (Riesebrodt 2007:244–253). This is so even if religious traditions throughout the world refuse to see themselves as privatized and marginal in society. In sociology of religion, *differentiation of spheres in society* is the dominant definition of secularization. Another common definition emphasizes *the regression of religious beliefs and practices among common people in daily life*.

In both senses of the word, Western Europe – as Grace Davie has argued – is the primary and almost only example of significant secularization. In recent years, the debate, especially among sociologists of religion, has focused on the direction of the secularization process: Is it going to continue until the full disappearance of religion, as argued by Karl Marx and Max Weber? Or has it stopped at the present level? Or, indeed, has it been turned into its opposite in a process of “desecularization”? Or is the place of more or less institutionalized and socially integrated religion being taken over by new and freer forms of *spirituality* after “the massive subjective turn in modern culture” (Heelas 2006)?

The Canadian historian and philosopher Charles Taylor has created a new point of departure for interdisciplinary discussion about secularization in his *opus magnum* from 2007, *A Secular Age*, where, through integrating what has been documented and debated in several disciplines in recent decades, he combines a historical account of the secularization of cultural and social life in Western societies with an examination of the conditions for the personal experiences of, and search for, religious or nonreligious existential self-understanding and practices in the secular age of Western societies.

The historical process of secularization in Europe has passed through a number of phases. Taylor points firstly to the *Reformation* when the hierarchy of holiness is broken, access to God is “democratized” through the individualization of faith and salvation, and finally, the Church is subject to reform by mortals (*ecclesia semper reformanda*) – as indeed hereafter are all sorts of institutions in society. Next comes the idea of *modern civility*, making room for a society based on common culture and manners supported by a rational interpretation of the laws of nature and with the downplaying of irrational antistructures to authorized religion such as carnivals. Next, Taylor points to the long age of *Deism*, where the new trinity is God as destiny, virtue as the golden mean, and eternal life compounded of an eternal soul, the impersonal laws of nature, and art as produced by human creativity (and no longer by imitating God’s

creation). Along comes also *humanism*, which promotes the ideas of the absolute value of the individual human being and of universalism from Christianity, both freed from their connections to God and the Christian faith. The age of *mobilization* changes the established churches into denominations for the individual to choose among, the common backdrop for life in society breaks down, and the individual is left to be saved in the religion of their choice. Eventually, we come to the age of *authenticity*, where only what is experienced by the individual or some trustworthy first person (the author) can be believed. If we do not *feel* God, then he is dead. Conversely, if traditions and practices where God is alive are experienced as authentic, then God is alive again for that individual.

For Taylor, the process of secularization has especially three lines of development. Most fundamental is (1) *disembodiment*, *social disembeddedness*, and thereby, the *excarnation* of religion. In the constitution of human individuals, Taylor at the same time finds (2) a shift from *porous selves*, which may allow themselves to be invaded by religious powers, to *buffered selves*, which control their own relations to and use of, religious elements. Alongside these, he emphasizes (3) *the dissolution of holiness*, the belief that God's power is somehow concentrated in certain people, times, places, or acts. Being secularized – and not just old-fashioned religious or newly spiritualized – means (4) being able to experience the deep coherence and even fullness of life within *the immanent frame* where “God” at the most can be seen as the way the individual is part of the great evolutionary emergence and limited to the destiny ascribed to each of us as a part of nature. For Taylor, it is important that secularization is not primarily a disenchantment of life (as in Weber) but a very real transformation of human and thus religious life:

We have moved from an era in which religious life was more ‘embodied’, where the presence of the sacred could be enacted in ritual, or seen, felt, touched, walked towards (in pilgrimage); into one which is more “in the mind”, where the link with God passes more through our endorsing contested interpretations – for instance of our political identity as religiously defined or of God as the authority

and moral source underpinning our ethical life. (Taylor 2007: 553 f.)

The process of secularization has ended not with the *disappearance* of religion but with radically *changed conditions for relating* to religion. For society, secularization means that the overarching and, as it seems, transcendent religious system is reduced to a subsystem – to a more or less marginal dimension of culture in a functionally differentiated society. For the individual, secularization means moving from a religiously authorized, integrated world into a disenchanted world with broken horizons for human identity and ambivalent interpretations of crucial experiences and the meaning of human existence.

Taylor accepts that religion is a viable interpretation of life. So are humanism and naturalism. He considers these three as equal from a philosophical and scientific point of view. His personal view, however, is that life depends on nature and culture, within which an experience of fullness can be embodied. It is a condition for human life that we always ask for more, for transcendence:

Transcendence escapes embodiment in the sense that, on the one hand, I do not know if my present way of reaching God, understanding of God or whatever, is inadequate. It does not do justice to reality and hope that I will somehow be able to climb further. But, on the other hand, there is no way in which I will have a relation to God which is not in some way or the other embodied. It is just like when I am writing a poem and I am trying to find the right word and I feel all the time this is not the right word, but what I am trying to do is to find the right word, so there is no way for me getting that written without finding the word. (Taylor in Lombo et al. 2003)

Secularization is an integrated part of a complex historical process in Western societies, affecting human beings who are complex creatures – parts of nature but always reflecting on their own existence and place in history and nature. Secularization has changed the conditions for religious life in Western societies, but it has never made religion disappear – nor indeed has any “desecularization” made religion return – except for in specific cases and areas. Secularization cannot be adequately described as a process of subtraction, whereby religion increasingly

disappears from modern life as a result of modernity. On the contrary, it may be argued that exactly the malaises of modernity are challenging religion to *contribute* to human life in modern society. Especially in recent decades, the ethos of authenticity that originated during the Romantic age has established itself as a common condition for human beings in Western societies. The central question thus seems to be: What is experienced as “authentic”?

This is far from meaning that religion will return to a leading role in existential interpretation and practical support in the challenges of modern life. It does mean, however, that the long religious traditions which for centuries were part and parcel of our societies will remain as a common heritage to be drawn on in many areas of life – perhaps even more so in postmodern times. Jürgen Habermas, who personally believes in modernity and not in religion, puts it this way:

In the West Christianity not only fulfilled the initial cognitive conditions for modern structures of consciousness . . . Egalitarian universalism, from which sprang the ideas of freedom and social solidarity, of an autonomous conduct of life and emancipation, of the individual morality of consciousness, human rights and democracy, is the direct heir to the Judaic ethic of justice and the Christian ethic of love. This legacy, substantially unchanged, has been the object of continual critical appropriation and reinterpretation. To this day there is no alternative to it. And in light of the current challenges of a postnational constellation, we continue to draw on the substance of this heritage. Everything else is just idle postmodern talk. (Habermas 2006:150f)

Future Prospects

It is generally agreed that the processes of modernization, often combined with urbanization, rationalization, and the massive introduction of modern technologies, do not in themselves lead to secularization. Some even use the terminology that modernities can be multiple and varied, with components of religion and secularity playing all sorts of roles.

In European tradition, the main trend is still to define modernity as a culture where (1) relations to nature are pragmatic and instrumental, (2) relations

to fellow human beings are separated into public and private spheres, (3) the individual can act and see himself/herself as an autonomous being, and (4) relations to something absolute such as God depend on the choice of the individual and are only applicable in the private sphere. Often, the views of the destiny of modernity and religion are bound together. Some – in line with Marx and Weber – think that modernity is an unfinished project which will eventually lead to a full secularization. Others think that modernity in Europe for all of us is a realized condition of life which nonetheless cannot sideline religious questions and needs. In that case, the process of secularization is not likely to come to an end in any foreseeable future.

Cross-References

- [Christianity](#)
- [Deism](#)
- [Embodied Theology](#)
- [European Studies](#)
- [Imagination](#)
- [Religion, Sociology of](#)
- [Religiosity](#)
- [Transcendence and Immanence](#)

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Sedation

► Anesthesiology

Selection Pressures

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Environmental constraints that limit an organism's access to vital resources for survival and reproduction. These pressures are typically thought of in ecological terms such as limitations in food or shelter, or the necessity of avoiding predators. However, selection pressures can also be present in terms of access to mates, attraction preferences exhibited by mates, or social pressures that influence status within a group. These pressures are often divided into those represented by natural selection (competition for ecological resources, disease, predation etc.), sexual selection (competition for mates), and social selection (competition for social status).

Self

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Related Terms

Consciousness; I; Mind-body; Mind-body problem; Person; Soul

When answering the questions like “what are we?” and “who am I,” the concept of self is typically

employed. In minimalist terms, a being can be described as a self when it is able to have first-person thoughts. In order to have this kind of self-experience (such as, “it is I who is looking back at me in the mirror”) in the sense that humans and some animals do, symbolic language and self-consciousness is needed. In human evolution, the turning point was the emergence of *Homo sapiens*, who had more developed cognitive functions compared to *Homo erectus* and other members of the *Homo* lineage. These capacities combined with symbolic communication enabled the recognition of oneself as “I.” Mirror tests performed on certain nonhuman, highly developed primates demonstrate that this capacity is not restricted to *Homo sapiens* alone (Hysussteen and Wiebe 2011). This alone, however, does not yet help us to fathom the ontological status of the self, that is, in what sense the self exists.

The question about the nature of self is one of the most complex issues in contemporary philosophy, science, and theology. This is due to the fact that self (like the neighboring concepts of person, ► [personhood](#), ► [consciousness](#), and ► [soul](#)) exists in the borders of multiple modes of enquiry, which all are constantly developing and changing. It would be easier to list those sciences, which do not have bearing on our understanding of the self than those that do, and even in this case the list would be very short. In addition to the vast array of sciences that all want to have their say on self, the discussion is complicated by the disagreement between the sciences, their underlying theories, methodologies and philosophies, and even political agendas.

For example, postmodern philosophers typically see the deconstruction of any stable notion of self as their ethical and therapeutic duty. This is supposed to liberate humans from external restrictions. In contrast, some scientists wish to reduce human personhood to the level studied by neuroscience and thereby purify the discourse from the purportedly vague talk of the philosophers. Where some seek to end external control, some seek to strengthen it. In both of these two cases, the means, however, are relatively same, namely, adopting a skeptical attitude toward the existence of any stable and sustained self (Strawson 2009).

Both of these options are problematic for those religious notions of self, which require stability and continuity as well as a nonreductive understanding of self, soul, and person. For example, monotheistic religions need some kind of a stable self in order to make the idea of postmortem survival internally coherent or the idea of moral progress or growth in virtues possible. Of course, self is defined differently in different religions and sometimes these interpretations are debated within the traditions themselves. Some Eastern religions deny the existence of self and regard it illusory; some consider it to be real, but only episodic. Thus the relevance of the discussion about self in the sciences and humanities for specific religions has to be decided case by case. The greatest challenge for the understanding what is meant by the concept self is that it has radically different uses in different contexts. In the following, two basic ways of using the concept are distinguished.

Where Am I?

Depending on the context, self can be approached from scientific/philosophical or existential/sociological perspectives, and naturally there is much overlap. The scientific/philosophical question is focused mainly on the location of self. If I use the word “I,” what do I refer to? Are we bodies, brains, immaterial souls, bundles of impressions, or some fusion of these, perhaps something else? Maybe there is no such thing as “I”? The heart of problem here is the difficulty to locate the *thing* that is the self. Above I gave a general, popular scientific answer to the question about what self as a concept means. These scientific/philosophical questions are more interested in the nature of the self: what kind of thing it is. The answers follow more or less the standard solutions of the ► [mind-body problem](#) in the ► [philosophy of mind](#), with the crucial distinction that the mind-body problem is about the nature of consciousness and other mental phenomena, while the question about self is about the nature of the subject of these phenomena. Choosing some

particular theory about the nature of the mind does not yet answer the question who we are as individual beings. The main ways of defining self in this context are either substantival (self is either physical or nonphysical entity) or non-substantival whence self is, as David Hume insisted, a bundle of sensations without any integrating unity (Olson 2007).

Recently, the emergence of neuroscience has had effects for the notion of self. If I detect the firing of neurons or an increase of blood pressure in some areas of the brain, does this mean that I have detected a human self? Is this event a human person? For example, Francis Crick (1995) has argued that we are “no more than the behavior of a vast assembly of nerve cells and their associated molecules.” Those who oppose this conclusion argue that Crick has committed the *mereological fallacy*: he has attributed properties of the whole being to some particular part of that being. In other words, it is *I* who feels, the person, not my brain. This is not to deny that brain is one of the central organs we need to experience pain in the first place, but pain is the property of the whole being, not just one organ.

How Did I Become Me?

The existential/sociological question requires a more practical answer. Existential considerations involve questions, such as how we see ourselves in relation to the various expectations of our culture or our own personal ideals. Sociology is, among other thing, interested in those mechanisms that shape our self-image. More deterministic theories see individual selves as mere reflections of the environment they happen to dwell in; this view is sometimes called environmentalism. In order to confront this kind of determinism, it is common to use different concepts to speak about person’s own desires and actions in contrast to self as it exists as a product of the society. This “unsocial” self brings in the element of indeterminacy. The question how much we are actually able to control how our selves are formed is open for debate (Elliot 2009).

From the existential/sociological perspective, self is the place where conflicting powers meet and clash with each other. Postmodernists usually speak about “subject” instead of self as it draws attention to being subjected to something, being influenced from the outside. Postmodern theory of the subject attacks stereotypical and frozen definitions of the self, in favor of more fluid and plural identities. The apparent paradox is that, in its radical forms, this politically motivated ideological strategy seems to make any sustained and public political action ultimately vacuous or even more subject to ambiguous use of power.

Both contemporary philosophy and psychology acknowledge the plural nature of human self-conception. We can inhabit multiple self-understandings in our lives and even at the same time. Among others, Charles Taylor and Paul Ricoeur have stressed the role of narrativity in our understanding of the self. Self is not an unchanging thing, but something that comes into being when our life is presented in the form of a narrative. This is one way we can try to have an access to an integrated self, without being able to answer all ontological questions; self just is the being that has had all these experiences. The narrative self is sometimes contrasted with the episodic self. Perhaps the best artistic portrayal of an episodic self is the representation of singer-songwriter Bob Dylan in the movie *I Am Not There* (2008), where Dylan is portrayed by different actors in a way that does not seem to form a coherent story.

Recently, Patrick McNamara (2009) has suggested that religion is an adaptation that allows us to cope with the fragmentation of the self. Religious activity helps the individual to mediate between the ideal self and current self by providing a framework, which is able to join together conflicting elements, both in individual and societal level. Ideally, religion contributes to healthy self-understanding and communal life by giving a structure to our lives. Here “religion” works as a meta-category that does not take into account particular philosophical or theological notions of self, and how self in fact appears in different traditions.

Cross-References

- [Externalism and Internalism](#)
- [Personality Psychology](#)

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Self Organization

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A defining feature of developmental systems that arises because dynamic interactions involve a dialectic relation between system-changing and system-constraining relations. Such a balance between changes that make the system different and changes that maintain the structure and function of the system reduces the potentially infinite complexity of the system and, as such, enables the identification of continuous instances of structure and function.

Self, From a Psychological Perspective

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Related Terms

[Consciousness](#); [Identity](#); [Self-awareness](#)

Description

The concept “self” has shifting meanings as a result of it originating in religious ideas about the soul, being heavily philosophized during the Renaissance and most recently being the topic of scientific research. The dominant contemporary definition is that self is the thoughts and images people have about themselves. Such a definition opens up the self to empirical research by asking people, in various ways, what they think about themselves. However, the self was not always conceived of as an empirical phenomenon.

The concept of the “self” grew out of religious thinking about the soul. Early thought experiments by Avicenna and Descartes tried to demonstrate that the thinking mind exists independently of all things material and thus that it belongs to the immaterial realm of the soul. Descartes was particularly influential in arguing for an ontological dualism between material and immaterial realms. In practice, this dualism was as much political as ontological. Specifically, it served the diplomatic function of legitimizing the sphere of science on the one hand and the sphere of religion on the other. While this dualism was a coup for science, in that it consolidated the domain of science as all things material, it created a problem for empirical research on the self because the self was seen to inhere in the immaterial realm.

Hume was one of the first to try to bring the self within the domain of empirical research. He argued against conceiving of the self as a spiritual

or religious concept. “Man,” Hume wrote, “is a bundle or collection of different perceptions” (Hume 1740). Thus, the self, according to Hume, is little more than the ongoing stream of thoughts, perceptions, and memory images as they are experienced. What Hume did was to take the self out of the immaterial realm of the soul and plant it firmly within experience – thus opening it up to introspective analysis. This situating of the self within phenomenological experience provided an essential platform for subsequent theorists and researchers who could then investigate, by introspection, the experience of self.

With the separation of psychology out of philosophy in the latter half of the nineteenth century came an even more determined effort to bring the self within the purview of scientific analysis. Central to this effort was William James (1890). James furthered the conceptualization of the self as an empirical thing, open to scientific analysis. Using introspection, James developed a model of the self which still provides the foundation for much contemporary scientific research on the self.

According to James, there are different levels of the empirical experience of self. At the most basic level, there is what he called the material self. This concerns the things that we can call “mine” – including our bodies, clothes, families, homes, cars, possessions, and accessories. The second level is the social self and includes the ideas and images that other people and groups have concerning us – including our parents, children, friends, colleagues, and society at large. The third level James somewhat confusingly called the spiritual self. The term spiritual reflects the religious heritage of the concept, but as James uses the term, it pertains to nothing spiritual. This third level includes our faculties of mind and habits that we identify with – our will, memory, determination, attention, moral convictions, piety, guilt, anxieties, and so on. Accordingly, it might be more appropriate to refer to this as the psychological self.

Today, there is a large and diverse scientific literature which elaborates James’ outline and proceeds to examine the various thoughts and images that people have regarding themselves.

Using a disparate set of terms, researchers examine people's self-concepts, self-representations, self-images, self-narratives, social identifications, and identities. One important finding to emerge across this research emphasizes the social nature of self. Although people are not very good at judging what other people actually think about them, there is a close connection between what people think about themselves and what they think other people think about them.

James added subtlety to the three layers of the empirical self by pointing out that each layer contains past, present, and future images. In support of this idea, research has since shown that people have a range of "possible selves" which can be central to people's sense of self even if they are not currently living out those possible selves (Markus and Nurius 1986). James emphasized that the existence of different possible selves in the past, present, and future makes possible a range of tensions within the self. This aspect of James' thinking has been developed in research on discrepancies between these images. For example, a discrepancy between someone's self-image in the present and their ideal future self-image should lead to motivation to change. Alternatively, a discrepancy between their self-image in the present and their ideal self-image could lead to depression or anxiety (Higgins 1987).

James was acutely aware of the religious and philosophic heritage of the concept of self. Accordingly, he devotes considerable analysis to the question: Is there anything beyond the material and social images of the self in the past, present, and future? Is there something "behind" these images which bind them together and which create our phenomenological experience? In short, is there anything approximating a soul?

Using introspection, James finds no evidence for anything beyond the phenomenological act of thinking and introspecting. Moreover, from the point of view of science, he argues that there is no benefit in postulating a "thinking substance" behind the thinking in order to explain the thinking. However, he does acknowledge, under the influence of Kant, that every thought about an object presupposes a thinking subject and thus that there is by definition an aspect of people's

selves that is beyond the content of the thoughts they have about themselves. James proposes to call everything which the self thinks about the self "me" and withholds the term "I" for that aspect of the self which does, or rather is, the thinking.

The three layers of the empirical self, and all the self-images in the past, present, and future, are all part of the "me" – they are self-descriptions. They cannot include the active, thinking, describing subject – the "I" component. Each thought about "me" and each act of self-regulation presupposes an "I" which is the subject of the thought or act. If the concept self were reduced to only the "me" – to self-description – then the self would be inert and inactive. Before a child has a self-narrative or self-concept, and thus before she has a "me," the child is still an active agent in the world: The "I" is active. As time passes, the baby becomes a child and develops self-descriptions, and each movement of self-awareness, each emergent self-conception puts, as it were, clothes on the naked "I" of action. First there is action, then there emerges an image of oneself acting, and then, those images begin to mediate action. But the self-images always lag behind the active component. According to James, one can never fully know oneself: The "I" of each action and thought exceeds previous self-description, thus making the self fundamentally open unto the future.

Recently, these ideas have led to research on the dialogical dynamics of the self (Aveling and Gillespie 2008). The self is conceived not only to be a system of self-images, or self-regulatory tensions between those images, but also to be a system within which there are I-positions which shape the stream of self-images but which are not themselves within that stream. The I-positions are not self-representations: Rather they are the positions from which people represent themselves. For example, someone who thinks that they are very wealthy, and prides themselves on their wealth, has, one could argue, internalized and cultivated a consumerist and materialistic I-position from which they are evaluating themselves. Alternatively, someone with a disability who stigmatizes themselves has,

arguably, internalized a negative view of others and that has become an I-position within their self. It is the position from which they stigmatize themselves. I-positions are often socially constituted through the internalization of the perspectives and discourses of others. Research has examined the contradictory tensions both between I-positions and between I-positions and self-images (Gillespie 2007).

Self, when conceptualized in common sense terms, seems to refer to something inside the person, an individual, idiosyncratic, even solipsistic thing – but it is not. As James recognized, and further research has productively elaborated – the self is deeply social. Considering first the “me,” it is social in four ways: First, each “me” image is a self-observation and on an equivalent footing to the observations we make about other people. In this sense, self-images are attributions and acts of social perception. Second, our various me images are significantly influenced by what we think other people think about us. Third, how we think about ourselves and other people is influenced by the societal roles occupied. Fourth, each culture provides a range of collectively created and historical images, some idealized and others scorned. In this way, each of us constructs our own self-images out of the cultural templates and narrative tropes that we are offered within our cultural milieu. Turning now to the “I,” it is social in a different sense: It is a set of socialized practices, tendencies, impulses, and habits. These habits of thought often correspond to the thoughts of others, and as such, when we adopt an I-position, we are in fact often taking the perspective of others.

If the self is social rather than spiritual, that opens it to change. We should expect that as society changes, so people’s selves will change. New self-images and new I-positions should become available, and new values link them together creating new ideal self-images and thus new impulses for self-regulation. But it is important to emphasize that people are not the passive objects of societal and cultural change. Rather, they are agents within the change process.

To study this self-constitutive process, Foucault (1988) introduced the concept of

technologies of the self. Technologies of the self are means which we use to act upon ourselves. Religions, much of psychology, and many cultural practices can be thought of as social technologies aimed at reconstituting selves. For example, Buddhism offers meditations and practices for breaking down the attachments and desires of the self. Consumerism, on the other hand, promises retail therapy through cultivating and satisfying people’s attachments to products. Both are technologies of the self, and clearly they constitute very different selves. The list of technologies of the self is long: Each therapeutic practice, many religious practices, many institutional regulatory practices, and many common sense strategies of self-control are part of the processes through which selves reconstitute themselves. Contemporary societies are characterized by a proliferation of possible selves, and even contradictory self-ideals, combined with a wide range of techniques for cultivating the desired self-image. Today, Gergen (1991) argues, we are becoming “postmodern selves” – swimming in a sea of media images and communication technologies, which enable us to cultivate and live out many disparate aspects of our selves. This tradition of research is distinctive, in that the self is not something to be discovered and described, rather it is something that is made and remade.

Our conceptualization of the self has changed as the concept has moved from the domain of religion, through philosophy, to the domain of science. But, it is not only our conceptualization of the self which has changed, what the self is has also changed. Each conceptualization of the self entails different normative ideals (Markus and Nurius 1986) which have been used to guide our educational activities, socialization practices, and personal techniques of self-regulation. That is to say, different societies at different points in time have created different selves. The mechanisms of self-creation are societal institutions and technologies. Realizing this reflexive and fundamentally cultural and historical aspect of the self gives us an obligation to conceptualize the self in such a way as to open up, rather than close down, new domains in which the self can be cultivated and performed.

Cross-References

- [Personality Psychology](#)
- [Phenomenology](#)
- [Philosophy of Mind](#)
- [Self, from a Psychological Perspective](#)
- [Simulation Theory](#)
- [Social Psychology](#)
- [Soul](#)
- [Theory of Mind](#)

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Self-Actualization

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As utilized by Abraham Maslow, self-actualization refers to the full realization of a person's potential. Placed at the top of Maslow's need hierarchy,

self-actualization was postulated as possible once the lower basic and meta needs of the self were met. Of particular importance, self-actualization is perceived to be motivated by the intrinsic desire for growth in the person, whereas more basic needs are motivated by deficiencies.

Self-Awareness

- [Self, From a Psychological Perspective](#)

Self-Help

- [New Age Religions](#)

Self-Organization

- [Chemical Thermodynamics](#)

Self-Regulation

- [Coping, Psychology of](#)

Semantics

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Description

A great many things possess meaning, e.g., thoughts, actions, gestures, natural objects, cultural artifacts, and linguistic expressions. Although all have meaning, some bear logical relationships and some do not. Clearly, while relations of synonymy (sameness of meaning),

antonymy (oppositeness of meaning), hyponymy (meaning inclusion), homonymy (same words/different meanings), analyticity (truth by virtue of meaning alone), entailment (whenever A is true, B is also true), logical truth (B follows necessarily from A), and equivalency (B follows necessarily from A and vice versa) obtain among linguistic expressions, they are not present in religious rites, hadrons, paintings, or storm clouds. Although both kinds of objects have meaning, they do not have it in the same sense. Theories of semantics arise principally in response to questions about meaning of the second variety: How do linguistic expressions gain and bear meaning?

The term “semantics” derives from the Greek adjective “*semantikos*” meaning “significant.” While philosophers have always been interested in semantic questions (especially Plato, Aristotle, the Stoics, Augustine, medieval philosophers generally, Hobbes, Locke, Leibniz, Berkeley, Hume, Mill, Peirce, etc.), semantics has been more deeply explored since the 1879 publication of Frege’s *Begriffsschrift*. While semantics has been traditionally studied within philosophy, since the late 1960s it has been increasingly explored within linguistics proper, where it is now investigated alongside of syntax, morphology, and phonology. One can distinguish within semantics the analytical study of artificial languages from the empirical investigation of natural languages. While the first seeks to provide an unambiguous interpretation or model for formal languages, the second aims to grasp the relations between terms and their meanings already present within natural languages.

Semantics is one of the three branches of semiotics (the study of signs), the other two being syntax and pragmatics. While syntax concerns relations among linguistic symbols, and pragmatics relations of uttering, using, responding, etc., to extralinguistic entities where the intention of the speaker, linguistic ability, belief, audience, and context of use are crucial, semantics deals with the relations of referring, denoting, and connoting extralinguistic objects generally. Semantic theories may be broadly divided among theories of meaning (connoting

and intension), theories of reference (denoting and extension), theories which combine elements of both, and pragmatic theories taking meaning to be the use made of an expression by interactive participants.

Of fundamental importance in semantics is the distinction between an expression’s extension and intension. Intuitively, the intension of an expression is simply its meaning (or concept) and the extension what is “picked out” by that meaning. More specifically, the extension of a singular term is its reference, of a general term the collection of things to which that term applies, and of a sentence its truth-value. Alternately, the intension of a singular term is its sense, of a general term the property or relation so expressed, and of a sentence the asserted proposition.

Extensionality applies if and only if the substitution of one term (or predicate) by another having the same referent does not change the truth-value of the sentence under question. Consider the following where “ $\Box$ ” means “necessarily”:

1. $\Box(9 > 7)$
2. The number of planets = 9
3. Thus, $\Box$ (the number of planets > 7)

The argument is clearly invalid because (1) and (2) are true while (3) is false. But what went wrong? Even though “the number of planets” and “9” have the same extension (the number nine), substitution of one for the other within a context of necessity (a “modal” context) does not preserve truth, and thus the context is intensional. In addition to modal contexts, intensionality also characterizes quotations, indirect speech, propositional attitudes (e.g., “believing that” or “knowing that”), intentional constructions (e.g., “looking for” or “wishing for”), and temporal designations. While extensional semantics has been enormously successful within formal languages, it has proven less so for natural languages. For instance, while the extension of “is a unicorn” and “is a ghost” is the same (both designate the empty set), natural language wants to be able to say “S believes that y is a unicorn” is true and “S believes that y is a ghost” is false.

Theories of meaning and theories of reference are framed to account for different sorts of things. Meaning, theories attempt to explain notions of synonymy, analyticity, entailment, intensional contexts, intentionality, and meaning inclusion, and thus appeal to sense, meaning, semantic markers, and lexical entry. Such theories employ a componential analysis in which the meaning of words is decomposable into more primitive semantic markers. Meaning theories can be divided further into atomic theories precluding analyticity and molecular theories presupposing it. On the other hand, extensional theories of reference extend to truth conditions – logical, necessary, and contingent truth – and entailment and therefore appeal to reference, denotation, satisfaction, truth, models, and possible worlds. An advantage of theories of reference is that they seem ontologically simpler, for one need not posit the existence of meaning entities. In addition, one can distinguish internalist and externalist semantic theories. While the former understands the semantic relation as holding between language and “what goes on in the head,” the latter asserts a relationship between linguistic expressions and the world.

Another group of theories argues that the conceptual role of expressions and mental states are most important in understanding semantics. “Conceptual role semantics” (sometimes called “functional role semantics” or “procedural semantics”) are related to the pragmatic attitude of the later Wittgenstein, whose “meaning as use” approach supposes that meaning must be understood functionally. Conceptual role semantics thus claims that the meaning of linguistic expressions and the content of mental states is determined by the role played by them. The theory is applicable both to language in an ordinary sense and to mental representations – either as part of a “language of thought” or as mental states generally. Because the theory denies that thoughts have intrinsic content prior to their functional use, meaning, and content derive from use, not vice versa.

While broadly speaking, conceptual role semantics claims that the content of linguistic symbols or mental states is determined by use,

more narrowly, conceptual role semantics asserts that the content is determined by symbols or mental states within inferential mental processes. Simply put, the meaning of a sentence is fixed by its place within the network of the inferences it legitimates. (Fodor calls theories of this kind “inferential role semantics.”) While the relevant “uses” which determine meaning generally in conceptual role approaches include perceptual input, internal thinking, and behavioral output, another class of (information-based) semantic theories claim that a symbol’s content rests solely upon the first of these uses: information about the environment carried by the symbol’s internal tokening.

Self-Identification

Science

While philosophical semantics explores what it is about language, persons, and the world that makes words and thoughts have meaning, linguistic semantics concerns itself primarily with the empirical question of how the meaning of particular expressions contribute to the meaning of larger ones. Just as physics starts with natural objects and properties and explains their interrelationships without advocating a philosophical ontology, so too linguistics seeks to explicate the interrelationships of linguistic meaning without ontological prejudgment. Although this is the goal, philosophical issues arise frequently in the work of contemporary linguistic semantics, a fact that is not surprising given the role philosophers have played in the area.

Since semantics is part of linguistics, and linguistics explores linguistic competence by investigating the innate endowment of human beings to speak a language, linguistics (and thus also semantics) is sometimes thought to be a special domain within psychology. Chomsky, for instance, speaks of “I-grammar,” an internalized grammar having the components of phonology (rules telling how to pronounce expressions), syntax, and semantics. By virtue of this I-grammar, humans have an ability to acquire linguistic capacity; they possess a “language acquisition device” which explains

how they can learn a grammar though they have a poverty of stimulus.

Chomsky and followers argue “mentalist” theories of language against behaviorist methodologies that understand human linguistic behavior without appeal to internal states. Their mentalist theories were generally internalist in that they presupposed what Putnam calls “the principle of methodological solipsism,” the notion that psychological states do not presuppose the existence of individuals external to the subject. Each speaker has her own internalized grammar, I-grammar, which is intensional, individual, and internal. While internal mentalist theories hold that speaker grammatical competence can be accounted for without postulating anything external to grammatical states, external mentalist theories claim that while each person has an internal representation, there is yet a relation between elements in the person’s I-grammar and external objects. The nature of this relationship is a topic of some dispute. One option groups the I-grammars of individuals into resemblance classes; another holds that individual I-grammars token an I-grammar type. Critics have claimed that the ability of humans to learn language is accounted for on the basis of a general learning ability and not on the basis of a special linguistic-acquisition device. Others argue that the science of semantics need not appeal to internal representations at all.

Extremely important for the development of linguistic semantics is the pioneering work of Tarski’s student, Richard Montague, who rejected a theoretical difference between formal and natural languages. In denying that natural languages were too unruly to be formalized, he claimed that both syntax and semantics could be grasped algebraically, and a homomorphism maps the elements of syntactic algebra onto the elements of semantic algebra. In his formal semantics, Montague showed how the compositionality of syntax could map to a corresponding compositionality of semantics. Because syntactic rules put expressions together to form expressions, corresponding semantic wholes can be decomposed into more primitive parts.

The work of Katz should also be mentioned. His acute sensitivity to intensionalist elements

within natural languages, and his scathing criticisms of naturalism – his semantics does not reduce meaning to either use or to truth-functional, referential approaches – produced a trajectory of work that has been crucially important within linguistic semantics. He and Fodor proposed the first semantic theory in the framework of generative grammar: Starting with the semantic component of primitive lexical items, they showed that the meaning of longer expressions could be generated through application of recursive projection rules. Jackendoff’s “conceptual structure” approach also accepts this principle of compositionality and identifies an expression’s meaning with the mental representation of its content, but his semantics analyzes verbs and sentences in terms of the notion of abstract location and movement.

Religion

A central semantic problem arises in all religious traditions: What do religious and theological expressions *mean*? In the sixth century, Pseudo-Dionysius articulated the problem of how human language oriented to the finite can conceptualize and speak of the infinite:

Nor can any words come up to the inexpressible Good, this One, this Source of all unity, this supra-existent Being. Mind beyond mind, word beyond speech, it is gathered up by no discourse, by no intuition, by no name. (*On Divine Names*, 49–50)

Allegiance to this Dionysian-inspired apophatic tradition is found in varying degrees in most medieval theologians. Anselm’s unconceptualizable “that which none greater can be thought” and Aquinas’ analogical predication are two examples. Famously, the latter held that when referring to God, language is neither simply univocal (same sense) nor equivocal (different sense), but analogical: While the sense of the earthly term or predicate is stretched, it nonetheless remains applicable to the divine.

By the eighteenth century, trust in the apophatic approach had given way to suspicion. Hume suggested that because propositions in which “God” appears cannot be built up from propositions analyzable into simple ideas correlated to simple impressions, the propositions lack

meaning. Hume's insight clearly fueled twentieth-century concerns about religious language. Ayer famously denied truth-conditional semantics to religious and theological language entirely, asserting that all synthetic propositions not reducible to statements of sense experience are nonsense. Flew pointed out that because the believer's utterance, "God loves his children," is consistent with any way that the world might have gone, it is not falsifiable and thus meaningless.

Responses to this challenge were twofold: Some argued that the positivist theory of meaning was incorrect; others argued that religious language did connect empirically to the world by providing a label for particular empirically discernible patterns or a framework for explaining experience. Braithwaite argued that religious language communicates parables and stories that stimulate moral conduct, while Hare claimed that religious assertions merely state nonfalsifiable frames of reference ("bliks") that express evidentiary standards. Other accounts of religious and theological language include expressivist views in which religious language merely expresses human existential states and orientations, and metaphorical views where language functions nonliterally but sometimes referentially.

An interesting semantic issue concerns the putative reference of "God." Does "God" refer to a "rigid designator," the same individual in all possible worlds regardless of how language refers to it (Kripke), or does it denote a "world line," an individual that winds through possible worlds according to its identification within various intensional contexts (Hintikka)? The question is important religiously because it concerns the priority of semantics over both metaphysics and epistemology in religious contexts: Believers seemingly succeed in referring to God even in the absence of both metaphysical and epistemological accounts of the divine.

Characteristics

Important for understanding the significance of semantics is the "linguistic turn" of the last

century. While much of the history of philosophy has focused upon the object (world), the Enlightenment ushered in a preoccupation with the subject (self), the epistemic agent whose investigation was deemed necessary for knowing the world. Much on nineteenth-century philosophy continued in this subjective spirit by stripping meaning out of the world and locating it in "the head" (psychologism). Twentieth-century philosophy, however, made the "linguistic turn," arguing that meaning resided neither primarily in things nor in the head, but rather in language. This approach implicitly made semantics foundational for all reflection about the self and its relationship to the world.

Relevance to Science and Religion

The question of the semantics of religious/theological and scientific language is logically prior to relating these languages to each another. Consider the expressions "God created the heavens and earth" and "the universe resulted from the Big Bang." How are they locatable with respect to each other? Do particular statements in the sciences entail statements in religion or theology, or vice versa? Is there a statement entailed by one that conflicts with a statement entailed by the other? Crucial here is the question of how the terms and concepts of each discipline acquire and sustain meaning.

We can distinguish semantic atomistic, semantic molecularistic, and semantic holistic approaches. While the first claims that the meaning of a representation (term, concept, etc.) is that to which it applies, and the second that the meaning is determined by its relationship to other (but not all) expressions, semantic holism holds that the meaning of a representation is determined by its relationship to all other representations within the system. Accordingly, a linguistic statement has meaning only within the context of a language, a scientific hypothesis has meaning only in the context of a theory, and a concept has meaning only within the context of a belief system.

Obviously, if semantic holism is true, it becomes difficult to relate scientific and

theological statements, for an individual scientific statement s has meaning only within the context of an overarching scientific theory, and a religious statement r has meaning only within religious practice and reflection. But how is it possible to relate s and r without the religious person knowing enough scientific theory to understand s , and the scientist knowing enough theology to understand r ? In its most extreme form, semantic holism asserts *incommensurability* between religious/theological and scientific theory: There is no way to map meanings from one language into or onto the other. Fortunately for the religion/science discussion, claims of incommensurability are overstated, for the necessary condition for plotting the semantic difference of these putatively disparate languages is the existence of a common background language onto which the sentences of each can be mapped.

Sources of Authority

Philosophical semantics grounds its authority in logical analysis, and linguist semantics finds authority in empirical methods coupled with such rigorous analysis. Clearly, both make extensive use of logic and set theory, and one cannot enter the discussion deeply without competence in these areas. Crucial for the development of philosophical semantics in the twentieth century has been the work of Frege, Wittgenstein, Russell, Tarski, Quine, and Davidson. Within linguistic semantics, the work of Chomsky, Katz, Montague, and Jackendoff has been especially significant. Important journals in the field include *Linguistics and Philosophy*, *Natural Language Semantics*, *The Journal of Semantics*, *Mind and Language*, and *The Journal of Logic, Language, and Information*.

Ethical Principles

Semantics is guided by standards of academic excellence that apply to the empirical sciences and philosophy generally. There is no special

code of ethics that guides the work of the semanticist. Scholarly societies include *The Linguistic Society of America*, *The European Society for Logic, Language and Information*, and *Die Gesellschaft für Semantik*.

Key Values

Just as human beings are curious about nature and the causal laws at work within it, so are they concerned with meaning and the regularities and laws governing it. Semantics' key values are mathematical precision and rigor. An example of such precision and rigor is *model theory*, a method by which artificial languages are granted interpretations.

One begins by assigning meaning to sentences through a *boolean interpretation*. Such an interpretation β assigns either "true" [1] or "false" [0] to each letter in language L . The interpretation is a *function* that maps for each and every sentence in L some unique value (1 or 0). For any sentence letter in L , say θ , and a particular boolean interpretation β_1 , we can say that " θ is true for β_1 " or " β_1 of θ is true." Because L is "truth-functional" – the truth-value of compound sentences are a function of the truth-value of simple sentences comprising them as they are connected by the five standard logical operators of negation, disjunction, conjunction, conditional, and biconditional – giving a boolean interpretation to the simple declarative sentences gives truth-values to all compound sentences. We thus obtain a "boolean model of a set." If every sentence belonging to a set Δ of sentences in L is true for a boolean interpretation β , then β models Δ . Accordingly, β models all simple sentences assigned as true under its interpretation, and all compound sentences model truth-functionally derivable from those sentences: " β models Δ " if and only if $\forall s \in \Delta [\beta(s) = 1]$, or more succinctly " $\beta(\Delta) = 1$." If no boolean interpretation models Δ , then Δ is *unsatisfiable*. If some boolean interpretation β_1 models Δ , then Δ is *satisfiable*. If for every sentence $s \in L$, and any interpretation β_1 , if s is true for every β_1 , then s is a tautology:

Furthermore, if any boolean interpretation modeling Δ also models θ , then θ is a tautological consequence of Δ . Accordingly, if β models $\Box$ and $\Omega \subseteq \Box$, then β models Ω .

Things become more complicated with predicate logic. Allow f to be a function that assigns an element from nonempty domain D to each logical name in the calculus. An interpretation I is a function that assigns either 0 or 1 to each 0-ary relation letter, assigns to each 1-ary relation letter a subset of D , and assigns to each k -ary relation letter a k -ary relation among elements in D . An interpretation specifies the domain, and the denotation of each sentence letter ($1 \vee 0$), the denotation of a 1-ary letter (a set), and the denotation of a k -ary letter (a set of ordered k -tuples). The naming function f then assigns a unique element in D to the names in the language. Thus, for the set of all Americans D , if b is Bush, and $P = \{x \mid x \text{ is an American president}\}$, Pb is true because $b \in \{x \mid x \text{ is an American president}\}$. A “naming interpretation” consists in the ordered pair $\langle I, f \rangle$ which assigns definite meaning to any statement of the language. A sentence θ is true for an interpretation I if and only if, $\forall f \in \langle I, f \rangle$, $(\theta) = 1$. $\langle I, f \rangle$ is a model of $\Box$ if and only if $[\forall \theta \in \Box](\langle I, f \rangle (\theta) = 1)$, that is, it is a model for $\Box$ if and only if every sentence in $\Box$ is true. A set of sentences $\Box$ is *satisfiable* if and only if $\Box$ has a model, that is, that they are all true given a certain interpretation and naming function.

Interpretations of models can be further studied as algebraic groups. Accordingly, an interpretation maps from a language “domain” onto a range that is a structure. The elements in the range of the mapping are the elements of a structure. A structure S models a set of sentences Ω just in case the interpretation models Ω . When an interpretation models Ω , we say that M models Ω , or that M is a model of Ω . “Model” thus carries two meanings: (1) It is an interpretation for which a given sentence or set of sentences is true and (2) it is a structure. A “theory” is furthermore defined as an ordered triple $\langle L_t, \Omega_t, \text{Cns}_t \rangle$, where “ L_t ” is the language of the theory, “ Ω_t ” the axioms of the theory, and “ Cns_t ” the semantic consequences of Ω_t . We say that “ θ ” is an *assertion* of theory T just in case $\theta \in \text{Cns}_t$.

Conceptualization

Nature/World

Semantics does not reflect directly upon the meaning of nature and the world, but rather upon the meaning of linguistic expressions about nature and the world. Because semantics deals with language, it is crucially important for those disciplines claiming knowledge of nature and the world, and is thus central in understanding the nature of scientific theory.

Human Being

One way that semantics connects to the question of human being is in the relationship between semantics, linguistics, and psychology. If scientific semantics is a subset of linguistics, and linguistics – as many argue – is a subset of psychology, then the study of semantics must tell us something about ourselves. Moreover, if one is committed to mentalism, then it is clear that when humans learn about semantics, they are learning something about their own capacities for inner representation.

Life and Death

Semantics does not deal with questions of life and death but is concerned with any interpretation of the meaning of questions about life and death.

Reality

Semantics does not deal with metaphysical questions directly but is useful in disentangling them. This is particularly true when considering the phenomenon of reduction, the claim that the things talked about in one discourse (the reduced theory) *really are* things talked about in another discourse (the reducing theory). Examples of reductions in philosophy include *logicism* (reducing statements about numbers into statements of logic and set theory), *phenomenalism* (reducing statements about external macro-objects into statements of actual and possible experience), *logical behaviorism* (reducing statements about mental states into stimulus–response conditionals), *logical positivism* (reducing statements employing theoretical entities to ones referring only to observed

objects), and *naturalism* (reducing normative ethical statements to ones whose terms refer to natural properties only). All these philosophical reductions are semantic, for all use definitional equivalence statements (i.e., statements in the reduced theory just mean equivalent statements in the reducing theory).

Semantic reductions like these have been out of favor in philosophy since the 1950s, however, and have been replaced by theoretical reductions that understand the biconditionals connecting theoretical terms in the reducing and reduced theories as specifying coextensive property instantiations. While statements in the reduced theory *mean* something different than statements in the reducing theory, the reduced theory statements are true if and only if their corresponding reducing statements are true, e.g., the reduction of thermodynamics to statistical physics.

Reductions can also be found in theology and religion, though they are not often presented as such. For example, Kant semantically reduced talk of God to expressions about morality, while Schleiermacher reduced it to modifications of the feeling of absolute dependence. Marx, Freud, and Durkheim attempted theoretically to reduce religion to economics, psychology, and sociology, respectively.

A general philosophical question concerns the reduction of semantic content to some other domain. For instance, if one begins with materialist ontological commitments and regards the phenomenon of “meaning” as not conforming with these commitments, then one might want to eliminate, reduce, or somehow square claims of meaning with what one thinks there ultimately is, e.g., “naturalizing semantics.”

Knowledge

Epistemological questions arise in connection with semantic theories in a number of ways, the most obvious being the charge that semantics is not possible as a scientific theory. A powerful tradition of semantic skepticism associated with Wittgenstein claims that since linguistic expressions and utterances vary meaning from context to context and user to user, there is nothing

constant across the tokening of these expressions for a scientific semantic theory to be about. Another way semantic theory relates to knowledge is the verificationist criterion of meaning where knowing a statement’s meaning is knowing how to verify it. In this way, language-dependent epistemic norms become the subject matter of semantics.

Truth

Semantics is tied to truth within truth-conditional semantics. On this extensionalist view, the meaning of a declarative sentence is grounded in its truth conditions: To know what the sentence means is to know what the world would have to be like in order for the sentence to be true. Accordingly, semantics is concerned with *truth* for any syntactical language *L*. In order to understand this, we must distinguish an object language from a metalanguage.

Object language *L* is formed by specifying rules for the formation of proper formulas – so-called *well-formed formulas*. Here is an example:

$$\exists x \in D(Wx \ \& \ Px)$$

This states that there is some element of domain *D* that has *W* and *P*. The metalanguage *uses* words or symbols to *mention* the object language. For instance, one might say that the symbol “ $\exists x \in D$ ” specifies that there is at least one object within domain *D*, and “*Wx*” and “*Px*” state that this object has a particular property *W* and *P*, or alternately, that this object is simultaneously a member of the set of all objects having *W* and all objects having *P*. Assuming that the metalanguage *m* is used to mention the object language *L*, specific rules are given in *m* which specify necessary and sufficient truth conditions for each sentence in *L*. According to Tarski, the material criterion for truth of sentences in *L* is a statement like the following:

“ $\exists x \in D(Wx \ \& \ Px)$ ” is true in *L* if and only if there is someone who both walks and plants flowers.

The material condition for truth is given by that which follows “if and only if” in the locution, that is, “there is someone who both walks and

plants flowers” is an instance of the general material condition form:

... is true in L if and only if _____.

Tarski also specified a formal condition for L. Expressions of the form “is true in L” are precluded from themselves being in L. Semantic theory relates to truth when considering *truth in a model*. See “[Key Values](#)”.

Perception

An example of how semantics relates to perception is information-based theories that use the notion of covariancy to capture the perceptual information carried by the environment. An internal representation of a tokening of blue carries the information that something is blue in the environment. The symbol has the content of blue if and only if the symbol’s application covaries with the instantiations of blue in the environment. But a problem arises: Does the tokening of a rabbit covary with respect to rabbits, undetached rabbit parts, or temporal rabbit stages? Furthermore, the tokens of rabbit or blue must figure somehow in the percipient’s psychology: How does the internal tokening of a symbol relate to other internal states of the percipient?

Time

While there are many ways in which semantic theory might be linked to questions of time, the two are obviously joined in any intensionalist semantics that attempts to give a semantics for tensed verbs. The idea is that just as the meaning of a term can be understood as a function from possible worlds to an individual, so can the meaning of a tensed verb be understood as a function from moments of time to propositions true at those times.

Consciousness

The question of consciousness is tied to semantics loosely because if consciousness is understood as “aboutness,” then that which consciousness is about must have *meaning*. While phenomenology deals with content-meaning generally, semantics concerns the meaning of linguistic expressions and propositional attitudes. One might also argue that while

linguistic ability might not itself presuppose consciousness, the kind of linguistic analysis done in semantic theory clearly does because such analysis presupposes imagination and design capabilities.

Rationality/Reason

Semantics is a highly technical endeavor that demands disciplined observation, rigorous application of mathematical and logical resources, and philosophical sensitivity. Reason, however defined, is necessary for engaging in semantic analysis. Furthermore, the internal representation of semantic structures suggests a determinate contour to our structures of reasoning.

Mystery

With religious language, of course, the question of mystery arises in that words from mundane contexts are supposed to mean and refer to supramundane, divine entities, properties, relations, events, and states of affairs. Sensitivity to semantic issues can help clarify what is essentially mysterious and what is not.

Relevant Themes

To further significant dialogue between religion/theology and science, it is necessary to know the meaning of the statements of each and the expressions into which they can be decomposed. It is as easy for theologians not to understand the semantics of scientific theory as it is for scientists to misunderstand theological semantics. Sensitivity to semantic issues (and issues in the philosophy of language generally) is crucial for the future of these discussions.

Cross-References

- ▶ [Epistemology](#)
- ▶ [Holism](#)
- ▶ [Meaning, The Concept of](#)
- ▶ [Ontology](#)
- ▶ [Phenomenology](#)
- ▶ [Truth](#)

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Semeiotic

- [Semiotics](#)

Semiconductor Physics

- [Condensed Matter Physics](#)

Semiology

- [Semiotics](#)

Semiosis

- [Biosemiotics](#)

Semiotics

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Related Terms

[Semeiotic](#); [Semiology](#)

Description

Semiotics is the study of signs. That is, semiotics is concerned with such things as the processes of signification, representation, interpretation, and the nature of meaning. The field derives its name from the Greek *semeion*, meaning “sign.” The tradition of semiotics can be traced to antiquity, perhaps originating with the Greek physicians as the branch of medicine concerned with the interpretation of medical symptoms and signs. Plato and Aristotle were both interested in the nature of signs and the Stoics regarded the theory of signs as the basis of logic. Augustine (354–430) developed these philosophical approaches to semiotics in a Christian direction, regarding aspects of the natural world as signs of God’s will and activity in creation. Although an interest in what would now be called semiotics may be traced through medieval and Renaissance philosophy, the field only regained a sense of being a distinctive discipline in the wake of Locke’s (1632–1704) division of the sciences into natural philosophy, practical philosophy, and “semeiotica,” or “the doctrine of signs.” Locke predicted that semeiotic would “afford us another sort of Logick and Critick, than what we have hitherto been acquainted with” (*Essay Concerning Human Understanding* Book IV, Chapter XXI). The discipline(s) of semiotics as currently practiced, however, are largely traceable to the work of Swiss linguist Ferdinand de Saussure (1857–1913) and American scientist-philosopher Charles Sanders Peirce (1839–1914).

Self-Identification

Science

Saussure envisaged his “semiology” as “a science that studies the life of signs within society Semiology would show what constitutes signs, what laws govern them. Since the science does not yet exist, no one could say what it would be; but it has a right to existence, a place staked out in advance” (quoted in Nöth 1995, 57). Peirce, in contrast, regarded semiotics as a branch of philosophy rather than a “special science” (equivalent to, say, biology or physics). Nevertheless, Peirce thought philosophy itself should proceed by the method of science. He divided philosophy into (1) ► [phenomenology](#), (2) the normative sciences, and (3) ► [metaphysics](#), and the normative sciences were further subdivided into (a) aesthetics, (b) ► [ethics](#), and (c) ► [logic](#). Logic includes, or is constituted by, semiotics because all thought takes place in signs; logic “may be regarded as the science of the general laws of signs” (Peirce 1998, 260).

Religion

Semioticians would not understand their academic discipline as a religion. Semiotics is sometimes regarded as somewhat obscure and isolated from other academic disciplines (though its essence is, in fact, intrinsically interdisciplinary) with the result that some outside the field may regard it as a “religion” in a pejorative sense.

Characteristics

Semiotics is distinctive in studying that on which all other disciplines rely, namely, the possibility of representation, signification, and interpretation. In that sense, semiotics may be regarded as conceptually prior to, and necessary for, the practice of all other disciplines. Semiotics is therefore intrinsically interdisciplinary in nature, even though practitioners of other disciplines are often not explicitly aware of their reliance on the subject matter of semiotics.

Relevance to Science and Religion

The history of semiotics has many contacts with religion: witness, for example, the centrality of

the concept of “signs” in the Fourth Gospel, Augustine’s semiotic view of the created order, Aquinas’s semiotic account of the sacraments, and the relation between biblical studies and the origin of the discipline of hermeneutics. Given that neither science nor religion can function without using signs and representations of various kinds and given that the ultimate concerns of both would appear to be closely related to the view one takes of how signs work, it is perhaps surprising that the discipline of semiotics has not been more extensively drawn upon by the field of “science and religion” (See Robinson 2010 for an attempt to do so).

Sources of Authority

As noted above, Saussure understood his “semiology” as a branch of science and hence, presumably, would have expected it to proceed on the basis of empirical investigation rather than deference to any authority. Similarly, Peirce regarded emancipation from authority as essential to the whole enterprise of philosophy and science. Nevertheless, two fairly distinctive traditions of semiotics can be traced, respectively, to these founders of modern semiotics. In that sense, it may be helpful to regard Saussure and Peirce as “authorities” in relation to their respective traditions.

Saussure suggested that signs consist of two elements, the signifier (the “sound image,” the spoken word) and signified (the mental concept to which the sound image corresponds). He regarded these two aspects of the sign as related arbitrarily but inseparably – signifier and signified are like the back and the front of a piece of paper; one cannot be cut without affecting the other. A feature of Saussure’s dyadic concept of the sign is that it does not include any element relating to a real, external world. Saussure’s interest was in the relations between signs within a system. Hence, the label “structuralism” to describe the project that he initiated: the Saussurian tradition is interested in how systems of meaning hang together as a whole, rather than in how individual elements in the system connect with some non-semiotic reality.

Peirce, in contrast, proposed a triadic concept of the sign, according to which signs consist of a sign vehicle (sometimes simply referred to as the sign), an object, and an interpretant (the latter being the interpretive response of some agent, not necessarily a conscious interpretation). In his early semiotic theory, Peirce envisaged an endless progression of thought signs, each sign being interpreted by a further sign. This idea of unlimited semiosis is similar to Saussure's position in that it does not offer a clear account of how (if at all) signs connect with the world. Peirce later modified this view when he recognized the importance of "indexes": sign vehicles which are connected to their objects directly or causally (as when a weather vane indicates the direction of the wind). (Apart from indexes, Peirce proposed two other kinds of sign-object relations. Icons represent their objects by virtue of some resemblance; symbols are signs related to their objects by a rule or convention.) Furthermore, according to Peirce, not all interpretants need be thoughts: interpretive responses can also consist in actions (including, perhaps, very simple changes of state of an entity) or feelings.

The Saussurian and Peircean traditions have developed in ways that reflect these underlying differences. The Saussurian tradition has tended to remain anthropocentric. Its difficulty in giving an account of the connection between signs and reality tends to lead to a non-realist epistemology. For example, Michel Foucault claimed to identify a transition occurring in the seventeenth century when a previously triadic concept of the sign (stemming from the Stoics) was replaced by a dyadic concept. As Nöth puts it, "Thus a cleavage appears between the sign and its object. Since words no longer allow direct access to things, all that remains is representation, discourse, and criticism" (Nöth 1995, 305). Jacques Derrida took a step further, arguing that the idea of stable structures of meaning is problematic. According to Derrida, every sign in a system is marked by "traces" of every other sign. The system is characterized both by difference and "différance." Derrida coined the latter

term to allude to the alleged instability of systems of meaning: the meaning of any individual element is infinitely deferred and never fully consummated.

Peirce's semiotics, in contrast, lends itself (as Peirce intended) to a realist ► [epistemology](#). This is because Peirce's triadic concept of the sign includes an object. The object represented by the sign may be something quite abstract (such as a thought or concept) but can also be some actual thing in the (non-semiotic) world. Furthermore, again in contrast to Saussure's approach, Peirce's semiotics is not anthropocentric. Whereas the Saussurian tradition regards linguistics as the paradigm of all semiosis, for Peirce, language is one particular manifestation of more general semiotic processes. Consequently, Peircean semiotics has subsequently been able to expand to include the study of communication and signaling between nonhuman animals and organisms. Indeed, the field of "► [biosemiotics](#)" extends to the study of the role of representation and interpretation in fundamental biological systems such as the genetic "code" (e.g., Hoffmeyer 1996).

For the purposes of this entry, it will be helpful to emphasize the differences between the Peircean and Saussurian traditions in order to illustrate the potential consequences of different approaches to the concept of the sign. This strategy risks oversimplification, however, because it may overemphasize the degree of coherence within, and of separation between, each of the two traditions. Several major semioticians, including Roman Jakobson (1896–1982) and Umberto Eco (b. 1932), may be regarded as drawing on both the Peircean and Saussurian traditions.

Ethical Principles

Peirce regarded logic (of which he saw semiotics as a part) as the third of three "normative sciences." According to Peirce, aesthetics is the study of what is good in itself, ethics is the study of right control of conduct, and logic (including semiotics) is the "science" concerned with establishing right ways of reasoning. The

practices of the “special sciences” (physics, biology, etc.) were, in Peirce’s view, understood to be subject to the principles established by the three normative sciences.

Key Values

Peircean semiotics has, in general, retained closer connections with the natural sciences than has the more anthropocentric Saussurian tradition (see [Sources of Authority](#)). If Peircean semiotics tends to align itself with the values of the natural sciences (see [Ethical Principles](#)), then arguably the outworking of Saussure’s concept of the sign leads toward a different set of values, namely, the values of “suspicion” and “critique.” However, making such a distinction risks oversimplification, not least because the boundaries between the Peircean and Saussurian traditions are not always clear-cut (see [Sources of Authority](#)).

Conceptualization

Nature/World

Peirce once wrote that “all this universe is perfused with signs, if it is not composed exclusively of signs” (Peirce 1998, 394). In fact, Peirce’s philosophy is not consistently quite so “pansemiotic” in its vision as this statement may suggest. Nevertheless, Peircean semiotics at least regards everything in the world as having the potential to become a sign of something else. On the other hand, the Saussurian tradition, in keeping with its anthropocentrism and its lack of an account of the connection between signs and things, tends to be more agnostic about the nature of the world that is represented by semiotic systems.

Human Being

A particular contribution of semiotics to understanding the nature of humanity is to raise the possibility that what makes humans distinctive is our capacity (or the extent or specific form of our capacity) for using signs. This is reflected, for example, in Ernst Cassirer’s designation of

humans as the *animal symbolicum*. More recently, Terrence Deacon has proposed, from a Peircean perspective, an account of human evolution according to which we may be regarded as “the symbolic species” (Deacon 1997).

Life and Death

The field of biosemiotics, stemming from the Peircean school, regards semiotic processes as fundamental to life. Indeed, it has been suggested that the origin of semiosis is closely related to, and perhaps even defines, the origin of life. Although the origin of “coded” information in macromolecules such as deoxyribonucleic acid (DNA) is often regarded as central to the problem of the origin of life, the semiotic perspective suggests that a more general and fundamental issue may be the question of the simplest entity that would, in some minimal sense, be capable of interpreting its environment (Robinson and Southgate 2010).

Reality

As noted above ([Sources of Authority](#)), the Saussurian tradition tends toward a non-realist or antirealist view of the relation between signs and the world. Saussure described the non-semiotic world as “a vague, uncharted nebula” (quoted in Nöth 1995, 81). Peirce, in contrast, described himself as a “scholastic realist of a somewhat extreme stripe” (Peirce 1931–1935, 5.470).

Knowledge

Although the two main semiotic traditions differ in their attitudes to reality, they tend to share a commitment to epistemological non-foundationalism. That is, they do not seek any indubitable starting points for knowledge, either in reason (as did Descartes) or in sensory experience (as do philosophical Empiricists). As Peirce put it:

“But in truth, there is but one state of mind from which you can “set out,” namely, the very state of mind in which you actually find yourself at the time that you do “set out,” – a state in which you are laden with an immense mass of cognition already formed, of which you cannot

divest yourself if you would; and who knows whether, if you could, you would not have made all knowledge impossible to yourself?" (Peirce 1998, 336).

Peirce called his theory of inquiry "critical common-sensism" and regarded it as a development of the "common-sense" philosophies of eighteenth century Scottish thinkers such as Thomas Reid (1710-1796) and James Beattie (1735-1803).

Truth

Peirce conceived of "truth" in terms of the opinion that would be reached by the community of inquirers if investigation were to proceed well enough and long enough:

"The opinion which is fated to be ultimately agreed to by all who investigate, is what we mean by the truth, and the object represented in this opinion is the real. That is the way I would explain reality". (Peirce 1992, 139)

Peirce's notion of the final opinion, as originally formulated, is not entirely satisfactory. Peirce himself acknowledged that he might be asked what he would have to say "to all the minute facts of history, forgotten never to be recovered, to the lost books of the ancients, to the buried secrets" (Peirce 1992, 139). On Peirce's original view, these buried secrets and lost facts would not count as real even though they actually occurred. Conversely, it appears that were the community of inquirers to come to permanently hold an opinion that is at variance with the actual facts, then this opinion would, even though false, be held (by definition) to correspond to reality. Peirce's later formulations of the concept of truth avoid these problems by treating the idea of an ultimate convergence of opinion as a regulative ideal rather than as an inevitable historical occurrence. He therefore came to regard the existence of external reality as the ► [explanation](#) for observed convergences of opinion, rather than making the convergence of opinion constitutive of reality.

In the Saussurian tradition, the tendency toward agnosticism about the capacity for signs to represent a real non-semiotic world leads

to different kinds of question about truth. Questions of interpretative correctness relate more to the "text." Where previously (e.g., with Schleiermacher's biblical hermeneutics) the aim of interpretation was regarded as that of discovering the original intentions of the author, hermeneutics now tends to give priority to the interpreter, even to the extent of regarding the intentions of the author as irrelevant. Interpretation is always, according to this view, part of a "hermeneutic circle," a reciprocal relation consisting in "the interplay of the movement of tradition and of the movement of the interpreter" (Gadamer, quoted in Nöth 1995, 336).

Perception

A question semioticians might ask about perception is whether perceptions are pre-interpretive occurrences or whether they involve interpretation. Husserl (1859–1938) – whose term "phenomenology" was independently coined at around the same time by Peirce – took the former view. According to Husserl, the threshold of the origin of semiosis lies above, and depends on, a pre-semiotic intuition of the phenomena. Peirce, in contrast, regarded perception as much more closely related to, and perhaps inseparable from, interpretation.

Time

Semiotics does not have any unified approach to time, though it does grace the branch of semiotics devoted to how time is represented with the name "chronemics." The two main traditions of semiotics may be regarded as approaching their subject matter from different temporal perspectives. Thus, part of the originality of Saussure's project was to shift attention from the ("diachronic") evolution of languages to the ("synchronic") structural aspects of language at any particular time. Peirce, in contrast, was much interested in evolution and placed his semiotics within a speculative and highly original evolutionary cosmology.

Consciousness/Rationality/Reason

In a Saussurian perspective, the human capacity for using signs tends to be regarded as a product

of ► [consciousness](#), rationality, and reason. In contrast, Peircean semiotics regards consciousness, rationality, and reason as products of semiotic processes. As Peirce remarked, “just as we say that a body is in motion, and not that motion is in a body we ought to say that we are in thought, and not that thoughts are in us” (Peirce 1992, 42).

Mystery

Semiotics does not have any unified approach to mystery, though it has been suggested that “The model of the sign is the model of the sacred: a relation to the Absent, to the Other” (Cassirer et al., quoted in Nöth, p. 381).

Relevant Themes

Three themes may be picked out from the discipline of semiotics that appear particularly relevant to the field of “science and religion”:

1. An epistemological theme: the question of the relation between representation/interpretation and any reality external to such representation. Do religious/theological representations refer to something external to the mind or society that produces them, or are they to be understood in a non-realist sense as (merely) products of these minds/societies. Does religion/theology differ from science in this respect?
2. An anthropological theme: how are we to understand human religious practices and “symbols” (or, more strictly, “signs”) in the light of the discipline of semiotics? Do religious signs/symbols function in the same way (though with different “objects”) as representational practices in the sciences?
3. A theological theme: how do religions construe the relation between sign processes in nature and the existence and creative activity of God? The Fourth Gospel, echoing the first chapter of Genesis, speaks of God having created the world through the “Word”/Logos (John 1.1–3). Can traditional accounts of the role of the Logos in creation be revived or reframed in the light of contemporary semiotic

perspectives in such a way as to cohere with current scientific understandings of the world (cf. Robinson 2010)?

Cross-References

- [Biosemiotics](#)
- [Christianity](#)
- [Epistemology](#)
- [Evolution](#)
- [Philosophy of Mind](#)
- [Semantics](#)

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Semitic Languages

- [Language and Literature, Hebrew](#)

Sensation

- [Perception](#)

Sense-Datum Theory, The

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Briefly means that the perception is been given or sensed (which is in line with Alston's thinking). A distinction is made between the mental act of perceiving or sensing and the object of the perception or sensation. This theory is open for perceptions that may be illusory, because it treats all phenomenal properties as properties of the immediate object of experience. Hence, if an object is perceived as having a property that in reality it does not have, the theory says that some other object, as sense-datum, has this property. Simply put, the sense-datum theory holds that if somebody has a sensory experience, there is something of which this person is aware (Broad 1923; Moore 1910; Crane 2011). Objections to the theory are that the theory places itself between the experiencer and the experienced and therefore it does not solve the problem of how our senses perceive the world (See also the entry by Runehov on ► [Religious Experiences](#)).

Sensory Cortex

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A region of the brain surface which mediates responses to sensory stimulation. Strictly, there are several sensory cortices, each responsive to one form of sensory input – visual, auditory, etc. – and in most cases more than one such area per sensory modality. As a stand-alone term, however, “sensory cortex” usually implies the primary somatosensory cortex, a large strip

extending across the center of the cerebral cortex from the fissure between the hemispheres to the temporal lobe of each side, and activated by mechanical, thermal, etc., stimulation of the skin and deeper regions on the opposite side of the body.

Sensory Evoked Potentials

► [Evoked and Event-Related Potentials](#)

Sensory Experience

► [Perception](#)

Sentiment

► [Emotion](#)

Sex and Gender

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Related Terms

[Identity](#); [Politics of sexuality](#); [Sexual orientation](#);
[Sexuology](#)

Description

Sex

Biological/anatomical diversity between male and female, determined by the chromosome structure possessed by every human being.

Biological Specification

Chromosomal framework and sexual differentiation. It is an indisputable fact that when a human being is born, its sex is determined by the male gamete. Then the information that guides the growth of the cells, the differentiation, and the structuring is all codified inside the chromosomes. The difference male/female is given by the presence or absence of the Y chromosome in the last pair, of the 46 chromosomes, of the human cells. The chromosomes that determine sex are defined as X and Y.

That human beings have 23 pairs of chromosomes, which include 22 autosomes and one pair of sex chromosomes, either XX or XY (the Y chromosome in spite of its small size contains more than 86 genes; the X chromosome contains about 200–300 genes).

During meiosis, the spermatocyte is divided to form the spermatozooids, the sex chromosomes split into two, the Y chromosome goes to a spermatozoid and the X chromosome goes to another. In this way, every spermatozoid is endowed with 22 chromosomes (called autosomes as they are not involved in determining sex) and with one X or one Y chromosome. Because the mature but not fertilized egg cell, for the process of chromosomal reduction, always contains 22 chromosomes and an X chromosome, when it is fertilized by a spermatozoid that contains an X chromosome, the zygote will have its 23 pairs of chromosomes, including an XX and will be a female; instead if the egg cell is fertilized by a spermatozoid that contains a Y chromosome, the zygote will have 23 pairs of chromosomes, including an XY and will be a male.

The presence of the Y chromosome, through what is called the Sry gene, gives the signal for the development of the male gonad, independently of the female sex chromosomes (X chromosome) present. The absence of the Y directs the development of the individual in a female sense. Therefore, at the moment of conception, the genetic sex, male or female, is determined in the last pair of chromosomes present in the zygote. If the last pair of chromosomes is XX, we will have a female individual; if it is XY,

a male will be born. Actually, even if the formula of the sex chromosomes is defined in the zygote, the earliest fertilized one-cell stage of development of the embryo, true sexual differentiation of the external genitals and reproductive organs occurs in the human embryo at the sixth week of pregnancy. The brain sexually differentiates as male or female in the third trimester of pregnancy (Jegalian and Lahn 2002).

Social Specification

In social life, sex is defined as an “independent variable” that might or might not influence attitude and behavior (Parsons 1991).

Despite numerous studies on the issue developed intimate behavior, in some social class, is still a taboo. After numerous studies, emerging from recent statements, in possession of social psychology with reference to the intimate behavior of individuals are: changes in the sexual expression and costumes, differences/similarities between male and female sexual behaviors, reactions to sexual impulses and to pornography (Jaspers 2007). The difference between sexual behaviors is determined also in relation to the action of the nervous system: specifically sexual behavior is under the control of the interaction that the neuronal and hormonal activities.

The hypothalamus (the nervous system structure situated in the brain stem and controls body temperature, thirst, and hunger, and regulates sleep and emotional activity), through a hematic feedback, controls the production of gonadotropic hormones by the pituitary gland, so it regulates certain aspects of reproductive and sexual behavior (Reese and Sanders 2007).

Gender Difference

The difference between male and female that is evident in the physiological sphere affects also the social-cultural sphere and therefore, we speak about gender difference. To be a female or a male is not just determined by purely physical factors but also by a series of behaviors that indicate the female or male status/role, as can be noticed not only in working contexts, but in social-religious ones as well (Guionnet and Neveu 2005).

Gender/Role

The gender is the first category that identifies an individual socially and therefore is at the base of the classifications and of the relations that have a social matrix. "Diversity" is a process that transforms the biological differences into social differences, thereby defining the man/woman representations. A role is a model that includes behavior, duty, responsibility connected to the female and male sex and is the object of social expectations (Delphy 1998).

The male or female role (excluding the obviousness of the biological evidence) derives from the result and the interactions of a series of social-cultural processes of the various public systems with a consequent complex of behavioral rules differently addressed to the individuals of the one and the other gender. H. Schelsky (1912–1984) states that these different rules tend to limit the natural inclinations of individuals producing social-cultural and economic tensions (Schelsky 1955). H. Popitz (1925–2002) follows Schelsky's footsteps. The scholar affirms that the holders of the gender roles are both the addressee and the beneficiary of the rules: In the first case, they are bound by the different rules of behavior according to the gender they belong to; in the second case, the rules do not only lay down the duties but also the rights and advantages of the corresponding addressees (Popitz 1967).

It is necessary to make a distinction between the gender role (masculine/feminine) and behavior and general behaviors. Being a male or a female is different from being a *vamp*, a *dandy*, a *macho*; or living with the conviction that a boy cannot cry or that women need to be constantly protected. Furthermore, in the gender roles, it is convenient to distinguish between *ascribed* roles and *acquired* roles. The ascribed role is of a natural, social order defined at birth. It is an ascribed role to be a man or a woman, young or old, free or enslaved, noble or plebeian. For every role, there are individual differences that regard both the interpretation and the realization of the role itself.

The acquired role is obtained during our lives through the activities and the performances of every single individual. It is an acquired role to

be a husband or a wife, a father or a mother, a pensioner or a student (Toscano 2006). The first scholar to introduce the distinction between ascribed role and acquired role is Ralph Linton (1893–1953). The scholar asserts that the gender roles were ascribed, unlike the professional roles that were instead acquired (Linton 1936). Today, especially in a society with a high rate of variability of the human species, the acquired roles prevail over the ascribed ones (Toscano 2006).

Division of the Social Roles in the Religious Sphere
Every religious perspective in all ages has given to women a subordinate and limited role. The monotheistic religions are exclusively male. In Christianity, God almighty is called "Father," and his representative on earth, Jesus Christ, is conceived as "Son." Woman, because of original sin, is considered by many Christians to be the cause of the first evil. It is not her but "the devil," the Lord of hell. This male supremacy needs to be distinguished between the Old and the New Testament: In the case of the Old Testament, the Genesis says that God created man and woman in his own image and likeness.

For this reason, the two genders have equal dignity and equal nature; but from the moment that God created the male (that is man) first, the first gender is the masculine one and the female created from man's rib has a feminine gender that is second. In terms of time and function, man results to be superior to woman and his characteristics of noble, honorable, strong sex become the universal standard of the behavior in accordance to the role. Instead the woman embodies the deviated role: the seductress, the sinner, the "weak sex," the derived gender.

This deviated profile is extended also to the female body, through biological constructions, elevated to anthropological constant. In contrast to the "pure" man, the woman is considered because of menstruation "impure" and for this reason is bound by a series of prohibitions (Biale 1992).

The Muslim religion, like the Christian one ever since ancient times, has considered women greatly inferior to men. It is sufficient to consult the *Koran* to notice the sharp supremacy of man

over woman starting from everyday life with the obligation to remain silent and to keep the head and the face covered. *Veil = HIJAB*: Arabic word whose root is *hjb*. The term means “to hide the eyes, conceal,” and indicates “any veil in front of one being or object to hide it from view or to isolate it.” In the Sura An-Nūr (The Light) it is said: «And tell the believing women to reduce [some] of their vision and guard their private parts and not expose their adornment except that which [necessarily] appears thereof» (*Koran*, Sura XXIV, 31).

In the first case, the religious man has assured himself the exclusive right of the exegesis and of the preaching and even of the top positions in the religious institutions. The imposition to keep the face and/or the head covered still is in force in the Islamic world: The obligation to wear a veil has become a universally “recognized” symbol of the subordinate role of women while for men to go bare-headed and with a beard symbolizes their direct contact with God. In the Jewish culture, it is above all the woman’s role of “mother” that is emphasized (Ahmed 1993).

The assumption of the maternal role in this case seems to be a makeshift given to women in order to take them away from the negative female roles but actually there are other female roles inspired by chastity, virginity that have permitted women to deny their female sexuality and to transform themselves “spiritually into men.” It is interesting to notice that in almost all the religions, the exegetic and doctrinal aspect of religion is male, while the procedures and the realization of the precepts are female (Schelsky 1955).

The current orientation, above all in Christianity, wants a new social role of women to stand out that is not considered in a subordinate dimension anymore, but equal to the specific role carried out by man. In short, in the sphere of Catholicism, even the most accredited positions in matter from the recent popes are directed toward the confirmation of the peculiarity of the mission assigned to man (such as the presbyterate), but they also exalt the peculiarity of the female mission inside the church (Levitt 1995).

Many religions emphasize the need to respect differences of gender according to their biological sex, male or female.

Cross-References

- ▶ [Affective/Emotional Computing](#)
- ▶ [Biology of Religion](#)
- ▶ [Determinism and Indeterminism](#)
- ▶ [Education, Sociology of](#)
- ▶ [Empathy](#)
- ▶ [Endocrinology](#)
- ▶ [Medical Genetics](#)
- ▶ [Neuroethics](#)
- ▶ [Social Neuroscience](#)

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Sex Drive, The

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A motivatory complex aimed at seeking copulation. May be thought of as one of the three fundamental mating drives: (1) the sex drive motivates an individual to seek copulation with a *range* of partners and is mediated by testosterone and estrogens; (2) courtship attraction motivates an individual to prefer a *particular* partner and is mediated via pheromones, dopamine, norepinephrine, and serotonin; (3) partner attachment motivates an individual to *remain together* with a particular partner long enough to allow for sufficient parental care and is mediated via oxytocin and vasopressin (Fisher, H. (2004). *Why We Love: The Nature and Chemistry of Romantic Love*. NY: Henry Holt & Co.).

Sexual Orientation

► [Sex and Gender](#)

Sexuology

► [Sex and Gender](#)

Shakyamuni

► [Buddha \(Historical\)](#)

Siddhartha Gautama

► [Buddha \(Historical\)](#)

Simulation Theory

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Related Terms

[Mental simulation theory](#); [Off-line simulation theory](#); [Theory of empathetic understanding](#)

Description

Simulation theory is a theory in philosophy and psychology on the way in which we understand others, particularly in common sense psychological (“folk psychological”) explanation and prediction of action. The central claim is that understanding another person is a matter of re-creating or copying the other’s beliefs, desires, and other mental states in one’s own mind. The interpreter thus functions as a model of the target system, the other person, in a way similar to that in which an airplane model simulates the reactions of a real airplane. In some cases, the interpreter voluntarily and consciously imagines herself being in the other’s situation and seeing it from her perspective, having her background beliefs, desires, evidence, and so on. However, following the discovery of so-called mirror neurons (see Gallese and Goldman 1998), the recent debate has brought more primitive and automatic forms of mental replication into focus, which do not necessarily require “putting oneself in the other’s shoes”. (See below on high-level and low-level simulation.)

Besides “simulation” or “mental simulation,” participants in the debate have used the terms “replication” (Heal 2003, pp. 11–27), “co-cognition” (Heal 2003, pp. 91–114), “projection,” “empathy” (Stueber 2006), “empathetic understanding,” and synonyms and cognates of the last-mentioned terms, such as “re-enactment of thought” and the German words *Verstehen*

(understanding), *Nacherleben* (re-experiencing), *Einfühlen* (empathy), and *Hineinversetzen* (transposition; Stueber 2006, p. 11). “Simulation” is the standard term in philosophy of mind and “empathy” in the philosophy and methodology of the humanities and social sciences (Stueber 2006; Davies and Stone 1995a, b; Kögler and Stueber 2000). In psychology, both terms are used (Harris 2000; Håkansson 2003). However, while “simulation” refers specifically to the understanding of others (“mind-reading” or “mentalizing”), “empathy” can also signify the sharing of others’ emotions, and the concern or benevolence for others, sometimes also referred to as sympathy. Some authors distinguish simulation and empathy as separate steps in a mental process where the interpreter first reads the other’s mind and then shares her emotions (Ravenscroft 1998), and some make even finer conceptual distinctions (for example, (Goldie 1999) conceptually separates simulation from understanding, emotional contagion, empathy, imagining oneself being in another’s shoes, and sympathy). Others use “empathy” for the whole process (Stueber 2006).

Simulation and empathy are thus to some extent interchangeable terms, and the two theory traditions overlap. However, simulation theory is a strand in analytical philosophy of the last few decades, while empathy theory has roots in German nineteenth and twentieth century hermeneutics and aesthetics (Stueber 2006, pp. 5–19; Kögler and Stueber 2000). Unlike empathy theory, simulation theory is exclusively concerned with the phenomenon of understanding and interpretation of others (and to some degree oneself). Moreover, simulation theorists have investigated understanding as a topic in philosophy of mind, but have had less to say on philosophy and methodology of the human sciences and moral philosophy, which are central topics in empathy theory (Davies and Stone 1995a, b; Kögler and Stueber 2000). An exception here is Karsten R. Stueber, who discusses both philosophy of mind and philosophy of science, using preferably the term “empathy” but referring mostly to theorists in the simulation tradition, thus connecting the two traditions (Stueber 2006).

Some prominent simulation theorists, mentioned in alphabetical order, are Alvin I. Goldman, Robert M. Gordon, Jane Heal, and Karsten Stueber. Historically, the theory originates in two articles from 1986 by Gordon (Davies and Stone 1995a, pp. 60–73), who introduced the term “simulation,” and Heal (2003, pp. 11–27). However, the prehistory goes as long back as the theory of empathetic understanding. Thus, it includes R.G. Collingwood’s theory of re-enactment of thoughts as the method of history, Wilhelm Dilthey’s theory of understanding in the human sciences, and, at least according to some interpretations, David Hume’s and Adam Smith’s theories of sympathy (on the history of empathy theory, see (Stueber 2006; Kögler and Stueber 2000; Nilsson 2003)). In analytical philosophy, W.V.O. Quine, Robert Nozick, and Hilary Putnam have defended similar ideas using other terms.

One person may simulate another physiologically, for example, by ingesting a drug and predicting that it will have the same effect on the other as it has on herself (Heal 2003, p. 14). In mental simulation, the interpreter exposes herself to the same situation as the other, or imagines herself being so exposed, and assumes that the other will respond by forming the same beliefs, desires, and volitional states as the interpreter does herself. For instance, I may venture to explain Hamlet’s decision to revenge his father by imagining myself being in Hamlet’s place, realizing that my father has been murdered, reacting emotionally to this insight, going through the alternative courses of action, reaching a decision, and finally inferring the motives for Hamlet’s actions by assuming that he was motivated by the same reasons. To understand another’s thoughts on some subject matter, I thus think through the same subject matter myself, and assume that the other is similar enough to follow the same lines of reasoning as I do. The simulation account seems to offer an explanation of the fact that, in common sense thinking, we are often able to predict and explain the actions of others without seeming to know anything like a general psychological or brain physiological theory of their mental functions.

Simulation theory is opposed to so-called *theory theory*, according to which we do understand others precisely by employing a general theory of mind, a set of psychological or other theoretical assumptions by which we can infer the mental states of others from their observable behavior, and explain and predict their behavior from their assumed beliefs and desires (see Davies and Stone 1995a, b; Goldman 2006). On this analysis, the fact that we are often unable to account for our theoretical assumptions shows only that we know them tacitly rather than explicitly. Hence, theory theory takes folk psychology to employ essentially the same general methods or patterns of reasoning as common sense (“folk”) physics. By contrast, simulation theorists see a fundamental difference between the understanding of others and the understanding of nature. With regard to the last-mentioned issue, the debate repeats, or continues, the earlier controversy between that which is sometimes called positivism and hermeneutics, or methodological monism and dualism about the human sciences (Stueber 2006; Kögler and Stueber 2000).

Goldman has also opposed the idea of simulation to the *rationality approach* in interpretation theory, represented by Donald Davidson and Daniel Dennett, among others (Goldman 2006, pp. 4, 23–24, 53–68). According to this understanding or version of the simulation theory, the interpreter re-creates the other’s mental processes without assessing them with regard to their rationality. Hence, the same process of simulation is applied to irrational and rational thought and behavior. By contrast, Heal and Stueber argue that an interpreter who simulates another person ascribes to her the beliefs and desires which, according to the interpreter’s own standards, the other has reasons to hold in the circumstances (Heal 2003, pp. 6–7, 131–150, 225–249; Stueber 2006, pp. 65–97; rationality is here understood in a minimal sense of being responsive to reasons, rather than as the fulfilling of strict requirements of logical coherence and completeness, and Heal restricts herself to what below is called high-level simulation). Thus understood, simulation theory is a form of rationality theory, or overlaps with it.

It can be noted here that W.V.O. Quine, when laying the foundations for the rationality approach, regarded the “projecting” of one’s own logic and language on the other as integral to radical translation (Quine (1960), p. 58, see also Quine’s his analysis of indirect quotation, Quine (1960), p. 219).

It is relatively uncontroversial to say that one person can replicate another’s mental reactions in situations where both are literally in the same circumstances, or very similar ones, and have similar background beliefs and values (Stich and Nichols 1997, pp. 300–302). Gordon gives the example of someone who is hiking and sees a fellow hiker suddenly stop, turn around, and walk quickly in the opposite direction. Asking himself what happened, he looks ahead and sees a grizzly bear further along the path. Seeing this makes him at once experience the same feeling of fear as the other and understand the reason for the other’s behavior (Davies and Stone 1995a, p. 102). Simulation of this type has been called *total projection* (Davies and Stone 1995a, pp. 102–105) and *actual-situation-simulation* (Stich and Nichols 1997, p. 302).

If the other’s beliefs, values, or external circumstances are very different from the interpreter’s, as in many cases of historical interpretation and interpretation of people from other cultures, then simulation becomes more complicated and theoretically problematic. In principle, one could separate four categories of interpretive situations, from the simplest in which interpreter and other share both external circumstances and perspective (point of view, worldview) via the more complex in which they share perspective but not circumstances, and vice versa, to the most complex and demanding, in which they share neither circumstances nor perspective. Simulation in the last type of situation has been called *pretense-driven-off-line-simulation* (Stich and Nichols 1997, p. 303). For reasons explained below, this choice of term is controversial, however.

A further distinction can be drawn between what Goldman calls *low-level* and *high-level simulation* (Goldman 2006, p. 113, 147), and Stueber *basic* and *re-enactive empathy*

(Stueber 2006, pp. 145–147, 151–152). Low-level simulation replicates relatively simple mental states, some of which lack propositional content, such as fear and disgust. It enables us to recognize simple emotions in others by immediate observation of their behavior – for instance, I realize that another is afraid by seeing her facial expression. Such simulation comes as a relatively automatic response, and largely operates below the level of consciousness. It seems closely connected to the phenomenon of emotional, cognitive, and motor contagion (mimicry, imitation) – which, for instance, invokes a feeling of joy in someone who sees expressions of joy in another, or makes someone jump when seeing another jump. There is evidence that low-level simulation depends on so-called mirror neurons, which are activated both during the execution of an action (grasping an object, for instance) and during observation of the same action being performed by others (Goldman 2006, pp. 113, 132–144). The interpretation of this evidence has been disputed, however (Gallagher 2007; Jacob 2008; Goldman 2009).

High-level simulation, by contrast, replicates more complex mental states, such as propositional attitudes, and is generally more voluntary and more accessible to consciousness than low-level simulation (Goldman 2006, p. 147). This is the type of simulation of which it seems appropriate to say that the interpreter imagines herself “being in the other’s shoes.” The nature of such simulation has been a topic of debate among simulation theorists. The two main positions which have emerged can be referred to as the *off-line simulation* view and the *imaginative identification* or co-cognition view respectively.

According to the off-line simulation approach, represented by Goldman and assumed by most theory theorist critics, high-level simulation is essentially a form of inference by analogy (which is not to say that it necessarily depends on all Cartesian notions associated with that idea). Thus, the interpreter simulates the other by imagining herself being in the other’s situation, introspectively observing the resulting goings-on in her own mind, assuming that the

other is sufficiently similar to herself to react in the same way to the situation, and finally attributing her own mental processes and states, or something very similar, to the other. In order to compensate for differences in background beliefs and values between herself and the other, the interpreter puts her cognitive apparatus into an “off-line” mode, where it does not receive its ordinary input or deliver its ordinary output. For the purpose of simulation, she introduces into her mind “pretend” beliefs and desires which match those of the other, suspends (or “quarantines”) beliefs and desires of her own which the other does not share, and disconnects her action motivating mental functions from her motor system so that she does not act on her pretend-beliefs and pretend-desires (Goldman 2006, pp. 28–30; Stich and Nichols 1997). For instance, a social anthropologist studying the Azande tribe attunes her own mind to that of the Azande by pretend-believing in magic, witches, oracles, and so on, without of course for that matter taking active part in Zande customs and rituals. (If there exist no relevant differences in perspective between interpreter and other, the interpreter may simply apply her ordinary ways of thinking “on-line.”) According to this view, the interpreter in simulation acts as a relatively detached observer of her own and the other’s mental states and processes (see Stueber 2006, p. 122).

Some of the central ideas in the conception of high-level or re-enactive simulation as imaginative identification are aptly summarized in the title of one of Gordon’s articles, “Simulation without introspection or inference from me to you” (Davies and Stone 1995b, pp. 53–67). According to this version of the theory, represented by Gordon, Heal, and Stueber, the interpreter’s focus of attention is not on the mind of either herself or the other, but rather on the world as perceived from the perspective of the other (Heal 2003, pp. 91–114; Stueber 2006, pp. 151–171; Davies and Stone 1995b, pp. 60–63). To simulate the other, the interpreter re-centers her ego-centric map of the world by shifting the reference of her indexical concepts to match the other’s, and simply imagines the world being the way it appears for the other – containing

witches and oracles, for instance. In doing this, the interpreter does not need to observe or consciously regulate her own mental functions. It is sufficient that she employs the ordinary human capability to imagine and hypothetically consider counterfactual states of affairs. Since the interpreter thus primarily looks at the world rather than at the other subject, simulation does not essentially involve introspection and inference by analogy from one's own mental states and processes to those of the other – although it can be argued, as Goldman, Stueber, and Heal have done, that the validity of simulation nevertheless depends on the minimal theoretical presupposition that the interpreter and the other are sufficiently similar in relevant respects. According to the imaginative identification view, the interpreter thus adopts a relatively engaged stance toward the other's mental goings-on, acting more as an active participant in the other's ways of thinking than as a detached observer of them. (Heal prefers the term "co-cognition" to "simulation" because the former suggests a more engaged and the latter a more detached mode of thinking, but despite this uses "simulation" to cover both off-line simulation and co-cognition; (Heal 2003, p. 92).)

Thus understood, the imaginative identification and off-line simulation views are conflicting interpretations of the nature of high-level simulation (re-enactive empathy). If otherwise construed, however, the two views are not necessarily contradictory. According to Heal, the co-cognition or imaginative identification view is an *a priori* analysis of the personal, or phenomenological, level of simulation, while the off-line simulation view is best thought of as an empirical hypothesis on the underlying sub-personal psychological or biological mechanisms (Heal 2003, pp. 108–111). What happens in the brain of an interpreter when he re-enacts the thoughts of others may well be that the decision making system is disconnected from the motor system, and so on, although the interpreter will normally be unaware of any such fact. If so, there is no real conflict between the two views. However, it is the imaginative identification or co-cognition view which primarily constitutes

an alternative to the theory theoretical analysis of our capacity to understand others.

This connects to a further issue of debate among simulation theorists, namely, whether the theory is empirical or *a priori*. Goldman is probably the strongest proponent of the view that it is an empirical and more precisely psychological and neuroscientific hypothesis, to be confirmed or falsified by empirical data like any other such hypothesis (Goldman 2006, p. 20). Heal takes the opposite stance, arguing that the ability to think about others' thoughts and the ability to think about the subject matter of those thoughts are non-contingently connected in the way postulated by simulation theory (Heal 1994, p. 141).

The arguments for simulation theory are both empirical and of a more traditional philosophical kind. In common sense thinking and interpretive sciences, we seem capable of understanding others without knowing anything like a general theory of their minds, at least not explicitly (Davies and Stone 1995a, pp. 60–73), and something like simulation, or empathy, seems to perform an epistemic function in such understanding, as suggested by everyday language expressions such as "I would have done the same if I were you" or "Imagine being in my shoes."

Although theory theory is probably the dominant view among psychologists, certain findings in empirical psychology and neuroscience fit well with simulation theory, among them the relatively recent discovery of mirror neurons, which has already been mentioned. Studies on autistic children have shown them to be deficient not only in their capacity to understand and relate socially to others, but also in their abilities to see things from other people's perspectives, participate in pretend play, imagine counterfactual possible worlds, and react emotionally to such worlds – precisely what one would expect if these two sets of abilities were connected in the ways simulation theorists claim. The interpretation of these data has been contested, however, and other empirical findings seem to fit better with theory theory than with the simulation view (Stueber 2006, p. 103, 116, 118; Goldman 2006, pp. 134–144, 200–206; Goldman 2009).

Heal and Stueber among others have pointed to cognitive economy as an argument for simulation (Heal 2003, pp. 50–59; Stueber 2006, pp. 154–158; Ravenscroft 1998, pp. 174–177). I simulate another's thoughts on a given subject matter by using my own capacities for thinking about the same subject matter, and the motives for her actions by using my own abilities to consider alternative courses of action, weighing reasons for and against, and so on. Therefore, little more is required for understanding and interpreting others than the affective, cognitive, and conative capacities that I already employ for other purposes. According to theory theory, by contrast, I need a complicated theory of the laws or regularities governing other people's thought and behavior. Heal even argues that such a theory would have to be orders of magnitude more complicated than common sense physics or any other theory, because it would have to take account of the many different worldviews which people have, with all their complexities, and the respective consequences of these worldviews and the differences between them for behavior in indefinitely many possible circumstances (Heal 2003, p. 58). However, cognitive economy can also be an argument for the methodological monism of theory theory against the dualism of simulation theory, since applying the same kind of methods to both nature and people is in at least some respect simpler than applying two different methods, or sets of methods (see Stueber 2006, p. 150).

An influential objection against simulation theory, originating from Carl Hempel and Daniel Dennett among others, may be referred to as the *anti-simulationist collapse argument* (Hempel 1965, p. 240; Dennett 1987, pp. 100–101). Using a plane model to simulate a real plane presupposes that the latter generally behaves like the former in the relevant ways. Otherwise the results of the simulation will not be relevant to predictions or explanations of the plane's reactions to high speed, etc. By analogy, mental simulation presupposes a sufficient degree of similarity between the interpreter and the other for them to react with the same mental output to the same input. This assumption can only

be justified by reference to general laws of psychology, which means that the supposed empathy-based explanation is in fact covertly theory-based. Hence, simulation is not really a distinct method of understanding, and the idea of mental simulation collapses into a version of the usual theory theoretical model of understanding. (This argument should be distinguished from the more general collapse argument, which questions the entire theory theory-simulation theory distinction and thus affects both positions equally; (Davies and Stone 2001).) A possible objection from proponents of the non-rationality approach is that the argument conflates the question how ascriptions of mental content are actually made with the question how they are justified; on the rationality approach, however, ascription is inseparable from justification.

In response to such objections, Goldman and Gordon in early articles defended a position that could be called externalism about simulation. According to epistemological externalism (of which Goldman is a proponent), it is sufficient to know something that one's belief on the matter has been produced through a reliable belief-forming process, such as visual observation in favorable conditions. Hence, it is not necessary that one is aware of reasons for one's belief, or for the assumption that the belief-forming process is reliable. In a similar vein, Goldman and Gordon have argued that successful simulation only requires the interpreter to be sufficiently and relevantly similar to the other, but not to have reasons for assuming this to be so (Davies and Stone 1995a, pp. 100–122; Davies and Stone 1995b, pp. 53–67, 74–99.).

A different response, perhaps most clearly stated by Arthur Ripstein, is that the interpreter can determine the degree of similarity between herself and the other by a kind of induction from particular cases. If the interpreter studies the other's statements and actions in a sufficiently wide variety of cases, and they consistently appear reasonable from the interpreter's own perspective, then she has reason to assume herself to be sufficiently attuned to the other, without thereby depending on a theory of the other's mind (Ripstein 1987; Bohlin 2009). That is, the

assumption of similarity is theoretical in the minimal sense that it is general and based on inductive reasons, but it is not a theory in the more demanding sense in which, according to theory theory, understanding of others depends on theory; it is an empirical surface generalization to the effect that the other in general reacts similarly in thought and action to the interpreter, not a theory of the inner structure or functions of the other's mind (see Stueber 2006, p. 180).

A third type of response has emerged in the later debate. The early theory theory-simulation theory debate was mostly dichotomous in the sense that understanding of others was assumed to be either entirely based on theory or else entirely based on simulation. More recently, hybrid positions have been developed, perhaps most fully by Goldman and Stueber (Stueber 2006; Goldman 2006). It has been maintained both that simulation can account for some but not all cases of understanding, and that even when we do simulate, the process of understanding combines simulation with theoretical inference.

For instance, Stueber argues that non-rational behavior requires other methods of explanation and prediction than simulation, or empathy, and that even central cases of simulation depend on theoretical assumptions. The argument for the last point is based on Stueber's division of the process of simulation into three phases, which he calls matching, simulation, and attribution. In the matching phase, the interpreter adjusts her own perspective to the other's, compensating for the relevant differences in background beliefs, evidence, and so on. In the simulation phase, the interpreter thinks through the subject matter at issue from the other's perspective. In the attribution phase, she ascribes the resulting cognitive, affective, and conative states to the other. Stueber argues that theoretical assumptions can play an essential role in both the matching and the attribution phase (Stueber 2006, pp. 120–121). When matching the minds of the Azande, for instance, it may be necessary for the interpreter to be aware of the fact that they generally believe in witchcraft and oracles, and it seems reasonable to say that any results of the

interpreter's attempts to see things from the Zande perspective will be valid only if, apart from the differences compensated for in the matching phase, the Azande are relevantly and sufficiently similar to the interpreter herself, or more generally to members of her culture, social group, and so on. However, such unsystematic contrastive generalizations about perspectives do not amount to anything like a fully developed theory of Zande mind, or the human mind in its Zande manifestations. To compensate for the lack of theoretical knowledge in this more demanding sense, the central simulation phase remains indispensable.

Cross-References

- [Autism](#)
- [Empathy](#)
- [Epistemology](#)
- [Externalism and Internalism](#)
- [Hermeneutics, Theological](#)
- [Philosophy of Science](#)
- [Theory of Mind](#)

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Simulators

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A simulator is a computer program designed to artificially recreate a robot and its environment. Many robotic simulators incorporate some form

of physics engine to simulate a robot's dynamics and kinematics, and a visualization system to provide sensor information to the robot and output for a human. Simulators aid in the development of new algorithms, in the debugging process, and facilitate rapid prototyping. They provide a safe environment in which to test theory and even write algorithms to control a robot in a hazardous environment.

Sin (Vice, Human Limits, Negativity)

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Related Terms

[Evil](#); [Human limits](#); [Morality](#); [Punishment](#); [Vice](#)

Most current societies have lists of morally right and wrong actions that are often sanctioned or supported by a deity (God, superior being, force, or agency) capable of causing retribution (Lyman 1989). In societies with salvation religion, being out of favor with the deity may make one ineligible for salvation (Coward 2003). In some current societies, these immoral actions are restricted to overt behaviors. Sin may be viewed as reality, even embodied, next to the concept of evil; more frequently, it is an attribution, a way to qualify an act or behavior. In some societies, sin is against other people. In other societies, it is against the deity. Most societies have degrees of sin. All societies have ways or means of being relieved from sin (Ensor 1997). In some societies, sin is an act; in other societies, it is a state from which one has to be relieved to be in good standing or to be in a state of grace with a deity.

Sin is inexorably related to the concept of evil, which is that which is morally bad or wrong.

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Virtually all sin is related to intentionality and the concept of free will. Because human beings may do things that are wrong or evil and because most concepts of deity attribute goodness and omnipotence to the deity, the concept of free will is also obligatorily related to the concepts of sin and evil, otherwise one would have to solve how a loving and good deity could allow evil human behaviors to occur. Many societies solve this problem by an evil deity or spirit who influences the free will of believers (Wright 2006).

Apart from setting and promulgating moral standards in a society, sin may have other functions. Whereas many sins are universal across societies, other sins are society specific. As such, they serve as religiously mediated in-group markers. They, along with the minimally counterintuitive and counterfactual beliefs that make up most religions, would help to bind the in-group together.

A vice is a habit or personal characteristic deemed immoral (Shklar 1985). Often, such behaviors are associated with such things as prostitution, sex with underaged children, illegal drugs, gambling, and even compulsive criminal activities. The degree to which some individuals are morally responsible for certain types of vice is difficult to determine, as certain individuals may be biologically predisposed to engage in behaviors that are nonnormative. The concept of criminal responsibility is not the same as moral culpability. Both crimes and what are considered morally objectionable behaviors have some degree of cultural and temporal relativity, as what may have been illegal or immoral at one point in time is not considered so in another point in time in the same society. Almost all human beings have moral vulnerabilities. Human beings differ in the degree to which they can conform their behavior to the legal and moral requirements of their society. As such, all human beings have their limits. The Native Americans understood this well with their often-quoted saying, "Do not judge another person unless you have walked a mile in their moccasins." Such an understanding can cause one to have compassion even for those who commit acts that are illegal and/or immoral.

Cross-References

- ▶ [Action Control](#)
- ▶ [Biology of Religion](#)
- ▶ [Body](#)
- ▶ [Collective Behavior](#)
- ▶ [Criminology](#)
- ▶ [Ethics](#)
- ▶ [Evil, Problem of](#)
- ▶ [Experience](#)
- ▶ [Free Will](#)
- ▶ [Happiness](#)
- ▶ [Negative Theology](#)
- ▶ [Self](#)

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Singularity

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A term borrowed by popular robotics and AI theorists from astrophysics. Mathematically, singularity refers to a point at which the object cannot be defined. In pop robotics, it refers to the point at which exponential progress in computation produces social changes so enormous that they cannot be predicted from our present vantage. This is generally assumed to mean that machines will become extraordinarily intelligent, and human beings will merge with technology as cyborgs and, shortly thereafter, minds uploaded into machines.

Skinner Box

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A Skinner box is used in a laboratory setting to study associative learning in animals. The device was introduced by the behaviorist Burrhus F. Skinner around 1930. It can be utilized, for example, to test classical conditioning in a rat by associating a blue light with an enemy in each session, eventually causing the rat to be frightened not only by the enemy, but upon seeing the blue light. In an operant (instrumental) conditioning paradigm, for example, a rat's behavior upon pressing a lever is reinforced by food, eventually causing the rat to press the lever in order to get food.

Sleep Disorders

► [Sleep Medicine](#)

Sleep Medicine

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Related Terms

[Sleep disorders](#); [Somnology](#)

Description

Sleep has been fascinating people for centuries. Besides dreams, sleep was considered to be the

brother of death in ancient Greece and has been taken as a state of “small death” until Berger in 1928 discovered the (electroencephalography) EEG and found that sleep has a different electrophysiological expression from the wake state (AASM 2005). In 1949, Moruzzi and Magoun showed that forebrain and cortical arousal/waking behavior is mediated by a set of ascending pathways that originate in the upper brainstem near the pons-midbrain junction called the “ascending reticular activating system” (Aserinski et al. 1953). When rapid eye movement (REM) sleep in the early 1950s was discovered by Aserinsky and Kleitman, sleep could be clearly described as two major different forms: non-REM and REM sleep, the first being found in different forms of sleep depth from stage non-REM 1–4 (Berger 1929, Daan et al. 1984). The analysis of the sleep microstructure was first standardized by Rechtschaffen and Kales in 1968; the latest revision by the American Academy of Sleep Medicine was performed in 2007 (Feinberg and March 1995, Hobson 1975). Further analysis of sleep microstructure established models such as the “two process model of sleep and wake” by S. Daan and A. Borbély in 1982, while in 1975, Hobson and McCarley discovered that the occurrence of non-REM and REM is based on the reciprocal discharge by two brainstem neuronal groups (Iber et al. 2007, Lu et al. 2006). More recent models of sleep-wake regulation have been established like the “flip-flop switch model” of orexin by Lu and Saper in 2006 which also shows the connections with the autonomous, the motor, the endocrine, and other systems (Manni et al. 2011).

In most western parts of the world, scientific activity in sleep research expanded fast and stirred the foundation of National Sleep Societies, which today are established scientific medical societies. As sleep medicine is not restricted to one faculty, it is the first “interdisciplinary society” also including nonmedical disciplines.

After classifying sleep disorders by establishing accepted methods, some very efficient therapeutic tools were developed. The most successful until today is the therapy for sleep apnea by applying “continuous positive

nasal airway pressure” (nCPAP) during nocturnal and diurnal sleep. Research was and still is revealing the impact of the different sleep stages on diurnal physiology, psychology, and cognition in all kind of medical and behavioral disorders. Sleep deprivation studies have led to insights into all kinds of accidents caused by sleepiness or other sequelae of disturbed sleep.

In the meantime, sleep has found its way into all major medical disciplines and is a source of new insights into pathophysiology, morbidity, and mortality. Sleep deprivation studies challenging cognitive processes have set a trigger to understanding the function of sleep for our mental capacities. Genetics have been of tremendous help identifying some initially “rare diseases” such as the “sleep phase advance syndrome” and the “sleep phase delay syndrome”; they are able to identify the chronotype of complete populations with their vulnerable wake and sleep times (Mayer et al. 2009).

Pharmacogenetics is gaining more and more importance as the number of medical products to induce healthy sleep and to prevent daytime sleepiness is increasing. Imaging is a further contributor to new insights into the molecular mechanisms of sleep and its relation to other systems.

Self-identification

Sleep medicine from its beginning on has been based on scientific methods. It is not a religion as it is based on the principles of scientific methods and not on belief. However, in ancient times and in traditional cultures, people would tell their dreams in the morning to keep in touch with their “inner spirits” (Moruzzi et al. 1949). Dreams have been interpreted in many mystified ways, they have been used extensively in literature as predictors of fate (i.e., Lady MacBeth by Shakespeare) or even a whole nation (the seven good and the seven bad years in ancient Egypt), and people lived up to them. These traditions of awareness of dream contents became a real psychoanalytic method with Sigmund Freud who focused on dreams as a feature of unconscious

wishes, while Hobson and McCarley stated REM-based dreams as a neural activity without any sense. Today, scientific methods show that a lot of equal brain regions are involved in REM dreaming, memory functions, and emotions or even the recall of emotions. Both the decrease of central regulatory control mechanisms and the dissociative tendencies of mental functions during REM may erase old affective patterns, allow the testing of new emotional behavior within a given situation and the subsequent selection, emphasizing these new learned affective patterns.

Characteristics

Since all findings clearly showed that sleep, respectively disturbed sleep, has a great impact on social life, productivity, and general health, sleep medicine is the first real interdisciplinary discipline which covers all fields of medicine including internal medicine, pneumology, cardiology, neurology, psychiatry, otorhinolaryngology, pediatrics, and others. Besides medical fields, it also includes nonmedical disciplines, that is, psychology, physiology, biology, physics, etc.

Relevance to Science and Religion

Dream research based on the scientific understanding of dreams has contributed very much to the understanding of “hallucinations,” “out of body experience,” and “appearances” (Palagini and Rosenlicht 2011). It has also shown that mankind is capable of commanding certain dream contents in a desired way (so-called lucid dreaming). The myth of “why we dream” and what the “individual meaning of dream contents” is has still to be fully analyzed (Rechtschaffen 1968, Toh et al. 2001).

Sources of Authority

The sources of sleep medicine are international classifications, guidelines, and recommendations

(see references) as well as established scientific procedures like PSG, first standardized by Rechtschaffen and Kales in 1968 and revised by the American Academy of Sleep Medicine was performed in 2007. Until today, the most important method to score sleep is the polysomnography which has 2–4 channels to record eye movements, 1–3 channels to record chin muscle activity, 3–8 channels to record scalp electroencephalogram, 1 channel for ECG, nasal airflow, thoracic and abdominal excursion, noninvasive oxygen saturation, and 1–2 channels (or more if needed) to record tibial anterior muscle activity. To classify disorders as parasomnias videometry is necessary to assess the behavioral phenotype.

These standardized methods helped to identify sleep disorders, which led to the first International Classification of Sleep Disorders in 1979 which in the meantime comprise more than 88 different disorders and which was revised in 2005 (Vogel 1960).

Ethical Principles

As for every medical subdiscipline, the ethical guidelines are the “Hippocratic Oath” and the “International Declaration of Helsinki.”

Key Values

The key values are diagnosis and therapy of sleep disorder worldwide. Specific health care activities focus on the teaching of the need for sufficient sleep in the general population.

Conceptualization

For all the items listed, the International Sleep Societies have given no general definitions.

Relevant Themes

Themes regarding the topic “Science and Religion” could be manifold. They could include time

management for religious services (i.e., to make the attendants more attentive), analyzing the scientific background of “appearances” occurring from sleep.

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SLI

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Specific language impairment; a deficit of producing sounds and grammar that runs in families.

Smṛti (Sanskrit)

► [Mindfulness \(Buddhist\)](#)

Social

► [Science and Scientific Knowledge, Sociology of](#)

Social Cognition

► [Attribution/Attribution Theory](#)

► [Social Psychology](#)

Social Component and School

► [Education, Sociology of](#)

Social Construction in Psychology

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Related Terms

[Constructionism](#); [Constructivism](#); [Social constructivism](#)

Description

The phrase, *social construction*, typically refers to a tradition of scholarship that traces the origin of knowledge, meaning, or understanding to human relationships. The term *constructivism* is sometimes used interchangeably, but much scholarship associated with constructivism views processes inherent in the individual mind, as opposed to human relationships, as the origin of people's constructions of the world. Social constructionism gained its initial prominence as a metatheory. It provided an account of all claims to knowledge, reason, and value – in science, religion, and elsewhere. On this level, it has served as a major alternative to empiricism. However, unlike empiricism, constructionists make no claims to the truth or ultimate rationality of constructionism itself. In this sense, constructionism may be viewed as a nonfoundational foundation.

However, constructionist ideas have also been used for purposes of substantive critique, description, and explanation of various social processes. At this level, constructionist ideas also give rise to new research practices, especially those considered qualitative. Constructionist ideas inform inquiry across the social sciences and humanities. They play a specially important role in narrative inquiry, discourse analysis, rhetorical studies, ethnography, cultural studies, conversation analysis, interpersonal communication, feminist inquiry, neocolonialist inquiry, organizational studies, the social studies of science, the history of science, and critical studies, among others.

Constructionism offers a major alternative to individualist and biological accounts of human behavior. Constructionist ideas also inform the development of numerous practices in society, especially those centering on dialogue, personal and social transformation, organizational development, and peace building. Many view constructionist ideas as the backbone of postmodern therapeutic practices. For further discussions of constructionist inquiry and applications, see Gergen (2004, 2009), Holstein and Gubrium (2008), Lock and Strong (2010).

Root Assumptions in Social Construction

Although one may trace certain roots of social constructionism to Vico, Nietzsche, and Dewey, scholars often view Berger and Luckmann's *The Social Construction of Reality* as the landmark volume (Berger and Luckmann 1967). Yet, because of its lodgment in social phenomenology, this work has largely been eclipsed by more recent scholarly developments. One may locate the primary stimulants to the more recent development of social constructionist thought in at least three, quite independent movements. In effect, the convergence of these movements provides the basis for social constructionist inquiry today.

The first movement may be viewed as *critical* and refers to the mounting ideological critique of all authoritative accounts of the world, including those of empirical science. Such critique can be traced at least to the Frankfurt School, but today is more fully embodied in the work of Foucault (Foucault 1980) and associated movements within feminist, black, gay and lesbian, and antipsychiatry enclaves. The second significant movement, the *literary/rhetorical*, originates in the fields of literary theory and rhetorical study. Poststructural literary theory has been especially prominent, including deconstructionist theory. Rhetorical study, in particular, demonstrates the extent to which scientific theories, explanations, and descriptions of the world are not so much dependent upon the world in itself as on discursive conventions. Traditions of language use construct what we take to be the world. The third context of ferment, the *social*, may be traced

to the collective scholarship in the history of science, the sociology of knowledge, and social studies of science. Here the major focus is on the social processes giving rise to knowledge, both scientific and otherwise.

In what follows, I shall briefly outline a number of the most widely shared agreements to emerge from these various movements. To be sure, there is active disagreement both within and between participants in these various traditions. However, there are at least three major lines of argument that tend to link these traditions and to form the basis of contemporary social constructionism.

The Social Origins of Knowledge

Perhaps the most generative idea emerging from the constructionist dialogues is that what we take to be knowledge of the world and self finds its origins in human relationships. What we take to be true as opposed to false, objective as opposed to subjective, scientific as opposed to mythological, rational as opposed to irrational, moral as opposed to immoral is brought into being through historically and culturally situated social processes. This view stands in dramatic contrast to two of the most important intellectual and cultural traditions of the West. First is the tradition of the individual knower, the rational, self-directing, morally centered, and knowledgeable agent of action. Within the constructionist dialogues, we find that it is not the individual mind in which knowledge, reason, emotion, and morality reside, but in relationships.

The communal view of knowledge also represents a major challenge to the presumption of truth, or the possibility that the accounts of scientists, or any other group, reveal or approach an objective truth about what is the case. In effect, propose the constructionists, no one arrangement of words is necessarily more objective or accurate in its depiction of the world than any other. To be sure, accuracy may be achieved within a given community or tradition – according to its rules and practices. Physics and chemistry generate useful truths from within their communal traditions, just as psychologists, sociologists, and priests do from within theirs. But from these

often competing traditions, there is no means by which one can locate a transcendent truth, a “truly true.” Any attempt to establish the superior account would itself be the product of a given community of agreement.

To be sure, these arguments have provoked antagonistic reactions among scientific communities. There remain substantial numbers in the scientific community, including the social sciences that still cling to a vision of science as generating “truth beyond community.” In contrast, scientists who see themselves as generating pragmatic or instrumental truths find constructionist arguments quite congenial. Thus, for example, both would agree that while Western medical science does succeed in generating what might commonly be called “cures” for that which is termed “illness,” these advances are dependent upon culturally and historically specific constructions of what constitutes an impairment, health and illness, life and death, the boundaries of the body, the nature of pain, and so on. When these assumptions are treated as universal – true for all cultures and times – alternative conceptions are undermined and destroyed. To understand death, for example, as merely the termination of biological functioning would be an enormous impoverishment of human existence. If a nourishing life is of value, there is much to be said of those who believe in reincarnation, the Christian vision of “a life hereafter,” or the Japanese, Mexican, or African tribal views of living ancestor spirits. The constructionist does not abandon medical science but attempts to understand it as a cultural tradition – one among many.

The Centrality of Language

Central to the constructionist account of the social origins of knowledge is a concern with language. If accounts of the world are not demanded by what there is, then the traditional view of language as a mapping device ceases to compel. Rather, constructionists tend to draw from Wittgenstein’s (Wittgenstein 1953) view of meaning as a form of language game. And, given that games of language are essentially conducted in a rule-like fashion, accounts of the world are governed in significant degree by conventions of

language use. Empirical research could not reveal, for example, that “emotions are oblong.” The utterance is grammatically correct, but there is no way one could empirically verify or falsify such a proposition. Rather, while it is perfectly satisfactory to speak of emotions as varying in intensity or depth, discursive conventions for constructing emotional life in the twenty-first century do not happen to include the adjective “oblong.”

Social constructionists also tend to accept Wittgenstein’s view of language games as embedded within broader “forms of life.” Thus, for example, the language conventions for communicating about human emotion are linked to certain activities, objects, and settings. For the empirical researcher, there may be “assessment devices” for emotion (e.g., questionnaires, thematic analysis of discourse, controlled observations of behavior) and statistical technologies to assess differences between groups. Given broad agreement within a field of study about “the way the game is played,” conclusions can be reached about the nature of human emotion. As constructionists also suggest, playing by the rules of a given community is enormously important to sustaining these relationships. Not only does conformity to the rules affirm the reality, rationality, and values of the research community, but the very *raison d’être* of the profession itself is sustained. To abandon the discourse would render the accompanying practices unintelligible. Without conventions of construction, action loses value.

The Politics of Knowledge

As indicated above, social constructionism is closely allied with a pragmatic conception of knowledge. That is, traditional issues of truth and objectivity are replaced by concerns with that which research brings forth. It is not whether an account is true from a God’s eye view that matters, but rather, the implications for cultural life that follow from taking any truth claim seriously. This concern with consequences essentially eradicates the long-standing distinction between *fact* and *value*, between is and ought. The forms of life within any knowledge-making community represent and sustain the values of that community.

In establishing “what is the case,” the research community also places value on their particular metatheory of knowledge, constructions of the world, and practices of research. When others embrace such knowledge, they wittingly or unwittingly extend the reach of these values.

Thus, for example, the scientist may use the most rigorous methods of testing emotional intelligence and amass tomes of data that indicate differences in such capacities. However, the presumptions that there is something called “emotional intelligence,” that a series of question and answer games reveal this capacity, and that some people are superior to others in this regard are all contingent on the conventions of a given tradition or paradigm. Such concepts and measures are not required by “the way the world is.” Most importantly, to accept the paradigm and extend its implications into daily life may be injurious to those people classified as inferior by its standards.

This line of reasoning has had enormous repercussions in the academic community and beyond. This is so especially for scholars and practitioners concerned with social injustice, oppression, and the marginalization of minority groups in society. Drawing sustenance in particular from Foucault’s work, a strong critical movement has emerged across the social sciences, a movement that gives expression to the discontent and resistance shared within the broad spectrum of minorities. In what sense, it is often asked, do the taken for granted realities of the scientist sustain ideologies inimical to a particular group (e.g., women, people of color, gays and lesbians, the working class, environmentalists, the elderly, the colonized) or to human well-being more generally? Traditional research methods have also fallen prey to such critique. For example, experimental research in psychology is taken to task not only for its manipulative character but its obliteration of the concept of human agency.

These three themes – centering on the social construction of the real and the good, the pivotal function of language in creating intelligible worlds, and the political and pragmatic nature of discourse – have rippled across the academic disciplines and throughout many domains of

human practice. To be sure, there has been substantial controversy, and the interested reader may wish to explore the various critiques and their rejoinders (see, for example, Gergen 2001, 2009; Hacking 1999). However, such ideas also possess enormous potential. They have the capacity to reduce orders of oppression, broaden the dialogues of human interchange, sharpen sensitivity to the limits of our traditions and to their potential offerings, and to incite the collaborative creation of more viable futures.

Self-Identification

Science

Social constructionists do not generally identify themselves as scientists, at least in terms of the positivist/empiricist view of science that largely prevails today. More generally, they raise questions about the definition of science and what is at stake politically and socially in attempting to generate strong borders of exclusion. At the same time, many constructionists carry out scientific work of the traditional kind, viewing such work, however, as itself a form of construction.

Religion

Constructionists do not generally view themselves as participating in a religion, at least in terms of a commitment to theistic or spiritual beliefs. At the same time, many constructionists participate in religious or spiritual activities, understanding these activities as traditions of meaning that carry with them valued implications for cultural life. Simultaneously, various religious groups are finding social constructionist ideas useful for enriching church and pastoral practices (Hermans et al. 2002).

Characteristics

Constructionists are similar both to the traditions of science and religion inasmuch as they are engaged in creating and sustaining particular constructions of reality, reason, and value. They

differ, however, in their avoidance of the kinds of foundational claims that are common to both traditional science and religion. Social constructionism is not a belief system; rather it is an array of ideas and related practices that many view of enormous potential in helping the world's peoples live together amicably. In part, this is so because constructionist ideas invite understanding and collaboration across traditions as opposed to competition.

Relevance to Science and Religion

For many constructionists, the interest in science and religion stems from the fact that these are institutions of pivotal significance in the contemporary world in their constructions of reality and value. However, of particular significance in recent years has been the way in which constructionist ideas inform the emerging dialogues between science and religion. By viewing each of these traditions as "truth generating" within its domain of assumptions and practices, one may avoid the problematic tendencies of searching for convergences on the one hand and mounting critique on the other. Both such tendencies move toward a world of singular truth, which is ultimately oppressive and pragmatically debilitating.

Sources of Authority

The general orientation to what are traditionally viewed as "sources of authority" within the social constructionist dialogues is skeptical. Constructionists tend to be critical of authority structures and to opt for all-inclusive dialogue.

Ethical Principles

In general, one may find in the constructionist dialogues two orientations toward ethical principles. The first is critical of all such principles. As it is variously argued, ethical principles are problematic at the outset because there are no

unambiguous means of deriving action from abstract principles. More importantly, such principles tend to reinforce a certain way of life, relegating others to a secondary status. In effect, they are exclusionary, and thus conflict provoking. Further, principles have a tendency to terminate the kinds of dialogues that are essential for understanding human action within what are inevitably unique circumstances.

The second orientation toward ethical principles is to locate within constructionist ideas an underlying set of ethical presuppositions. Some find, for example, that constructionist ideas favor pluralism, integration, collaboration, justice, tolerance, and democracy.

Key Values

The issue of values within social constructionist dialogues is controversial. As just outlined, one may see in constructionist thought a commitment to certain ethical principles or values. However, such claims are controversial primarily because a strong commitment to any value system may have the ultimate effect of bringing an end to the process of meaning, making out of which values are created.

Conceptualization

All the concepts included below are viewed as human constructions. They are created within cultures during specific historical periods and are used within these cultures for carrying out their ways of life. However, because there are multiple cultures and historical transformations in meaning, these concepts may be freighted with multiple meanings and usages. Most constructionist work with these concepts has had the purpose of denaturalizing them, opening them to critical inquiry, and offering alternative ways of thinking and practicing. In some of these cases, particularly where conflict is sharp and potentially lethal, new projects of dialogue are mounted. Some of this work is reflected in the following comments:

Nature/World

Important critical work has questioned the common binary between the natural world and the human or cultural world. As it is argued, this distinction has typically privileged the human world with resulting ecological catastrophe.

Human Being

Lively discussion of the various conceptions of the human being has taken place within constructionist writings. Recent attempts are aimed at moving beyond the conception of humans as self-contained organisms and toward a view of human action as an outcome of relational embeddedness.

Life and Death

Important constructionist work in this case has been devoted to defusing the conflict between pro-life and pro-choice factions. As noted, a constructionist orientation favors action-oriented contributions to society.

Reality

Whatever is to be said about reality, constructionists argue, is always issuing from a particular culture. Beyond these constructions, there is nothing that can be said. Foundational arguments about the nature of reality are futile.

Knowledge

All claims to knowledge are social constructions. This view invites a pragmatic orientation to knowledge making and a reflexive posture in evaluating the values inherent in any contribution to knowledge.

Truth

Like the concepts of reality and knowledge, constructionists view “truth” as a potentially dangerous category. Those who claim truth beyond a tradition are divisive. However, by viewing truth claims as means of securing trust within traditions, we can appreciate the use of the concept.

Perception, Time, and Consciousness

In viewing these as constructions, we avoid interminable debate and inquire into the utility and social value inherent in any given account.

Rationality/Reason

Rationality has come under critical fire among constructionists because of the way in which the concept has been used to valorize certain traditions and classes. In general, constructionists view reason in terms of discourses congenial with various traditions.

Mystery

Many constructionists celebrate the concept of mystery, as it invites curiosity and leaves paths to further dialogue open.

Relevant Themes

Of central concern to science and religion are issues of morality and materialism. While science tends to take no stand in the former case, those in spiritual traditions see the scientific preoccupation with materialism limited. Social constructionist ideas are useful here in inviting moral pluralism, on the one hand, and an appreciation (and the limitations) of multiple realities (including both material and spiritual) in terms of global contribution.

Cross-References

- [Critical Theory](#)
- [Self, from a Psychological Perspective](#)
- [Truth](#)

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Social Constructivism

- [Social Construction in Psychology](#)

Social Deviance

- [Deviance and Social Control, Sociology of](#)

Social Evolution

- [Evolutionary Psychology](#)

Social Inference

- [Attribution/Attribution Theory](#)

Social Influence Processes

- [Social Psychology](#)

Social Interaction Explanations

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Social interaction explanations examine how people become criminals and emphasize that criminal behavior is learned behavior. Sociologist Edwin

Sutherland developed the theory of differential association in the 1920s and 1930s to explain how people become criminals. He maintained that criminal behavior is learned in interaction with others and that criminals learn to favor criminal behavior over noncriminal behavior.

Social Interactionism

- [Deviance and Social Control, Sociology of](#)

Social Movements

- [Collective Behavior](#)

Social Neuroscience

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Persons and Objects

We experience interactions with persons in social encounters and manipulations of physical objects every day. Although we are usually not asked to reason about this, there seems to be a fundamental difference between persons or human beings and physical objects, which we are usually not aware of. However, we are making use of this distinction continuously and automatically throughout our everyday life. This difference refers to the following aspects. Whereas the behavior of persons can only be successfully explained or predicted by reference to the inner experience of the person including perceptions, thoughts, feelings, desires, or intentions-to-act, there is no need to assume anything

comparable to such an inner experience if we are asked to explain or predict the behavior of physical objects or “things.” The behavior of persons can only be explained on the basis of psychological rules (“folk psychology”) that we learn and acquire during our ontogenetic development; the behavior of physical objects can be explained on the basis of natural laws in the framework of classical Newtonian physics (“folk physics”). The behavior of persons can be predicted only on the basis of probabilistic estimates: In a given particular instance of a social encounter, we can never be sure how an interacting human will react (e.g., smiling at another person and her/his reaction to the smile); the behavior of physical objects can be predicted in a deterministic fashion: If we are sufficiently informed about the different forces that influence a given object, we can by necessity predict how it will behave (e.g., a ball running down a slope because of gravity). In contrast, there are no natural laws in the strict sense that can guide us during processes of person perception or impression formation. This fundamental distinction was put forward by Fritz Heider, the founder of the so-called attribution theory in the field of social psychology. He distinguished between “person perception” or “social perception” in contrast to “thing perception” or “nonsocial perception” (Heider 1958). In the following, we focus on experiences and processes related to the social domain.

Naturalistic Account

We as persons or human beings experience mental phenomena, such as perceptions, thoughts, feelings, desires, or intentions-to-act, from a first-person-perspective. Complementary to this, mental phenomena can be reconstructed from a third-person-perspective as “the subjective experience of cognitive function” (Fuster 2003). Following a naturalistic view, which holds that all relevant cognitive processes and their neural mechanisms can be studied and fully understood by employing the methodology of natural sciences including cognitive neurosciences, our mental phenomena or conscious

experiences are closely linked to their underlying neural mechanisms to which they correspond.

More precisely, the philosophical identity theory as prominently positioned in the philosophy of mind postulates that our mental phenomena are identical with neural mechanisms with which they can be (extensionally) identified, although the (intensional) content or “meaning” of mental phenomena and neural mechanisms are clearly different (Vogeley and Seitz 1995). In other words, whereas mental phenomena are experienced in a subjective space-time system, cognitive processes and neural mechanisms are observables in an objective space-time system (Kuhlenbeck 1981). Teleologically, consciousness provides an integrated internal representation of the outer world and one’s own organism based on experiences and memories providing reflected responses to the needs of our environment (Vogeley et al. 1999).

Based on this theoretical grounding, cognitive neuroscience has started to identify and address increasingly complex explananda during the last decade including self-consciousness and intersubjectivity. More recently, processes that are related to interaction and/or communication in social encounters between human agents have been studied systematically and extensively. These research activities have constituted the new research field of “social cognitive neuroscience” or “social neuroscience” (Ochsner and Lieberman 2001; Adolphs 2009; Schilbach et al. in press), from which already monographs, edited volumes, and academic journals have emerged.

Self-Other-Differentiation and Self-Other-Exchange

It appears useful to introduce a rudimentary taxonomy that covers at least three essential distinctions. First, the processes that focus on self-other-differentiation (as the ability to differentiate between one’s own and other person’s mental states; Vogeley et al. 2004; David et al. 2006, 2007) are to be differentiated from processes serving self-other-exchange (as the ability to share or exchange mental states with

others; Vogeley et al. 2001; Schilbach et al. 2006). This distinction is a crucial basic step to avoid a possible confusion of whether a given mental phenomenon refers to or can be traced back to oneself or not: Survival in a social world clearly requires the ability to distinguish between oneself and others as the “owner” or “agent” of mental states. Disturbances of this important capacity might give rise to the psychopathological phenomenon of ego-disturbances during which the owner or initiator of experiences or movements can no longer be adequately attributed, neither to oneself nor to others.

A “minimal self” as prerequisite of social cognition (Gallagher 2000; Vogeley and Gallagher 2011) comprises at least the following essential features as key constituents: (1) the experience of ownership (with respect to perceptions, judgments, etc.; e.g., expressed by the adequate use of personal pronouns) or agency (with respect to actions, thoughts, etc.; e.g., expressed by the experience that oneself causes and controls one’s own actions); (2) the experience of “perspectivalness” with conscious states being “centered” around myself, incorporated in my body, and embedded in a literally spatial, body-centered perspective; and (3) the experience of unity that is associated with a long-term coherent whole of beliefs and attitudes that are consistent with preexisting autobiographical contexts and that can, for instance, be empirically addressed by studies on autobiographical memory (Fink et al. 1996).

Based on the capacity of self-other-differentiation, we need to ground our everyday behavior in human encounters on adequate judgments and perceptions of other persons, also referred to as the so-called “theory of mind” or mentalizing capacity. A very prominent strategy to study such ascriptions of mental states to others in an inferential, rule-based manner refers to “theory of mind” paradigms that require the prospective modeling of the knowledge, the attitudes, or beliefs of another person (Vogeley et al. 2001). A very important key region among others that is involved in a variety of different social cognitive tasks including “theory of mind” tasks and mentalizing is the medial prefrontal cortex, a part of the frontal lobe of the human brain (Amodio and Frith 2006).

Levels of Processing

Being aware of one’s own mental states and being able to “read” other persons’ minds or to “understand” or “simulate” what they are experiencing are clearly two different capacities. A very important second distinction, presumably orthogonal to the first one that needs to be emphasized is related to different levels of processing of social information. Cognitive processes can, in general, be either implicit or explicit: Implicit information processing refers to a comparably fast, automatic, pre-reflexive mode that is employed, for instance, during nonverbal behavior. In contrast, explicit information processing comprises processes in a comparably slow, reflexive, inferential format, such as stereotypes or processing based on explicit rules (Lieberman 2007; Frith and Frith 2008). Only a part of psychological processes are experienced consciously and processed on a reflexive, inferential level, as shown for the processing of nonverbal communication cues (e.g., Burgoon et al. 1996). Whereas nonverbal cues including mimic expressions (Schilbach et al. 2006), gestures (Lindenberg et al. 2012), or social gaze (Kuzmanovic et al. 2009) are processed in a fast, automatic, pre-reflexive, and implicit manner, social interactions can also be based on explicit rules, such as stereotypes, that are processed in a comparably slow, reflexive, and inferential manner, and presumably more often in a controlled way (Lieberman 2007; Barsalou 2008).

Among nonverbal communication cues gaze behavior is an important and salient signal for social interest and the intention to communicate, thus indicating mental states of significant others (Argyle and Cook 1976). “Social gaze” is crucially modulated by various dynamic characteristics among which gaze duration is of particular relevance. We investigated the neural correlates of participants while being gazed at with varying gaze duration. Increasing gaze duration resulted in an increased likeability rating and increased neural activation again in the medial prefrontal cortex (Kuzmanovic et al. 2009). This process of gaze evaluation can be understood as a comparably late stage of processing implemented in the medial prefrontal cortex.

However, these levels of processing should be conceptualized as a continuum of different levels of processing resulting in a flexible capacity of person perception that is performed either automatically or in a controlled manner, depending on the data available.

Gaze can also establish triadic relations between self, other, and the world via the modulation of attention of others or “joint attention,” an important precursor of social cognition (Moore and Dunham 1995). It has been suggested that it might be the motivation to participate in joint attention that leads to shared, social realities as a unique aspect of human cognition (Tomasello et al. 2005). To realize a truly interactive paradigm we developed an eye-tracking setup allowing to track a participant’s gaze behavior and to contingently control the gaze behavior of a computer-animated character visible on the screen (Schilbach et al. 2010; Vogeley and Bente 2010). Participants were instructed to lead the gaze of the other person toward one of three objects by looking at it. The gaze behavior of the other was made responsive to the participant’s gaze and was systematically varied so that the participant had to follow the gaze (joint attention) or not. Alternatively, participants were asked to respond to the other by looking at the same or at another object. Employing functional magnetic resonance imaging, the analysis demonstrated that joint attention was associated with a recruitment of the medial prefrontal cortex. The second interesting finding was that directing someone else’s gaze toward an object activated the brain’s reward system (ventral striatum). This finding could correspond to the hedonic and motivational aspects of sharing attention with others or could reflect that control of others motivates to engage with others (Fiske and Dépret 1996).

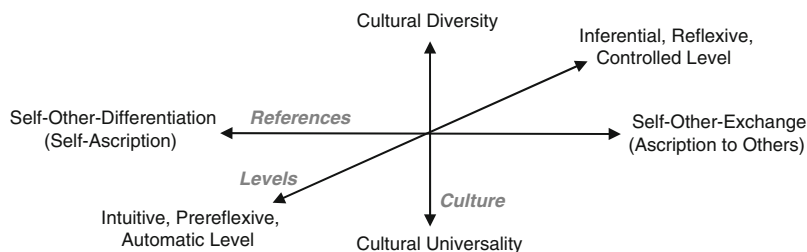
Cultural Universality and Diversity

In addition, during the last few years researchers in the field began to take into account the potentially considerable influence of culture on self-construct development and group formation also referred to as “independent” or

“interdependent” self (Markus and Kitayama 1991; Singelis 1994; Vogeley et al. 1999), which in turn might influence other domains of human cognition (Markus and Kitayama 1991; Nisbett and Masuda 2003). The issue of cultural influences should be taken into account as a third distinction. “Culture,” however, is not a clearly defined, rigid body of rules that shapes each and every individual of a given culture in a similar, uniform way, but is highly dynamic and continuously interacts with its constituting individuals, any individual can be part of different cultures at the same time (Hofstede 2003). A culturally sensitive neuroscience must take into account the dynamic character of culture, the dialectic exchange between individual and collectivity, and the recursive “looping effect” of cultural classifications on social practices and identity processes (Hacking 1999; Vogeley and Roepstorff 2009).

Focusing on the key term culture, it is important to differentiate between a “universal” and a “particular” concept of culture resembling the proposals of cultural universality and cultural diversity. Whereas the universal concept holds that culture is a result of our capacity to interact and communicate with other human beings and is universal for our species (Tomasello et al. 2005), the particular concept emphasizes the differences of cultural backgrounds that influence and shape our cognitive capacities and lead to considerable variations across different cultural settings (Kitayama and Cohen 2007) leading to the necessity to introduce culture as independent variable into psychological experiments, however, with a number of caveats (Vogeley and Roepstorff 2009).

Many studies in the field of “cultural neuroscience” (Chiao and Ambady 2007) that included culture as an independent factor into functional neuroimaging studies addressed empirical indicators of culture such as language or nationality. For instance, based on Kelley et al. (2002) one of the early cultural neuroscience studies asked test persons to attribute and ascribe certain attitudes toward oneself as compared to one’s own mother and other persons comparing a Chinese population and a so-called Western population



Social Neuroscience, Fig. 1 This figure illustrates three different distinctions that should be considered in the domain of social cognitive neuroscience. These include (1) the distinction of self-other-differentiation and self-other-exchange as the different “references,” (2) the

distinction of intuitive, pre-reflexive, automatic and inferential, reflexive, controlled processes as different “levels,” and (3) the distinction of cultural universality and cultural diversity

(Great Britain, USA, Australia, and Canada). Ascription of mental states to oneself and to their own mothers resulted in the common activation of the medial prefrontal cortex across the conditions in the Chinese population, but revealed a distinct pattern of activation in the Western population (Zhu et al. 2007), leading to the conclusion that the different populations process information about themselves and their mother differently. Different religious experiences were studied by Han et al. (2008) that resulted in a differential activation again of the medial prefrontal cortex during self-referential processing in nonreligious and Christian participants (Fig. 1).

Neural Mechanisms of Social Cognition

These concepts and observations lead us to a consideration of the underlying neural mechanisms. The empirical findings cited above should not lead to the neo-phrenological impression that the medial prefrontal cortex is “the” social cortex of the brain that is always specifically recruited during social cognition. This would imply a “reverse inference” that tries to infer the functional role from the localization of brain activation. This, however, is only possible if the brain region is selectively and specifically recruited only during certain cognitive tasks (Poldrack 2006). As was shown in a meta-analysis this is not the case for the medial prefrontal cortex that is involved in a rich variety of different cognitive tasks (Van Overwalle 2009).

The functional role has to be identified instead as a basic process that can be understood as a common denominator of the variety of different cognitive functions recruiting this region. In the case of the medial prefrontal cortex, it was suggested that its essential function is to contribute to “inexact, probabilistic, internally generated” cognition (Mitchell 2009). This is intriguing as it nicely corresponds to the distinction introduced by Heider (1958) on “person perception” that is characterized by an inherent ambiguity and uncertainty as opposed to “thing perception” that can be understood deterministically.

Another strategy has been to search for the networks of activated brain regions and not only single regions. Social neuroscience has revealed essentially two different systems recruited during social cognitive processes as follows: (1) the “social brain” or “mentalizing” network including essentially the anterior medial prefrontal cortex, the temporoparietal cortex and superior temporal sulcus, and the temporal pole (Frith and Frith 1999; Adolphs 2009), and (2) the so-called human “mirror neuron system” covering superior parietal and premotor regions (Rizzolatti and Craighero 2004). However, it is still an open debate that needs more thorough empirical research dedicated to this research question: What could be the differential functional roles of both systems? One plausible suggestion is that as soon as the attribution of mental states to others is involved the mentalizing network is activated, whereas the

mirror neuron system is recruited when a real or virtual motor component is involved, for example, in actions, simulations, or imaginations thereof (Vogeley et al. 2004; Keysers and Gazzola 2007; Wheatley et al. 2007). Another suggestion, that does not necessarily contradict the first view, assumes that the mirror neuron system correlates with early stages of social cognition such as the detection of motor expertise and might putatively also underlie the fast processing of “first impressions” in social encounters that are generated on the basis of facial expressions or gestures. In contrast, the social neural network is recruited during comparably “late” stages of evaluation of socially relevant information (Santos et al. 2010). Social cognition appears to constitute a “natural kind” of our cognitive capacities that are characterized by “the dependence on a qualitatively distinct class of mental representations” (Mitchell 2009). Seemingly different cognitive phenomena (including thinking about oneself, accessing one’s attitudes, experiencing emotions, inferring other person’s mental states, etc.) have in common the characteristics of “fuzzy,” probabilistic, and internally generated cognition, and on a neural level they share the same substrate, the medial prefrontal cortex (Mitchell 2009).

Notably, these key regions of the social neural network have also demonstrated to be active during the so-called resting states or baseline conditions that are characterized by the absence of any external instruction of an experimenter. This specific pattern of distribution of baseline activation has been identified as the so-called default mode of brain function or default network and was first studied by Raichle et al. (2001). Meta-analytical studies demonstrate a significant overlap between the social neural network and the default network (Buckner et al. 2008; Schilbach et al. 2012). Intriguingly this default network can be observed in humans irrespective of the task they are involved in and the methodology with which brain activity is measured and is also observed in other mammals (Vincent et al. 2007) and can, thus, be considered a neurobiologically universal building principle of mammalian brains.

This empirical observation of the overlap of both systems stimulates the speculation that one major cognitive function of the neural default network could be in fact social cognition which conversely implies that humans have a disposition for social cognition that is reflected in this default network. This convergence supports the hypothesis that this disposition for social cognition is neurobiologically instantiated and can be assumed to be disturbed during disturbances of social cognition. An even more ambitious move would be to assume that the default network is a neurobiological universal in humans and that social cognition is its key function. This would allow to conclude that social cognition itself is a universal cognitive capacity in humans. Notably, this is in concordance with the proposal of Michael Tomasello (Tomasello et al. 2005) who suggests that social cognitive capacities were a prerequisite for the development of human culture in a universal sense and were relevant for the development of the whole genus of *Homo sapiens*. According to this plausible proposal, social consciousness is what makes us human, and social cognitive neuroscience studies the neurobiological mechanisms that underlie these specifically human cognitive capacities.

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Social Perception

► [Attribution/Attribution Theory](#)

Social Psychology

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Related Terms

[Group dynamics](#); [Group processes](#); [Interpersonal relationships](#); [Social cognition](#); [Social influence processes](#); [Sociological psychology](#); [Symbolic interactionism](#)

Description

By Gordon Allport’s classic definition, ► [social psychology](#) is the scientific attempt to understand and explain how the thought, feeling, and behavior of individuals are influenced by the actual, imagined, or implied presence of others (Allport 1954). This definition has been influential and instructive for researchers’ partitioning of the field at many stages of its development from the earliest defining works of Ross and McDougall in 1908 through the conceptual and methodological pluralism of contemporary researchers. The attributes Allport chose as descriptors of the field also summarize a significant portion of current work, including cognitive models of attitude change, links between emotional response and aggressive behavior, interpersonal interaction in close relationships, and the implications of counterfactual thinking, each respectively corresponding to components of the classical definition (Gilbert et al. 1998).

Some areas of inquiry have fluctuated in the amount of attention accorded by researchers. For instance, studies of automaticity and the influence of the unconscious in social interaction are currently impactful in the literature, though scarce in earlier decades, especially during the periods dominated by behaviorist perspectives. Other topics have been important substantive areas within the field since its organization at the beginning of the twentieth century.

Stereotyping, prejudice, and discrimination are phenomena that remain current despite a relatively long history of investigation – a 1934 study by LaPiere famously reported a lack of strong correlation between self-reported attitudes and behavioral measures of discrimination. This finding led to an intense effort to understand the conditions under which attitudes and relevant behavior would correspond in a predictable way (Eagly and Chaiken 1993). Modern researchers address such phenomena with concepts such as implicit attitudes: Evaluations of people or other objects that predict behavior yet cannot be unexpressed by the individual. In settings from the courtroom to neighborhood backyards, implicit attitudes induce changes in judgment of others outside of awareness, either of the subject or object of the prejudice. While it is clear that implicit attitudes can have a negative impact on interpersonal interactions in matters of prejudice, other examples illustrate the adaptive value of nonconscious processes: Research in sexual attraction and mate selection shows that males tend to favor a particular waist-to-hip ratio of female partners despite the fact that they are not aware of the preference either during or subsequent to mate selection. This preference represents an implicit preference for body types most likely to bear reproductive success, and therefore the implicit attitude that drives this favoritism serves an adaptive utility that the conscious mind is simply not aware of in most situations (Tooby and Cosmides 1992).

Recently, demonstrated effects such as these have lead to some controversy over exactly how “smart” the unconscious process is and under what conditions nonconsciously driven behaviors are adaptive. For instance, the unconscious may have adaptive advantages in addressing some problems (e.g., optimal mate selection or adjusting attention appropriately to external stimuli), yet be wholly inappropriate for others: Driving down an unfamiliar road is best suited for conscious processes. Although psychologists have been aware of the impact and relevance of the unconscious since before the work of Freud, ascertaining properties of interest such as the amount of information that can actually be

communicated via subliminal perception and its ultimate impact on attitudes and behavior change is an effort undertaken with enthusiasm by modern researchers (Hassin et al. 2005).

In addition to the content of study, a defining factor of the social psychological endeavor is the array of methodologies employed by researchers in the discipline. These methodologies are rooted in the rules of scientific observation, experimentation, mathematical and statistical analysis of data, and the scientific exposition of results when communicating to others in the field. Recent methodological developments include the use of meta-analysis to aggregate studies and estimate effect sizes across a wide variety of contexts, the use of structural equation modeling to assess the correlational structure of variables and factors in studies involving many interrelated variables, such as is common in personality research, and computer simulation to model a sequence of many events or interactions over a period of time, as in studies of the development of emergent segregation effects in housing due to group-based preferences (Reis and Judd 2000). The methodologies employed are not topic specific, and the field has generally benefited from multimethodological approaches in understanding a variety of phenomena from the impact of group-level pressures toward conformity in political decision-making to the most effective attributes of successful advertising campaigns.

Self-Identification

Social psychology operates within the scientific tradition of objective, replicable methodologies and the systematic accumulation of knowledge and is therefore termed a science by its practitioners (Campbell and Stanley 1963; Campbell 1988).

Phenomena within the realm of social psychological interest are generally observable, measurable, and replicable. For instance, the impact of a conceptual prime, even a nonconsciously administered one within studies of automaticity, may be scientifically assessed by observing

the subsequent behavior of the participant: An experimental manipulation of a prime such as describing the behavior of an elderly vs. athletic person can induce subsequent observable differences in participant behavior such as walking speed – participants are more likely to take longer to walk down the hallway if they received the elderly prime. Although the mechanism of the impact of the prime is thought to be contained in the mind and is by nature unobservable, the difference in the behavioral outcome is measurable and therefore communicable to other researchers and amenable to replication efforts in other laboratories (Hassin et al. 2005). Other examples of observable psychological effects include the impact of attitudes on behavior such as the increased likelihood of purchasing of luxury products like candy bars, the impact of persuasion on attitude change and resultant behavior such as voting for Democrats rather than Republicans, and the impact of group membership on usage of stereotypes as operationalized as differences in judgment or impression formation and the ability to detect prejudice and social discrimination (Eagly and Chaiken 1993). Despite the varying objectivity of some of the processes involved in many of these effects, all have been investigated utilizing one or more of the following methodologies: laboratory experimentation, content analysis of historical documents, survey experimentation and analysis, and correlational and field methods. All effects such as these are open to disconfirmation in replication efforts (Campbell and Stanley 1963; Campbell 1988).

Ultimately, the research endeavor is termed scientific due to the ability of researchers to communicate, amend, and/or contradict earlier findings and interpretation, thereby advancing theory and understanding of the phenomena of interest to subsequent researchers. Whereas religions tend to draw knowledge and understanding of the world from static sources of authority (e.g., holy books), the body of scientific knowledge is dynamic in nature and always susceptible to revision, even after extremely long periods of success (e.g., Newton's understanding of gravity).

Characteristics

The focus on the interaction between external, social causes of behavior, and internal, psychological causes of behavior is the heart of the distinction between social psychology and other related disciplines such as psychology and sociology. Researchers in psychology as a whole generally focus on phenomena intrinsic to individuals such as biological processes of the brain, sensation and perception, analyses of genetic relationships to behavior such as learning, and other purely psychological characteristics such as intelligence. On the other hand, sociological researchers generally focus on group-level phenomena such as population distribution and the successes and failures of social and political movements. In short, social psychology distinguishes itself from these fields though its focus is on social processes both as causes and effects of individual psychological phenomena. It is the interaction of the individual- and group-level variables that is of most interest to social psychologists.

Social psychology is practiced within both the psychological and sociological traditions. The interdisciplinary differences are evident in conceptual focus: Sociological social psychology draws its perspective from theories such as the ► [symbolic interactionism](#) of George Herbert Mead (Blumer 1969) and emphasizes the influence of individual-level variables on macroscopic social analyses in studying topics such as social structure and group dynamics. Psychological social psychologists place greater emphasis on the impact of social context on individual-level variables in studying effects such as social influence, group perception, and attitude change. In psychological social psychology, the theoretical basis of these and other effects have shifted often over the last decades with emphases stemming from functionalist, behaviorist, attributional, social cognitive, and currently multimethodological, polytheoretic approaches. Methodological differences are also present between the subdisciplines: Sociological social psychologists are more likely to use sociometric data, unstructured interviews, social

surveys, observational techniques, and archival and qualitative data analytic research methods, while psychological social psychologists are more likely to rely on experimental methodologies in their mode of inquiry. Importantly, professional publication outlets and professional society memberships for each of the subdisciplines are largely nonoverlapping. However, despite differences in theoretical foundation as well as methodology, social psychologists from both traditions share interest in largely the same domain of human behavior: the interaction of the psychology of the individual with the social environment. The differences may be seen as a matter of emphasis rather than kind: Whereas psychological social psychologists give primacy to the individual's psychology as shaped by the social environment, sociological social psychologists give primacy to the social construction of self, as shaped by group-level differences. The differences between the subdisciplines may amount more to differences in the theoretical training that researchers receive to address and explain the same basic behavioral phenomena than substantive content boundaries between sociology and psychology.

Relevance to Science and Religion

The discipline of social psychology takes for granted that the appropriate method of inquiry is scientific in nature. While religious methods of inquiry are usually more subjective by primarily relying on introspective self-report, scientific social psychology relies on methods that are objectively verifiable. Even studies of cognition or emotion ultimately use behavioral variables as indicators of "black box" contents – in addition to physiological or observational measures, self-report instruments such as questionnaires and surveys of experience are subject to analyses of reliability and validity. In short, the essence of the scientific aspect of social psychology is that study results must be replicable at other times by different researchers in different laboratories with different participants. External peer review of results and interpretation is often used to

ensure that studies entering the literature meet the criteria of high scientific rigor and substantive contribution the field.

However, social psychologists acknowledge that there are many questions important to the human experience that is not answerable with this sort of approach. It is taken for granted that scientific methodologies cannot address the myriad of moral issues surrounding the determination of ethical practices, goals of research, and applications of findings. For instance, while it may be possible to assess the potential risk of a human or animal participant in a particular research project, weighing this risk against the potential benefits of the research to society is a value judgment that in some cases will be a cause of disagreement between researchers and disciplines or between the scientific and nonscientific communities. These roots of these values lay more within the domain of religion, or more generally, philosophy, rather than the scientific method. However, what current scientific practices can do is objectively study the effectiveness of policies and practices in reaching goals driven by these values. For instance, a social psychological analysis of interpersonal relationships may find correlates of love and friendship but cannot answer the moral questions about whether there is a need for love and friendship in order to live an objectively fulfilling life. Furthermore, the primarily sociological processes by which people in groups come to consensus on the answers to these moral issues and the primarily psychological process for each person deriving their own answers within the social context are both within the domain of social psychological inquiry; however, the content of these moral issues is largely beyond the scope of the scientific endeavor as it now stands.

Sources of Authority

The root authoritative sources in social psychology are textual, and found within peer-reviewed journals. Articles that are cited by others' work as foundational for future research endeavors are considered more authoritative as indicators

of the current direction of the field. Individual social psychologists gain authority by publishing frequently and/or having their publications frequently cited by other researchers. Largely influential lines of research are often synthesized in book form, which may or may not be peer reviewed, but will often consist of a collection of chapters assembled by an editorial team. The lead investigators are more likely to be invited to edit or publish textbooks and speak at major conferences; these contributions are also cited by other authors, adding to their influence.

Specific publications of historical and current interest in defining the field include *The Principles of Psychology* (1890), by William James, as important to the field of psychology as a whole, and his chapter on the Self continues to be influential in current social psychological considerations. As symbolic interactionism is a guiding theory in sociological approaches to social psychology, the work of George Herbert Mead is considered authoritative, as are other works summarizing his perspective; Blumer's *Symbolic Interactionism: Perspective and Method* (Blumer 1969) is a prominent example. Fritz Heider's *The Psychology of Interpersonal Relations* (1958) was and continues to be an inspirational source for research on cognitive consistency, which culminated in many ways in the massive 6-editor, 84-chapter volume *Theories of Cognitive Consistency: A Sourcebook* published in 1968. Susan Fiske and Shelley Taylor's advanced text *Social Cognition* (1991) emphasized the importance of the processes involved in perceiving, remembering, and interpreting information about ourselves and others. All editions of *The Handbook of Social Psychology* (first edition published 1954, most recent edition, 1998 (Gilbert et al. 1998)), which summarize recent research in the most important and active subfields of social psychology, are considered important summary sources of authority.

Ethical Principles

Several experiments in the 1960s and 1970s such as those by Stanley Milgram on the social

conditions of obedience and Phil Zimbardo on the impact of social roles on prison behavior have often been cited as examples of the need for the enforcement of ethical principles in the proper use of human participants in research. For instance, Milgram's studies asked the basic question, "Under what conditions would people obey authority figures when ordered to harm an innocent person?" Even though no physical harm was administered during his experiments, participants believed that they were administering painful (and in some cases hazardous) electric shocks onto a fellow participant. Understandably, this state of affairs was the cause of great psychological distress among the participants, even after they were informed following the study that no shocks were actually given. Zimbardo's methodology required the confining of participants within a simulated prison setting and is another example cited by critics who question whether the benefits of scientific knowledge gained in the study outweigh the psychological and physical risks of the participants involved. Zimbardo found that the situational characteristics of the social and physical environment were sufficient to elicit both extremely aggressive and submissive behaviors (in the case of guards or prisoners, respectively) that are often attributed to personality characteristics. The psychological and physical trauma reported by the participants in these and some other studies caused researchers within and outside of the social psychological community to question the methods by which these risks are weighed against potential benefits to society and therefore reevaluate the guidelines that protect participants from psychological and physical harm due to research participation.

An important guide used by social psychologists is the American Psychological Association code of ethics first published in 1953 and most recently revised in 2002. Relevant ethical principles guiding the use of human subjects include informed consent (participants should be notified of the nature of the research undertaking, including their right to decline to participate, or withdraw at any time before commencing with the study), restrictions on deception (researchers

will not conduct a study that willfully deceives the participant unless it can be determined that the use of such techniques is justified by the scientific, education, or applied value that could not be obtained through nondeceptive measures), and debriefing (researchers provide a prompt opportunity for participants to obtain appropriate information about the nature, results, and conclusions of the research, and they take reasonable steps to correct any misconceptions that participants may have had). These and other principles guide researchers in contributing to the literature in a uniformly ethical manner, as defined by leaders in the psychological community (Rosenthal 1994).

Key Values

Researchers in social psychology value knowledge of social psychological processes that can be communicated and verified with others in accordance with the general rules of scientific investigation. Social psychologists utilize the scientific method to develop and validate the theories they develop, creating new knowledge that can be reliably applied to relevant social situations. Often, the most valued and influential findings are those that are particularly nonobvious or counterintuitive. An example is the fact that a participant will often say that he thought a task was more enjoyable if he was paid less to complete it. The explanation is derived from the literature on cognitive dissonance: Enjoyable tasks are often done with no reward required, so a participant is more likely to rate a task as enjoyable if he was paid a nominal amount to complete it. That is, the cognitive dissonance of completing an unenjoyable task for little reward is reduced by nonconsciously altering perception of enjoyment of the task itself. The scientific nature of the investigation is also valued as a defining feature of the discipline, so efforts to advance methodology, measurement, statistical analysis, as well as more efficient publication and communication methods (e.g., electronic journals) continue to be actively sought.

Conceptualization

Nature/World

Social psychological conceptions of nature and the world include both environmental stimuli such as particular sights and sounds (assessed via sensory organs) and more endogenous mental stimuli such as particular emotions and thoughts (often as self-reported by participants to researchers). From a macroscopic perspective, the concept of nature and the world implies the totality of individual and social experience as it is to be understood through scientific means.

Human Being

In general, this is defined as the particular type of animal known as *Homo sapiens*, largely as they exist presently. This is the primary subject of inquiry by social psychologists, although some researchers use animal models to investigate certain aspects of behavior that are not amenable to testing with humans. For instance, some aspects of sexual behavior are more easily studied using nonhuman subjects; also, social facilitation, the idea that the presence of others will increase physiological arousal and therefore increase the probability of the psychologically dominant response to a problem, has been demonstrated in humans as well as other animals such as mice and cockroaches.

Life and Death

Human life and death are generally explained through social and biological processes. Life is produced by sexual behavior which is governed by a variety of social norms and biologically driven tendencies. Death inevitably occurs when the biological organism can no longer maintain normal functioning.

Reality

Reality can be defined both subjectively and objectively. Objective reality is governed by social agreement of the interpretation of physical phenomena. For example, many people agree that the color of the sky is “blue,” and therefore that perception is objectively real. On the other hand, subjective reality is governed by an individual’s

personal interpretation of internally derived physical and mental phenomena. For example, when one experiences the physical pain of a paper cut, or feels depressed, those perceptions are subjectively real, as no other person can personally corroborate the experience. Nonreality is generally a condition where an individual's experience does not correspond to the majority of others' experience when circumstances are such that a meaningful comparison is possible. For example, if one person believes that there is a conversation going on behind him, even though it is observed that no other people around are speaking, the perception would then be judged as nonreal.

Knowledge

Knowledge is generally considered as information, either cognitive or affective in nature, which is typically gained through any of several learning processes. For instance, learning can be nonconsciously attained through modeling behavior, as is common for young children when learning social rules from their parents and roles from their peers. Alternatively, knowledge can be obtained in a very strategic, conscious manner, such as is often done by students attempting to memorize material for an upcoming exam. Social psychologists often describe knowledge and the interrelationship between different knowledge structures in terms of individual schemata, or organized cognitive modules. This understanding of the interrelatedness of knowledge is necessary in accounting for a variety of effects in studies of memory, impression formation, and role-based behavior.

Truth

Truth qua the objective set of accepted facts comprising scientific knowledge of social psychology is generally considered to be the object of agreement between perceivers. This position is closely related to consensus epistemological theories, and the critical qualification is that relevant perceivers are professional researchers indoctrinated in scientific methods and hold compatible understandings of relevant substantive topics. From a methodological perspective, a social

psychological effect is "true" to the extent that the finding can be replicated by other researchers in other places at other times. This applies not only to effects such as an increase in aggressive behavior under certain social conditions but also to social psychological understandings of the effects themselves. For instance, the truth of the frustration-aggression hypothesis – the idea that feelings of frustration are likely to induce aggressive behavior – has been progressively uncovered since its first expressions as derived from psychoanalytic theory. The effort to reduce the uncertainty of the extent and conditions under which the effect would hold true represents the scientific endeavor to seek the truth of the effect, thereby progressively solving the mystery inherent in the previous uncertainty regarding the phenomena (see below).

Social psychologists also accept truth qua subjective personal or interpersonal experience. That is, personal experiences such as the qualitative nature of diverse emotions or spiritual awakenings may be accepted as true, yet beyond the bounds of current scientific modes of investigation or measurement techniques. Therefore, an experience may be accepted as true, insofar as an individual maintains an honest self-perception of psychological phenomena, yet outside the bounds of the accepted social psychological truth, as constructed by professional leaders in the field.

Perception

In its most general form, perception is the basic set of mental operations that brings subjective meaning to otherwise objectively meaningless stimuli. That is, while our sense of hearing can enable us to discern a wide variety of sounds, perceptual processes that lead to meaning are inherently psychological in nature and are therefore susceptible to influence from other psychological phenomena such as emotional state, cognitive complexity, motivation, and social context. In this way, although two listeners may objectively hear the same stimuli, some will perceive greater intricacy and beauty in a composition by Mozart, and this judgment will be impacted by social factors such as cultural

norms or social learning. Furthermore, these perceptual effects are often nonconscious and can often be developed through practice and training.

Time

Time is usually conceived as an objective aspect of reality, governed by regular planetary motion (e.g., the rising and setting of the sun). Different aspects of time are often implicit in social psychological theories and phenomena. For instance, theories of attitude change require that in order for persuasion to occur, in some conditions, communication messages must be delivered and elaborated on over a period of time.

Consciousness

Consciousness is often contrasted with the nonconscious and has been studied in terms of influences on affect, cognition, and behavior. John Bargh specified the “four horsemen” of automaticity – distinguishing features that together determine the nature of experience as being conscious or nonconscious: awareness, efficiency, intention, and control. Though social psychologists are far from a complete understanding of the nature of consciousness, the construct has been useful in understanding a variety of effects of interest to social psychologists. For instance, influential models of persuasion differentiate between automatic and controlled processes by which attitude change can take place: The persuasion that occurs when a person consciously thinks about an issue to decide which presidential candidate to vote for will be more durable and predictive of behavior than the persuasion that occurs when a person is nonconsciously influenced by subtle cues in a persuasive message such as attractive appearance or likeability.

Rationality/Reason

Rationality and reason are normally contrasted with more emotive or affectively based processing. Rational processes are often associated with maximizing the utility of actions to bring an individual pleasure or closer to a desired goal. Usually, such processes are considered to be conscious and cognitively based.

Mystery

Mystery describes aspects of social psychological phenomena that have not yet been thoroughly investigated in a scientific manner. That is, mystery is inherent in gaps in the field’s understanding of how the thought, feeling, and behavior of individuals are influenced by the actual, imagined, or implied presence of others. Areas such as the extent of the impact of nonconscious perception, the interaction of psychological and social forces to induce macroscopic effects such as war, and a complete understanding of the characteristics of successful romantic relationships are still being investigated by modern researchers. The collective lack of understanding of these and other effects represents the mystery that the scientific process is designed to progressively reduce.

Relevant Themes

Social psychologists also study religions as instances of social groups. Therefore, aspects of the behavior of individuals identifying with a religion will have commonalities with other social groupings such as those based on race, ethnicity, or nationality. Effects such as in-group favoritism and out-group homogeneity apply generally to members of groups, including those defined by religion.

It should also be noted that the study of religious groups in particular has been useful in understanding more general aspects of cognition and behavior. For instance, one of the most influential theories in social psychology, Leon Festinger’s theory of cognitive dissonance, was largely inspired by his study of a UFO cult in the 1950s and attempts to explain increased socialization within the group following the failed prophesy of extraterrestrial contact. The inconsistency between the prophesy and the resultant reality produced a dissonant state that group members were motivated to reduce. One mechanism of reducing this dissonance involved the seeking out of additional social support by recruiting other members into the group. Therefore, the counterintuitive finding that the group

members increasingly sought others' participation following the failure of the prophesy can be explained by the relatively simple construct of motivated dissonance reduction.

Social psychologists bring a unique perspective to the issues in the science and religion dialogue due to the fact that they incorporate both a scientific investigation of subjective psychological experience, as well as the corresponding objective social phenomena.

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Social Scientific Study of Religion

- [Psychology of Religion](#)

Social Stigma

- [Deviance and Social Control, Sociology of](#)

Socialization

- [Education, Sociology of](#)

Socialization Process

- [Education, Sociology of](#)

Sociological Psychology

- [Social Psychology](#)

Sociology

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Sociology of Communication

- [Popular Culture and the Mass Media, Sociology of](#)

Sociology of Culture

- [Popular Culture and the Mass Media, Sociology of](#)

Software Design

► [Software Engineering](#)

Software Development

► [Software Engineering](#)

Software Engineering

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Related Terms

[Computer science](#); [Software design](#); [Software development](#)

Description

Software engineering is a discipline that attempts to deliver fault-free software on time and within budget to meet the needs of the customer. A more formal definition from IEEE (IEEE Standards Collection: Software Engineering 1993) is as follows:

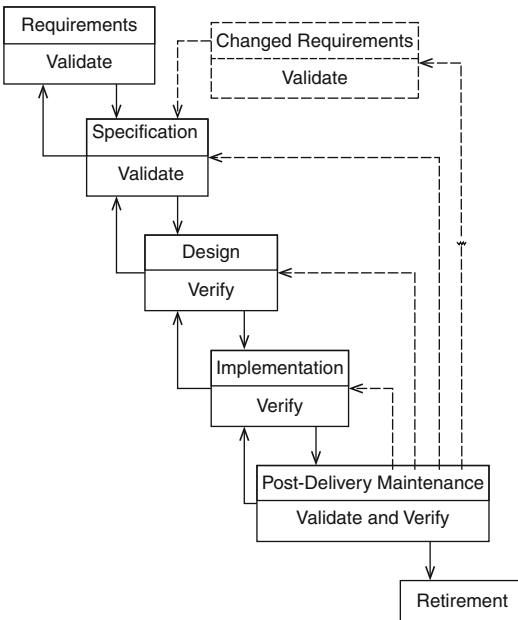
Software engineering: (1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, that is, the application of engineering to software. (2) The study of approaches as in (1).

There are a variety of software development life cycle (SDLC) models currently in use by professional software engineers. The first SDLC model was the Waterfall Model, but this model proved to be inflexible, as it is not conducive to changes in customer requirements or faults discovered late in the SDLC. The Waterfall Model, as originally proposed in 1970, consists of the following sequence of phases:

- Requirements (The customer's needs are determined.)
- Specification (A formal document enumerating product features and system constraints is composed.)
- Design (Architectural Design: The modules of the system are determined; Detailed Design: The data and algorithms are specified.)
- Implementation (The algorithms are translated to code.)
- Unit Testing (Individual modules are tested for correctness.)
- Integration Testing (Modules are combined and tested to check if system requirements are met.)
- Postdelivery Maintenance (Errors discovered after delivery are corrected; environment changes requiring adaptive maintenance are performed; improvements or enhancements known as perfective maintenance are implemented.)
- Retirement (The product has become obsolete or too cumbersome to maintain, so it is removed from operation.)

A more modern depiction of the Waterfall Model (see [Fig. 1](#)) contains feedback loops and often appears without testing phases. The omission of the testing phases emphasizes non-execution-based testing (Walkthroughs and Inspections) and/or execution-based testing should take place during every phase of the SDLC. Notice the terms validate and verify in the model. As originally defined by Boehm, validation is a customer-oriented activity where the developer asks the question "Are we building the *right* product?" Meanwhile, verification is a developer-oriented activity; the relevant question is "Are we building the product *right*?" It is interesting to note that even though the Waterfall Model has several shortcomings, the model or one of its adaptations is still widely used in industry (Sommerville 2007). The reason for its usage is probably due to the fact that management likes the model, because it requires developers to create a project plan with milestones and deliverables announced early in the SDLC.

The Rapid Prototyping Model was developed to counteract the shortcomings of the Waterfall



Software Engineering, Fig. 1 A modern Waterfall Model (Adapted from (Schach 2007))

Model. In particular, this SDLC model prescribes that developers first build a rapid prototype to elicit customer requirements. The prototype is often a mock-up of the proposed graphical user interface. Because the prototype is rapidly constructed without attention to design details, it should be thrown away. The phases of the Rapid Prototyping Model match those of the Waterfall Model except that prototype construction and customer feedback replace the Requirements Phase. The major advantage of the Prototyping Model over the Waterfall Model is the early customer feedback because, with feedback, the final product is more likely to satisfy the customer's requirements. However, the Prototyping Model has not proven to be successful in all cases.

Another adaptation of the Waterfall Model that clearly demonstrates the importance of testing is the V Model (see Fig. 2). In particular, the model illustrates that different types of test cases should be written in the early phases of the SDLC model as opposed to after implementation. For example, acceptance test cases should be written

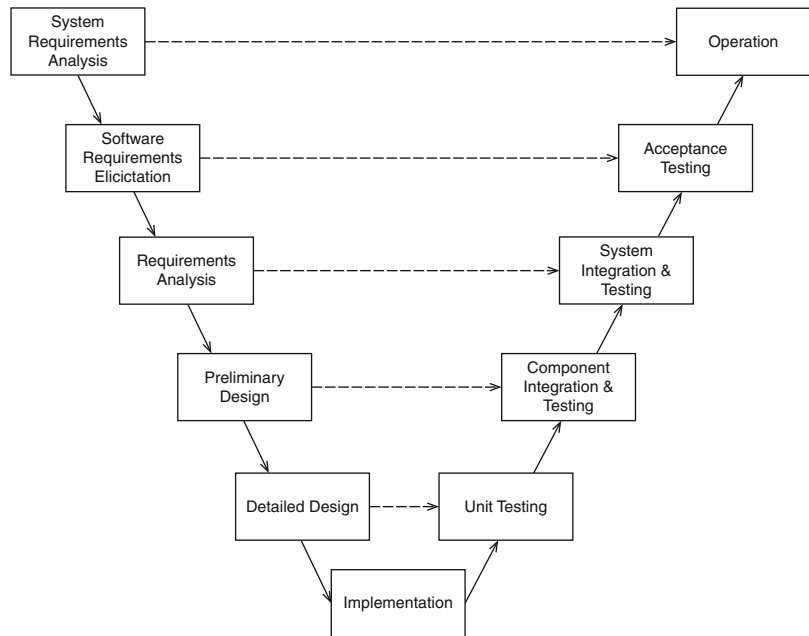
during requirements elicitation. Similarly, integration tests can be written during Architectural or Preliminary Design, and unit tests are easily constructed when performing Detailed Design.

Another important SDLC model is the Spiral Model developed by Barry Boehm in 1988 (Boehm 1988). The illustration of the Spiral Model is perhaps the most complex of all SDLC models (e.g., Waterfall, Rapid Prototyping, ► [Evolutionary Prototyping](#)) of its time. The Spiral Model is especially important, because it was the first SDLC model to promote ► [risk analysis](#). A simplified way of thinking about the model is to consider it as the Waterfall Model with each phase preceded by risk analysis (Schach 2007). However, the actual model contains a spiral drawn over four quadrants, and each quadrant contains a guideline for development. In particular, software developers should first determine project objectives and consider alternatives; second, they should evaluate the alternatives and resolve the risks, if possible; next, they should perform the activities associated with the phase in question, including verification; and finally, they should plan for the next phase. The major tenet of this model is software developers should perform risk analysis, and if the risks are too great, a project should be abandoned.

In today's world, the majority of software developers support an incremental, iterative approach to software development. That is, in order to better fulfill the customer's needs, software is constructed in increments with customer feedback at the completion of each increment. However, even when incremental development is employed, there are two widely differing schools of thought on how to best produce a software product. The conflicting models and associated guidelines are known as the disciplined or plan-driven approaches versus the agile methodologies (Boehm and Turner 2004).

A comprehensive plan-driven method is the Rational Unified Process (RUP) (Jacobson et al. 1999), which was developed by Booch, Rumbaugh, and Jacobson. Unlike other software development life cycle models, the RUP model contains both a vertical axis and a horizontal axis

Software Engineering,
Fig. 2 The V Model



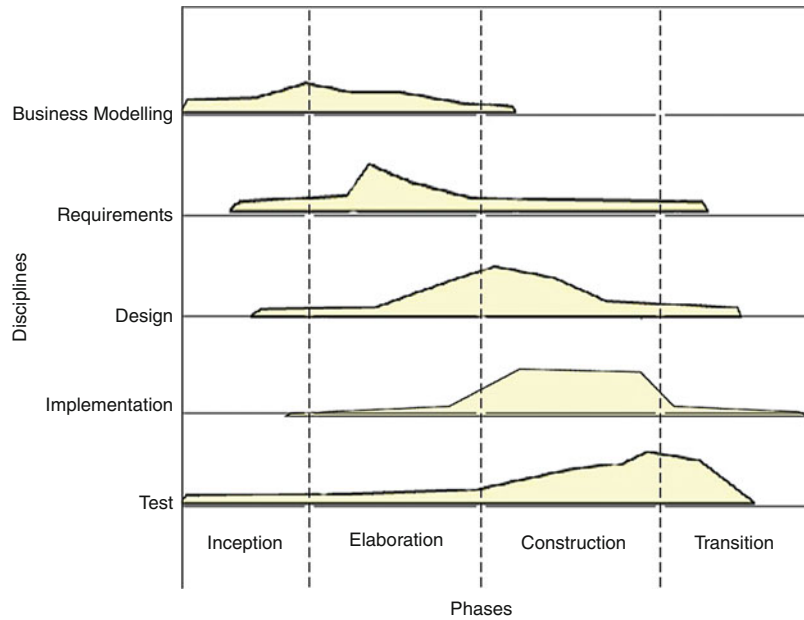
(see Fig. 3). The vertical axis specifies the disciplines (formerly known as workflows), which are similar to the phases of the Waterfall Model, whereas the horizontal axis denotes the actual phases of RUP. There are five major disciplines: Business Modeling, Requirements, Design, Implementation, and Testing. Other disciplines include Deployment, Configuration and Change Management, Project Management, and the Environment. At the same time, there are four phases: Inception, Elaboration, Construction, and Transition. During any one phase, developers may perform activities associated with multiple disciplines, although one or more disciplines usually predominate a phase. (Fig. 3 depicts a typical project; different projects would have different graphs.) The disciplines precisely describe the activities that software developers undertake when building software applications. In other words, developers follow a sequence of steps to implement a deliverable, but often iterate the steps in order to improve the documentation, correct errors, or adapt to changing requirements. In contrast, the phases of RUP correspond to management goals such as well-defined

schedules with deliverable dates for documentation such as the Vision Statement, the Software Requirements Specification (SRS), the Design Document, and Test Cases. Note: Nowadays this model is usually referred to as simply the Unified Process (UP).

Another thorough plan-driven method is the Team Software Process (TSP) (Humphrey 2000), which was developed by Watts Humphrey at the Software Engineering Institute (SEI). This method prescribes activities for individuals on a software development team based on their roles, and is meant to be used with Humphrey's earlier Personal Software Process (PSP). Note that PSP guidelines were written by Humphrey in response to companies being unable to reach acceptable levels of "goodness" in their processes as outlined in the original Capability Maturity Model (CMM). (See below for a description of CMM.)

An important skill for software engineers is the ability to model software systems. A modeling notation associated with RUP is the Unified Modeling Language (UML), which has become an industry standard. There are seven

Software Engineering,
Fig. 3 Unified process



major diagrams of UML: the Use Case Diagram, the Class Diagram, Interaction Diagrams (the Sequence Diagram and the Communication Diagram, formerly known as the Collaboration Diagram), the Statechart Diagram, the Activity Diagram, the Component Diagram, and the Deployment Diagram. Most tools supporting UML allow users to draw Use Case Diagrams, which specify the functionality of the system from the user's viewpoint; Class Diagrams, which denote the attributes and methods of each class and also illustrate the relationships and dependencies among classes; and Sequence Diagrams, which denote the time-ordering of messages between the objects of a software system. Although UML is normally associated with RUP, software engineers employing any other method may choose to model their software using one or more of the UML diagrams. For those applying agile methods, the Class Model and Sequence Diagrams would be the most likely choices.

The philosophy behind agile methods is best stated in the Agile Manifesto of 2001 (Beck et. al 2001).

- *Individuals and interactions* over processes and tools

- *Working software* over comprehensive documentation
- *Customer collaboration* over contract negotiation
- *Responding to change* over following a plan

The Manifesto itself is often misunderstood. Sometimes software developers will state that they are following an agile process, because they do not bother with documentation. However, all agile methods require documentation; the documentation produced is just different when compared to the deliverables of more traditional, plan-driven methods. Perhaps a better way to state the agile enthusiasts' point of view is the following: The most important objective of a software development team is to deliver a working product that meets the customer's needs. In other words, the developers should not become bogged down in documentation or become overly concerned with adopting the newest process or tool. Their goals can best be met by interacting with the customer throughout the project and having the farsightedness to change an infeasible plan.

There are several agile methods, but the most popular are Scrum (Schwaber and Beedle 2001) and Extreme Programming (XP) (Beck 2004).

As stated above, in UML, the functionality of a software system is expressed by the developer by drawing use case diagrams and a corresponding description for each use case. In contrast, in agile methods, customers record their requirements as user stories on index cards. An important characteristic of agile methods is the time boxing associated with incremental development. In particular, a software development team works a specified time period before displaying or delivering an increment to the customer. In Scrum, a typical increment, also known as a sprint, is about a month, whereas in XP, the time period is usually about 2 weeks. With both methods, customers prioritize the requirements, thereby allowing them to view or interact with more important features earlier in the SDLC. A distinctive characteristic of Scrum is the Daily Scrum, a meeting lasting about 15 min in which each team member describes his or her progress, problems, and plans for the day. Extreme Programming is more disciplined than Scrum, as its developers prescribe 13 practices. Below, we describe two distinguishing features: pair programming and test-driven development.

In pair programming, one developer acts as the pilot or driver for the code, while the other member serves as the copilot or observer. The pilot controls the keyboard and is responsible for algorithm creation; in her role, she is said to have “tunnel vision.” At the same time, the copilot looks for both syntax errors and logical faults; we also say that she is in charge of the “big picture,” or, in other words, how the code being implemented fits into the overall product. Another one of the copilot’s duties is to suggest when roles should alternate, as one developer may become tired, often with an associated degradation in performance. In agile teams, it is also recommended that individuals work with different partners occasionally, because pairs may become so accustomed to working together that the benefit of automatic reviewing of the algorithm and associated code is lost.

There are two testing activities associated with test-driven development: acceptance testing and unit testing. In acceptance testing, customers (perhaps with the help of developers) compose

their own test cases. Note each test case represents a particular scenario, and the customer typically uses a tool with tables in which he or she enters various values representing input data, along with the desired results or output. Meanwhile, unit testing in XP is called test-first development, because developers write their test cases in code before any production code is written. Naturally, when the test cases are first executed, they fail. Then, the developers’ strategy is to write “just enough code” for the test case to pass. Issues such as efficiency, readability, maintainability, and so forth are addressed later when the code is refactored.

It is important to note that there is really no best software development process (SDLC model plus associated guidelines) for all types of software applications. A process model should be selected based on the application domain including the degree to which requirements change, the size of the development team and the experience of its members, and the culture of the development organization (Boehm and Turner 2004). In reality, there are times when a combination of the agile and plan-driven methods is actually the best approach to implement a software product.

When developing safety-critical systems, a plan-driven approach is usually more desirable. A safety-critical system is a software system that may result in injury, loss of life, or damage to the environment. An example of a safety-critical system is the software monitoring a nuclear power plant. Furthermore, formal methods, which are mathematically based techniques, may be employed. There are two major categories of formal specification languages: algebraic and model oriented. With an algebraic specification language, a system is first described in terms of its operations by providing a signature (the input and output types, known as sorts) for each operation. Next a collection of axioms describes the relationships of the operations. In contrast, with a model-oriented specification language, the developer builds a model of the system using mathematical constructs such as sets and functions. Another consideration when building safety-critical systems is verification techniques, which may include proofs of correctness.

A related issue to process models is team organization. Just as there are widely disparate software development paradigms, team models exist at both ends of the spectrum. The two most widely cited team models are the Chief Programmer and the Democratic Team, but there are many other models as well. Note that companies using a plan-driven method will usually have a hierarchical team structure, whereas agile teams prefer the Democratic model.

In the Chief Programmer Model, each team member has a role to perform with associated duties. For example, the Chief Programmer is both the team leader and the team manager. As the leader, the Chief Programmer constructs the system architecture, and is ultimately responsible for every line of code. There is also a Backup Programmer, who has the same qualifications as the Chief Programmer, and is capable of replacing the Chief Programmer if necessary. A person responsible for system documentation called the Secretary and several general programmers comprise the remainder of the team. The advantages of this model are specialization and the limited number of communication paths (due to a hierarchy in interacting with the Chief Programmer). The major shortcoming of the model is finding personnel that can fit each of the roles, especially two people (Chief Programmer and Backup Programmer) who are excellent managers as well as established programmers.

Meanwhile, the Democratic Team or “ego-less team” has no designated leader. Rather, this team structure often arises in a research environment, where all team members respect the knowledge that each individual brings to the table. In a Democratic Team, the code belongs to the whole team. Because there is no “finger pointing” when errors are discovered, Democratic Teams are said to be better at locating faults and often produce higher quality code. The disadvantage of the model is the number of communication paths, because as the number of team members increases, the number of communication paths produces a ► [combinatorial explosion](#).

In today’s global economy, team members are not necessarily colocated, rather they may have

offices in different buildings, different cities, different countries, or even different continents.

Distributed teams offer specific challenges for software developers and management. For example, team members may have different technical backgrounds, come from dissimilar cultures, work in separate time zones, just to name a few concerns. Organizations are currently experimenting with modified team structures (including those with an agile leaning as reported in the 2008 Agile Alliance Conference).

Another phenomenon related to team structure is open source code. Nowadays, many software products are developed as open source, meaning that they are freely available on the World Wide Web. Usually there is a cadre of developers, but these primary developers allow others to suggest improvements and/or alter their code.

As mentioned earlier, CMM, which became S-CMM, was a process improvement and assessment model for organizations. Founded at the Software Engineering Institute in 1986, CMM described five levels of “goodness” and corresponding key process areas that an organization should follow, if it wanted to improve its process. The highest rating that a company could achieve was Level 5, which included two important imperatives: (1) a company should have a continual process improvement strategy in place and (2) a company should encourage innovative ideas and technologies. When a company’s process was formally evaluated, it received a single rating. For example, a company might be following a key process area in Level 4 but only receive a Level 2 ranking. The reason for this discrepancy was the fact that all key process areas of a particular level and all levels below must be exercised to receive the higher rating.

In 2001, the Software Engineering Institute compiled the Capability Maturity Model Integrated (CMMI). This process improvement model has several advantages over its predecessor Software Capability Model (S-CMM.) First, it combines several different capability models including the Software Capability Model, the Systems Engineering Capability Model, and the People Capability Model into a single framework. Furthermore, with respect to software, the

CMMI actually has two models: the staged CMMI and the continuous CMMI.

For companies accustomed to applying S-CMM, the staged CMMI is especially attractive. Like S-CMM, a company must practice all key process areas at a particular level to achieve the associated ranking, and ranks range from 1 (Initial) to 5 (Optimizing). However, if a company is more interested in assessing specific key process areas, the continuous model may be more appealing. In particular, the continuous model specifies goals to achieve along with desired practices. Furthermore, when using the continuous model, an organization receives a collection of ratings corresponding to the key process areas of interest. For example, a company could work on the six key process areas in the category of engineering and receive a ranking for each. If using the staged model, only a single ranking for the entire organization would be given.

Self-identification

Science

The term “software engineering” arose in 1967 as a result of a NATO study group, and the first conference devoted to the topic was held the following year in Germany. The goal of the attending members was to prescribe a more disciplined approach to the development of software applications. In other words, the motivation for the term was practitioners and academicians should pattern software development after the older, more established subdisciplines of engineering. Although a laudable goal, software engineering is actually very different from traditional engineering. To illustrate this point, let us compare software engineering to the older engineering subdiscipline civil engineering. When building a bridge, a civil engineer can build a model before constructing the final product, whereas software is invisible. Furthermore, the civil engineer has a foundation of knowledge that was built on “thousands of years of experience” compared to a mere 40 years for the field of software engineering. Similarly, the public’s expectations are different when comparing

software to a bridge. For example, when using software applications such as operating systems or word processors, oftentimes the software will fail, and the customer has come to accept these defects as necessary evils of computer systems. However, if a bridge collapses, the public is much less forgiving. Another difference between bridge-building and software construction is the type of mathematics involved. Traditional engineers must use calculus, which considers continuous functions, whereas a software engineer applies the theories of discrete mathematics. In other words, a software engineer must consider all of the system states, which are discrete, that a software application may occupy. However, the paradox is there is no way for a developer to determine “all” the states or the ways that a computer application may be used; because, when computer applications are successful, customers ask for additional enhancements (perfective maintenance) or use the system in unexpected ways resulting in software failures requiring corrective maintenance.

Characteristics

This question was best answered by Frederick Brooks in his definitive essay “No Silver Bullet.” That is, four characteristics of software engineering distinguish the discipline from the other sciences. Brooks describes each of these features in the following order: complexity, conformity, changeability, and invisibility. See the section “[Science](#)” for a discussion of complexity (number of discrete states in a system). Conformity means that software must comply with the requirements of a workplace or customer. These requirements may not be the most natural way to approach the problem making the developer’s job more difficult than necessary. Changeability is also discussed under section “[Science](#)” in that satisfied customers often request additional features when they like a product. Furthermore, as the world, economy, and so forth change, software needs to be modified (adaptive maintenance). The invisibility of software compared to physical models in other sciences is self-evident.

Relevance to Science and Religion

For the majority of software engineers, there is little interest in the area of “Science and Religion.” However, software engineers are interested in improving the lives of individuals. As an example, let us consider software used in the field of medicine. We all have heard of cases where a doctor predicts a patient will not recover or will only live for a limited amount of time, but the patient exceeds the doctor’s expectations; oftentimes, there is no medical explanation for this occurrence. Those who believe in religion might say that the patient’s experience is an “act of God.” Software engineers build systems that help doctors to better predict the illnesses (e.g., cancer, dementia, etc.) that plague mankind. Such applications are known as diagnostic systems.

Sources of Authority

Conference and journal articles are one major source of authority for this discipline/subdiscipline. The major conference is the *International Conference on Software Engineering (ICSE)*, and the major journals are *IEEE Transactions on Software Engineering* and *ACM Transactions on Software Engineering and Methodology*. All of the published articles in these sources are peer reviewed. Two other sources of authority are the Special Interest Group on Software Engineering (SIGSOFT), which is sponsored by ACM, and the *Guide to Software Engineering Body of Knowledge* (also known as SWEBOK), which is sponsored by the IEEE Computer Society. There are also many IEEE Standards publications that target specific subareas of software engineering. Finally, another source of authority is the Software Engineering Institute (SEI), which originated in 1984 at the request of the U.S. Department of Defense. SEI publishes several white papers each year describing research conducted at the Institute. Note: This is not an exhaustive list of sources. For example, there are several other major conferences devoted to software engineering

(e.g., *Fundamental Approaches to Software Engineering (FASE)*), as well as many well-respected conferences targeting subareas of the discipline (e.g., *International Conference on Requirements Engineering (RE)*).

Ethical Principles

The Software Engineering Code of Ethics (and Professional Practice) is comprised of a short version and a long version. The short version prescribes eight principles to which a software engineer should aspire, whereas the long version outlines specific examples for more guidance. In the discussion below, the principles are paraphrased, but the associated categories remain unchanged. Note: The categories are listed in the order of importance. In other words, if there is a conflict of interests, the principle with the lower number has priority.

1. Public: The foremost principle is software engineers must consider the interests of the public before all other concerns.
2. Client and Employer: The interests of the client and the employer should be considered when developing software.
3. Product: The original product and any modifications to the product after its initial delivery should meet the highest professional standards possible.
4. Judgment: Software engineers should adhere to both moral and ethical principles when making decisions in their daily jobs.
5. Management: Managers should foster an environment where both managers and engineers abide by the ethical principles when developing and maintaining software.
6. Profession: Software engineers need to demonstrate their ethical principles when dealing with the public. Furthermore, they should advance the knowledge of the public when they have opportunities to do so.
7. Colleagues: Software engineers should help their colleagues and give credit where due.
8. Self: Software engineers should continue to learn new techniques for software development, as information technology is a rapidly

changing field. Furthermore, software engineers should adhere to moral principles in their professional lives.

Key Values

In the Code of Software Engineering Ethics and Professional Practice, it states that software engineers should commit themselves to making the discipline a respected profession. Furthermore, they should always strive to promote the health, safety, and welfare of the public.

Conceptualization

Nature/World

Software engineers consider nature as the items in the world that are not necessarily associated with human beings. When developing applications, software engineers must consider the effects on the environment.

Human Being

The discipline of software engineering considers a human being to be a member of the human race or, in other words, a person (living or dead). The Software Engineering Code of Ethics states that a software engineer's primary responsibility is to the public. In other words, if there is a conflict of interests, the concerns of other human beings should be foremost.

Life and Death

Life is the beginning of existence for members of the plant or animal kingdoms, whereas death is the ending of this existence. However, the discipline of software engineering considers the concept of life as the steps in the development of a software application. (See the discussion of software development life cycle models in section "[Description](#)").

Reality

Reality refers to living or nonliving items that actually exist. Software engineers may build "virtual reality" systems, which are imaginary

worlds simulated by computers. For example, users might like to imagine that they are playing particular sports or going to exotic vacation spots.

Knowledge

Knowledge is information gained through study and reasoning. The management of knowledge and knowledge engineering are both important to the field of software engineering. For example, knowledge management is a necessary requirement when building an expert system.

Truth

Truth is a fact that has been proven or, in other words, the opposite of a falsehood. Software engineers have a responsibility to educate the public about technology. A concern is some computer users are naïve or uneducated in basic computer literacy. For example, naïve individuals may believe that all output from a computer application is correct or that all information on the Internet is true.

Perception

Perception is an individual's interpretation of a situation or a concept by using one of the five senses. A common perception among the public is a software engineer spends most of his/her time programming. However, the majority of software nowadays is developed in teams, where software engineers meet regularly with the customer and report to management. In other words, the job of software engineer requires excellent communication skills, and the activities in a typical day involve much more than programming (see discussion under section "[Description](#)").

Time

Software engineers define time as the duration of a period, measured in minutes, hours, days, and so forth, for an activity to be completed. They are especially interested in delivering software "on time." Like computer scientists, in general, software engineers must also consider the "run-time" of the algorithms that they use to solve problems.

Consciousness

Consciousness is an awareness of a problem or concept.

Rationality/Reason

Rationality is the ability to make the optimal choice, whereas reason is the action of considering alternatives. This concept is of major importance to software engineers. In fact, if one were asked to describe the requirements for the job of software engineer, the ability to reason might appear first. Two examples follow. First, when implementing a program, a software engineer must consider the trade-offs between how data is stored (a space issue) versus efficiency (runtime). Similarly, a software engineer must deliberate the price that a customer is willing to pay for a product versus the amount of time that it will take to implement the desired features. As a point in question, some features of a system might have to be implemented in a future release due to customer's time and cost constraints.

Mystery

A mystery is an occurrence or phenomenon with no logical explanation.

Relevant Themes

There are now several universities that offer degrees in software engineering. When compared to computer science degrees, software engineering degrees are more application oriented, whereas computer science degrees are more theoretical in nature.

In 2004, the Software Engineering volume of *Computing Curricula* designated ten knowledge areas: Computing Essentials, Mathematical and Engineering Fundamentals, Professional Practice, Software Modeling & Analysis, Software Design, Software Verification & Validation, Software Evolution, Software Process, Software Quality, and Software Management. Some of the topics in the knowledge areas coexist with topics in the Computer Science or Computing Engineering volumes of *Computing Curricula*.

Cross-References

- ▶ Algorithms, Computer
- ▶ Complex Systems
- ▶ Cyberethics
- ▶ Games, Computer
- ▶ Robot Programming

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Solar Temple

- ▶ UFO Cults

Somatology

- ▶ Embodied Theology

Somnology

- ▶ Sleep Medicine

Soteriology

► Eschatology

Soul

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Related Terms

Dualism; Psyche; Self; Spirit

The idea of the human soul defines what most people think of as the inner being or core principle of an individual person. The anthropogeny contained in the *Atrahasis* poem of ancient Mesopotamia contains initial hints of ensoulment, since by mixing the flesh and blood of a god that the other gods have killed with clay, a new creature is formed. The soul is related conceptually to the Hebrew word *nepheš* (נֶפֶשׁ) in the Hebrew Bible which refers to a living being which breathes. A living being is that which breathes, an effect of God's breathing life into Adam through his nostrils (Gen. 2:7). A dualism is potentially implied between the spiritual living being and the physical dust from which the human is created. Prior to the development of a belief in the resurrection of the body in Judaism and the Christian church, the soul in the Hebrew Bible goes to *She ol* after death. In the Hebrew Bible, the soul of a living being refers to an aspect of a person, the seat of one's appetites, the self and even mental processes, including the will.

In Hellenistic culture initially, the soul was a univocal means for expressing how a living organism lives and mentally functions. A conceptual separation of the soul from the body became formalized through the use of the different words for spirit (*pneuma*), body (*sōma*),

and soul (*psuchē*). Plato's idea of a disembodied post-mortem life, of immortality, develops earlier ideas from the Homeric age. Plato's dualism between physical and ideal realities signifies the identity of personhood with a non-visible soul. He was opposed by Aristotle, who held out for the existence of souls as essential operating principles for all living things, including plants and animals (Aristotle, 1961).

Christian belief in the human soul is attested by the numerous mentions of *psuchē* in the New Testament. Related to the Greek verb *psuchēin* "to breathe," this word refers to a natural sense of self, in continuity with the Hebrew word *nepheš*. In contrast, *pneuma* is associated with the equally less physical Hebrew word *ruah*. This spirit, in contrast with ordinary human soul, is associated with the being of God, a predecessor to the development of the Christian doctrine of the trinity. Yet, Paul is less precise in employing the term *pneuma*, as, for instance, in 2 Cor. 2:13, which suggests the notion of soul. And, the New Testament generally assumes a body-spirit unity rather than a notion of human persons who "have" either a soul or body, despite Paul's account of struggle between the flesh and the spirit.

In Islam, the word *nafs* (etymologically similar to the Hebrew *nepheš*) means soul and is distinguished in the Qur'an from God's spirit or *ruh*, which is breathed into humans at their creation. Al-Kindī (d. c. 870) articulates an Islamic philosophical notion of the soul in neoplatonic terms, while Ibn Sīnā (or Avicenna, d. 1037) is the most influential exponent of an Islamic understanding of individual immortality of the soul. Sufi interpreters of the soul emphasize its role in the mystical experience of God, while its metaphysical status is contested among Sufi philosophers. And, among Indian religions, the soul is an accepted concept that marks off the living from the dead.

Historically, and especially in the science-religion dialogue, accounts of the soul are related to accounts of mind. Particularly since philosopher René Descartes defended a causal interaction between two separate entities, mind and body, the soul has come to be associated with dualism, which postulates the separate, mutual causation of two kinds of phenomena: spatial physical

objects and nonspatial mental events. For Descartes, nevertheless, the soul was postulated as located in the pineal gland, where he speculated that all thoughts are formed (Descartes, 1897).

A subtle mind-body dualism is proposed by Thomas Aquinas, who sees the soul in terms of an Aristotelian outlook, where the soul is the formal, not the efficient, cause of thought and bodily movement. This is the most well-known form ofhylomorphism, in which the substance of the person is understood as a composite of matter and form. The human person is “not a soul only but rather a composite of soul and body” (Aquinas 1964–1973: I, q75, a4). While Aquinas’ and Descartes’ accounts of the soul share a substance metaphysics, the semantic thrust of Aquinas’ understanding of substance is conducive to the idea that mind can emerge from the physical world. Hence, current defenders of the idea of the soul are more likely to rely upon a Thomist metaphysic than a Cartesian metaphysic. Prominent exponents of a substantial soul include the philosophers Karl Popper, John Eccles, and, earlier in the twentieth century, neurophysiologist Wilder Penfield. Contemporary Thomists, such as Fergus Kerr and Alasdair MacIntyre, argue for the retention of a broadly Aristotelian notion of human personhood in terms of rational animals, as opposed to the idea of humans as essentially thinking beings.

Some contemporary thinkers expound an “emergent dualism,” in which the soul is the organizing principle within a network of complex rational and affective operations that potentially orient the reception of God’s grace. For W.G. Leibniz (1646–1716), the soul plays a role in his metaphysical view which mediates two famously opposed eighteenth century dualist portraits of consciousness: those of Descartes’ picture of mind-body interaction and Malebranche’s suggestion of a miraculous cause for mental events. Leibniz sees the concept of the soul as important for the “primitive unities” of bodies, which are otherwise aggregates of non-unified substances. Jean (John) Calvin discusses the soul in the *Institutes* and affirms it in continuity with medieval thought, as, for example, when he claims “man consists of

a body and a soul; meaning by soul, an immortal though created essence” (Calvin 1960: I,15).

In the contemporary period, materialists deny the existence of the soul due to their belief that consciousness is entirely physical in nature. This denial takes a number of forms, beginning with British philosopher Gilbert Ryle’s description of Descartes’ dualism as that of a “ghost in the machine.” Another criticism materialists make is that the soul is simply based upon a commonsense view of mind constituted by an invalid “folk psychology.” So, on the materialist view, the notion of the soul is unable to illumine any problem of consciousness. Cognitive scientist Steven Pinker claims that the mind “is what the brain does,” a functionalism that stresses the role of physical causal relations in making up mental states, thus disallowing any nonbiological elements in cognition, emotion, or higher forms of reason. Daniel Dennett adopts a similar skepticism toward the mind and, by extension of the soul, in his well-known eliminativism: philosophical problems arising from consciousness are to be eliminated from existence because they are problems based on nonscientific, unanalyzable, first-person accounts of experience (Dennett, 1992).

Opposed to materialism is a range of philosophers who stress a number of elements, especially those of thought and intentionality. Richard Swinburne’s composite dualism posits that mental properties are ascribed to the soul while physical properties are ascribed to the body (Swinburne, 1997). Property dualists hold, contrary to Descartes, that there is only one material substance, yet there are two kinds of properties, physical and nonphysical. This position is sometimes called “dual-aspect monism.” William Hasker holds that individuals emerge alongside the properties for consciousness in bodies. His position is called “emergent” dualism wherein the mind is a “soul field” analogous to a magnetic field’s relationship to a magnet (Hasker, 1999). For Hasker, both humans and animals possess souls. Nancey Murphy and others adopt a “nonreductive physicalism,” which stresses a definition of supervenience, in which mental events supervene by means of informational feedback loops upon neural

processes, thus leading to “downward causation” of the mental on the neuronal. Yet, for Murphy, the soul is ultimately an unnecessary concept for Christian belief. And, in a similar vein, Kevin Corcoran advances a “constitution” view wherein the human person is constituted by bodies but not identical with bodies. Less scholarly contemporaries provide the soul with a looser psychological, phenomenological, or spiritual meaning. Examples of thinkers in this genre include James Hillman, Gerald May, and Ken Wilber.

Cross-References

- [Consciousness](#)
- [Dualism](#)
- [Free Will](#)
- [Imago Dei](#)
- [Mysticism](#)
- [Negative Theology](#)
- [Neurotheology](#)
- [Self](#)
- [Theological Anthropology](#)

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Source Localization

- [Magnetoencephalography \(MEG\)](#)

Space

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Related Terms

[Curved space](#); [Dark energy](#); [Expansion of the universe](#); [Gravity](#); [Heisenberg’s uncertainty principle](#); [Planck length](#); [Relativity theory](#); [Spatial dimensions](#); [String theory](#); [Virtual particles](#)

Introduction

What is space? By this we do not necessarily mean outer space – the cosmos. We are talking of space in general. The obvious answer seems to be “nothing.” If there are no objects in a particular region of space, we speak of it as being empty space – which seems to imply nothingness. And yet that is not how the modern physicist views it.

The Expansion of Space

The sun is a star. The stars are gathered into great swirling whirlpools called galaxies. Galaxies in their turn form clusters of galaxies. When we view distant galaxy clusters we find that they are all retreating from each other. The universe is expanding. This is in the aftermath of

the Big Bang which is believed to mark the creation of the universe. But the Big Bang was not an explosion like other explosions. The galaxy clusters are not receding from us by moving through space; it is space itself that is expanding and carrying the clusters along with it. The situation is similar to inflating a rubber balloon on which 5p coins have been glued. The coins separate not because they are sliding over the rubber into regions where previously there had been no coins. They are separating because the rubber in between them is expanding. So it is with space. The clusters are being carried along on a tide of expanding space. This is our first indication that space is hardly to be regarded as nothing!

The Creation of Space

At the instant of the Big Bang, all the contents of the universe were at a point. But not just the contents, but space itself. A point has no volume. For this reason it is believed that the Big Bang saw not only the creation of the contents of the universe, but also the creation of space.

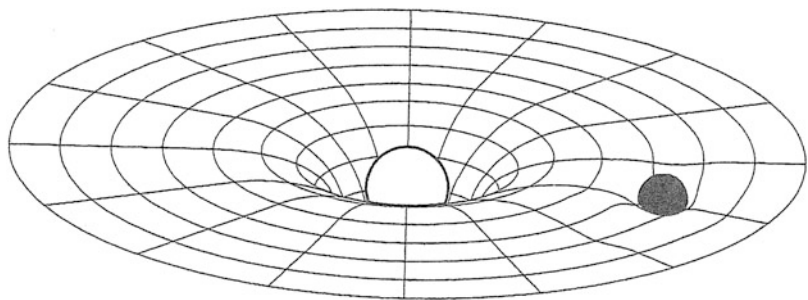
The Curvature of Space

A space station moves in orbit about the earth. Why? Because of the force of gravity exerted on it by the earth. That, at least, is how one conventionally describes the situation. However, there is something very odd about the gravitational force. We can see that by considering an astronaut

stepping outside the space station and floating in orbit alongside it. Both the astronaut and the station are essentially traveling in the same path. But the astronaut is much lighter than the spacecraft, so it takes less force to keep her on course than it does the craft. Thus gravity has to pull less strongly on her than on the craft. Gravity somehow seems to know exactly how hard to pull on objects to make their motions the same. How does it know? And in any case, *why* would it want to keep both the craft and the astronaut on the same path?

The answer from relativity theory is to do away entirely with the concept of gravitational forces. Instead it holds that a better way of looking at things is to say that what the Earth is doing is not exerting a force on the objects orbiting it, but instead it is curving, or warping, the surrounding space. As a result of this distortion of space, anything passing through the affected region no longer travels in a straight line. Instead it follows a curved trajectory. The spacecraft and the astronaut follow the same path because that is the *natural* path for *any* object to follow if they start off from the same point with the same velocity. The natural path is not a straight line – a straight line requiring a force to convert it into an orbit. It is as though the Earth has caused a dimple in space – much as a ball bearing would if placed on a stretched rubber sheet (see Fig. 1). A second ball rolling across the sheet – say, a light table tennis ball – would follow a curved path because of the curvature of the sheet. It might even find itself captured into an “orbit” repeatedly circling the ball bearing. So, the Earth causes a dimple in three-dimensional

Space, Fig. 1 The Earth causes the surrounding space to curve, this curvature being responsible for spacecraft and spacewalkers following curved orbits



space, and the Sun an even more pronounced dimple such that the Earth finds itself describing an orbit around it.

This way of viewing gravity – which we owe to Einstein’s general theory of relativity – comes up with more accurate descriptions of nature than Newton’s ideas based on an inverse square law of gravitational forces – and so is to be preferred. Thus we find space is something that can be curved.

Space and Quantum Theory

According to quantum theory, so-called empty space is not empty at all. Instead it is a seething crowd of subatomic particles popping into and out of existence. It is a manifestation of the basic uncertainty that afflicts everything going on at the subatomic level.

How can particles, which were not there before, suddenly come into existence? Did we not learn at school that “matter can neither be created nor destroyed”? The simple answer is that this statement is not true. According to relativity theory, matter is just another form of energy – much like the others: kinetic energy, the energy of the Sun’s rays, heat energy, etc. There is a law called the law of conservation of energy. It maintains that whatever energy you have at the beginning (in all its forms) will be the amount of energy you will have at the end. From this it would appear that if one starts off with the zero energy of empty space, one cannot create particles in it – the particles being a form of energy. However, that is not the whole story. This is where Heisenberg’s uncertainty principle comes in. While it agrees that the law of conservation of energy must hold in the long term, averaged over a period of time, there can be minute fluctuations over shorter times. A physical system can “borrow” energy, provided it pays it back within the brief time specified by the principle. It is similar to a short-term loan to cover a firm’s temporary cash flow problem, rather than an extended mortgage for a house purchase. The reason these energy fluctuations are not obvious in normal everyday life is that they are so transient. They are too fleeting to notice.

But on the subatomic scale, the energy fluctuations can be significant. All of atomic and subatomic physics must take account of quantum uncertainties. And in the present context, when thinking of the nature of space, we must allow for subatomic particles to be popping into and out of existence thanks to this fundamental uncertainty. We do not actually *see* these particles; they disappear again much too quickly. For this reason they are called *virtual particles*. They are expected to be formed in pairs rather than singly: particle/antiparticle pairs. Antiparticles have the same mass as their particle, but opposite values for other properties, like for example, electric charge. Thus, an electron has negative electric charge, whereas the antielectron – called a *positron* – has positive charge. The proton – one of the constituents of atomic nuclei – has positive electric charge, whereas the antiproton has negative charge. The creation of a virtual particle/antiparticle pair will therefore not violate other physical laws such as the law of conservation of electric charge which has to be obeyed rigorously.

It is in this way the physicist has further reason to consider so-called empty space to be not empty at all.

Dark Energy

All this quantum activity is expected to give rise to an overall average energy. This energy – the energy characteristic of empty space – is called *dark energy*. Dark energy accounts for 70% of all the energy in the cosmos; it outstrips that of the matter we see. Though we never see the virtual activity causing the dark energy, the dark energy is expected to be there. Indeed, Einstein himself was aware, from his equations of general relativity, that empty space could have an energy density itself – an energy density that would be the same everywhere. Though the energy cannot be seen directly in the form of virtual particles, it is expected to produce detectable effects. It should give rise to an expansion – moreover, one that is accelerating. In other words, unlike gravity which attracts, dark energy produces a repulsion.

Until recently it was thought that, although the universe is expanding, with the galaxy clusters separating to greater and greater distances, they will be slowing down because of the mutual gravitational attraction between them. But in 1998 it was discovered that the distant galaxy clusters, far from slowing down, were actually accelerating away from us. It is now believed that at an earlier stage of expansion there probably was indeed a slow down due to gravity. But operating against this attraction was the repulsion of dark energy. With the expansion of the universe being due to an expansion of space, there was ever more space being created, and with it more and more dark energy to go with the new space. It is the enhanced repulsion due to the increasing amount of dark energy that has now led to us passing over into a phase of the universe's expansion where dark energy has at last won the day in its battle against the gravitational attraction, and the clusters are no longer slowing down but accelerating away from us. And all this is due to the action of so-called empty space!

Holes in Space

We mentioned just now how particles had antiparticles. The existence of antiparticles was actually predicted by Paul Dirac long before they were experimentally found. Here we are talking about *real* antiparticles as opposed to the virtual ones we have so far dealt with. These are produced at particle accelerators where subatomic particles like electrons and protons are accelerated to high energy and then undergo violent collisions with the transformation of energy of motion into energy in the form of new matter – new subatomic particles.

Dirac was engaged in seeking an expression for the energy of an electron, taking into account the new insights that had become available through Einstein's theory of relativity. The details do not concern us. Suffice to know that the last step in the derivation involved taking a square root. Now, as is well known, two solutions arise whenever one takes a square root – a positive solution and a negative solution.

For example, the square root of 4 is either +2 or –2. Thus Dirac found that the mathematical solution to his problem yielded a positive value for the energy of the electron and a negative one. The first solution correctly described the behavior of the electron. But what about the negative solution? In this sort of situation it is customary to discard the negative value as being “nonphysical” – a quirk of the mathematics having no practical significance. After all, if an electron did have a negative energy it would mean that its locked up energy, that is, its mass, would be negative. That would imply a particle such that when you pushed on it, it would come toward you, and when you pulled on it, it would move away! Clearly we know of no such behavior. So the sensible thing would simply have been to ignore the negative solution as just a mathematical oddity.

Dirac, however, thought differently. By an astonishing piece of lateral thinking, he suggested that the reason we never saw negative mass electrons was not because they did not exist. On the contrary, we did not see them because there were so many of them! They were everywhere – literally *everywhere*. They filled up the whole of space – even the space between the nucleus and the electrons of an atom. Negative energy electrons formed a continuum – a perfect continuum – and a feature of a perfect continuum is that it is undetectable; it cannot be observed. To be able to observe something, a chair, say, it must be characterized by being at a particular location in space. You need to be able to point to it and say “I am talking about that; I am not talking about anything else in the room.” But in the case of the continuum of negative energy electrons, where does one point? Everywhere – and nowhere in particular.

Dirac did not let this difficulty put him off. He hit on a way that might disturb the continuum. He envisaged a particle, or a packet of light energy (called a *photon*) moving through space and hitting one of these unseen negative energy electrons. In doing so, it could be that the impact was so great, and the consequent energy transfer so significant, that the negative energy electron acquires sufficient energy to convert its negative

mass into a normal positive mass. This being the case, the electron would no longer be part of the continuum of negative energy electrons, and would thus suddenly become visible; it would appear to have popped into existence from nowhere. Not only that, it would leave behind a “hole” in the continuum. What would that look like? It would be a loss of a negative mass – which is equivalent to a gain of positive mass. So the “hole” would appear to be a particle with the normal mass of an electron. What else? The original negative mass electron would have had a negative charge like any other electron. But now we have the loss of a negative charge – which is equivalent to the gaining of a positive charge. So the “hole” would show up as a positively charged particle with the same mass as the electron – the antielectron, or *positron*. In summary, such a collision would give rise to a pair of particles – an electron and a positron. And indeed, this is exactly what is observed. Particle-antiparticle pair production is now a well-established phenomenon.

This then is another indication that empty space is not to be regarded as simply nothing. It is packed with negative mass electrons – and also with the negative mass versions of many other fundamental particles described by Dirac’s equation, such as the proton and neutron.

Or is it? Although it is true that the negative energy continuum was the route by which Dirac came to his prediction of the existence of antiparticles and how they might be produced – a discovery for which he was awarded the Nobel Prize – the question arises as to whether this actually is a true description of reality. Opinion is divided. Some physicists will have nothing to do with the continuum idea. The fact that Dirac correctly predicted the existence of antiparticles by a somewhat quirky line of reasoning does not necessarily mean that this is the correct way of looking at things.

The Dimensionality of Space

A popular physics theory at the present time is string theory. This is based on the idea that the

fundamental particles, such as the electron, are not point-like particles as hitherto thought, but tiny vibrating strings. It is the different modes of vibration that confer on the particle its various properties such as mass and electric charge. One of the features of the theory is that in order to accommodate all the required properties, the vibrations must be in 10 or 11 spatial dimensions. But we only know of three. This gives rise to the idea that the additional dimensions might be curled up so tiny we cannot see them, that is, at each point in three-dimensional space there are 7–8 curled up dimensions. Whether this is so or not has still to be resolved.

A Smallest Unit of Space?

We are accustomed to thinking of it as being divisible into ever smaller distances: kilometers, meters, centimeters, millimeters, nanometers, and so on. But does that go on indefinitely? Is there no limit to how small a division of space can go? Or do we eventually get to a basic unit of space that is no longer divisible?

At present we have two great physical theories: quantum theory and general relativity. The eventual aim is to reconcile these two into a combined theory of quantum gravity. Such a theory is bound to depend very heavily on three fundamental constants: (1) the gravitational constant, G , governing the strength of gravity in both Newton’s theory of gravity and Einstein’s general theory of relativity; (2) Planck’s constant, h , governing the size of quantum fluctuations, and (3) the speed of light, c , which figures prominently in both relativistic and quantum physics. From these three constants, the German physicist Max Planck, one of the founders of quantum theory, found that there was a unique way of using them to define a quantity with the dimensions of length:

$$l_P = (hG/2\pi c^3)^{1/2} \approx 1.6 \times 10^{-35} \text{ m}$$

This quantity is named the *Planck length*. It is very small – about 10^{-20} times the size of the proton. It is often regarded as in some sense

the “natural” unit of distance. What one can say is that any attempt to unite quantum theory with relativity must involve these three constants, and hence any expressions of a distance arising out of the combined theory will involve this unit of length, possibly multiplied by some unimportant numerical factor such as 2π . According to some theories of quantum gravity, this is expected to set the scale where quantum fluctuations become so pronounced that the very structure of space itself breaks up and it becomes a discrete kind of foam – thus setting a limit on the smallest distance that can still have properties recognizable as those of space. But there are other attempts at formulating a theory of quantum gravity that do not point to such a conclusion. The position is unclear, and could remain so.

Space in Relation to Time

According to relativity theory, motion affects spatial distances. For example, a spacecraft flying at high speed is, according to the mission controller, shorter than when it is stationary on the launch pad. Distances are also affected by gravity. Time is also affected by motion and gravity. As explained under the entry *Relativity*, all this points to the idea that space and time are intimately connected as a four-dimensional continuum called spacetime, rather than there being a three-dimensional space and a separate one-dimensional time.

Space and Religion

We have seen how physicists have thrown into question the idea that empty space is just another name for nothing. We have seen that one might just as well regard space as full everywhere with dark energy, full of particles popping into and out of existence, and furthermore as a uniform continuum of negative energy fundamental particles.

Those familiar with attempts of Buddhists to explain Nirvana might see the same dichotomy arising in that context. That blissful state is sometimes described in terms of nonbeing or

nothingness. And yet there is a certain ambiguity between nothingness and plenitude.

Christians contemplating Heaven traditionally thought of it as being “up there” – for example, Christ ascending to heaven. Then it became more a case of “out there.” Neither is satisfactory. With the possibility that there might be further spatial dimensions we do not perceive – either because they are curled up as suggested by string theory, or because they are nothing to do with our spacetime, some might seek to locate Heaven in some of these extra dimensions. But such attempts, in all likelihood, are spurious. Heaven, however it is conceived, is simply not to be described in terms of a physical spatial location.

Cross-References

- ▶ [Astronomy](#)
- ▶ [Cosmology](#)
- ▶ [Energy in Physics](#)
- ▶ [Gravity](#)
- ▶ [Quantum Theory](#)
- ▶ [Relativity](#)
- ▶ [Space and Time](#)

Space and Time

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Modern ideas about the nature of space and time have been decisively shaped by the development of physical theory. A few key aspects of the evolution of these ideas can be traced by comparing the conceptions of space and time of Aristotle and Newton, with the conception of spacetime due to modern relativistic physics.

Aristotelian Views

Aristotle identified space and time as features of perceptible entities and processes. His cosmology

described a finite, bounded universe, spherical in shape, with nothing outside of it – not even empty space. Thus, Aristotle rejected the conception of space as an infinite expanse within which material objects are located. He held that regions within the cosmos are necessarily filled with matter and these “places” are properly characterized in terms of the matter by which they are bounded. A region of space, considered as a bare volume, he held to be a mere mathematical abstraction. As for time, Aristotle declared time to be an aspect of change. The time of a change is the quantity of this change, as measured by comparison with a periodic process used as a standard (e.g., the motion of the sun across the sky). In general, then, Aristotle held time to be change considered as quantifiable by comparison with co-occurring changes. Aristotle’s views of time and space were highly influential throughout the middle ages and into the seventeenth century.

Newtonian Absolute Space and Time

The conceptions of space and time formulated by Isaac Newton as part of his system of mathematical physics (first published in 1687) are starkly opposed to Aristotelian views. Newton held the passage of time to be independent of any physical processes, a precondition of change rather than a feature of it. He acknowledged the necessity of using some “sensible and external measure” of time – an observable, regular process – to detect and measure its passage, but he insisted that the “relative” times thus picked out should not be mistaken for “absolute” time itself. Any physical standard for measuring time might fail to pick out intervals of perfectly uniform duration; but “absolute, true, and mathematical time, in itself and of its own nature, without reference to anything external, flows uniformly” (Newton 1726/1991, in the Scholium to the Definitions, p. 408).

According to the *absolute* conception of space championed by Newton, space exists in its own right, as an infinite arena with a Euclidean geometric structure within which material objects can exist. There are locations in space, and spatial relations (e.g., distances) between them, quite

independent of whether any matter exists. Material objects inherit spatial properties and relations from the regions of space that they occupy. Space itself is an enduring entity – one and the same space exists through all times – and each part of space is immovable and unchanging. It follows that a material object has a definite state of motion with respect to absolute space: either its location in absolute space changes over time (absolute motion) or it does not (absolute rest).

Newton posited absolute space in order to provide a theoretical basis for the distinction, central to his laws of motion, between *inertial* (non-accelerated) motion and accelerated motion. Newton insisted that the physical effects displayed by accelerated matter, such as the concavity of the surface of a liquid made to rotate by stirring, could not be understood merely as the results of acceleration relative to other material bodies, and he took such effects as marks of acceleration with respect to absolute space itself.

Gottfried Leibniz, Newton’s contemporary and critic, objected forcefully to Newton’s conception of absolute space. To posit absolute space, Leibniz insisted, is to assign artificial significance to concepts, namely position and velocity with respect to absolute space, that are manifestly nonphysical since they have no discernible effects on matter. Leibniz advocated instead a *relational* conception of space, according to which spatial relations are properly understood as relations between material objects rather than between locations in an independently existing space. Space itself he held to be a purely conceptual entity consisting of all (actual and possible) spatial relations among material objects. In a similar way, Leibniz insisted that time itself was a conceptual entity, arrived at by abstraction from the real temporal relations among objects and events.

Since Leibniz and other relationist critics of Newton were unable to provide an alternative version of Newtonian mechanics, freed from dependence on the notions of absolute acceleration and hence of absolute space and time, Newton’s views came to be widely accepted as the basis of physical theory for the next two centuries.

Spacetime

Albert Einstein's 1905 theory of special relativity resulted in a decisive transformation in scientific conceptions of space and time. Einstein's central insight was that previous conceptions of space and time presupposed a relation of absolute simultaneity that could not be empirically substantiated. He argued that a physical method of determining whether two events are simultaneous, would in fact lead different inertial observers (i.e., observers moving at different constant velocities) to disagree about simultaneity: two events simultaneous from one observer's perspective would fail to be simultaneous as seen by another. Taking this *relativity of simultaneity* to be a fundamental feature of the nature of space and time has profound consequences; in particular, it implies that spatial distances (e.g., the length of a rod) and temporal intervals (e.g., the time elapsed between ticks of a clock) can be assigned a definite magnitude only relative to the state of motion of an observer. These consequences are undetectable at ordinary speeds, but they become significant when the relative speeds involved are a sizeable fraction of the speed of light (approximately 300,000 km/s), which represents an upper bound on the speed with which physical effects can be transmitted; these relativistic effects have been thoroughly confirmed by experiment.

In 1908 the mathematician Hermann Minkowski reformulated special relativity in geometric terms. In this setting, space and time appear as inseparable aspects of a single four-dimensional manifold, *spacetime*. The relativity of simultaneity appears as the freedom to "slice up" spacetime into instants of time encompassing all of space in many different ways. Different slicings give different ways of decomposing four-dimensional spacetime intervals into distinctly spatial and temporal components. The physical equivalence of these many possible decompositions reflects the fact that they amount to descriptions from different perspectives of a single four-dimensional reality.

Like Newtonian absolute space, the spacetime of special relativity has a perfectly uniform

geometry that is unaffected by the matter within it. Einstein's 1915 theory of general relativity, which he devised in order to account for gravitation in terms of the structure of spacetime, gives up both of these features. In general relativity, the geometry of spacetime is determined (in part) by the distribution of matter and energy. Spacetime is curved in the vicinity of a massive body, and it is this matter-induced curvature of spacetime, rather than the gravitational force posited by Newton, that is observed as gravitational attraction. A freely falling (or orbiting) body in a gravitational field is not accelerating under the influence of a force but is following an inertial path (a *geodesic*, the analogue in relativistic spacetime of a Euclidian straight line) in a curved region of spacetime.

Absolute space and time as traditionally conceived have an intrinsic structure that is completely independent of physical objects or processes in space and time. Since in general relativity the structure of spacetime varies with the distribution of matter and energy, the spacetime of general relativity is not absolute in this sense. However, in many models, the structure of spacetime is not completely determined by the distribution of matter and energy; some residual structure is due to spacetime itself, and so general relativity does not support a full-fledged relationism, either. For similar reasons, other aspects of the traditional absolute-versus-relational debate are difficult to settle with regard to general relativity. Multiple distinct issues are bound up together in the traditional debate; these must be pulled apart and considered separately, in the context of general relativity (Earman 1989; Huggett and Hoefer 2006).

Future Physics

Quantum mechanics, our best physical theory of the very small, has yet to be reconciled with general relativity, our best physical theory of the large-scale structure of the universe. Quantum field theory, which unites quantum mechanics with special relativity and spacetime curvature by setting quantum fields within a relativistic spacetime background, has been remarkably

successful. But this approach still represents spacetime as a fixed background structure; a full unification would treat spacetime itself as a fully fledged dynamical entity, subject to quantum-mechanical description (see Rovelli 2001).

The looked-for theory uniting quantum mechanics with general relativity is called “quantum gravity.” There are at present no fully worked-out theories of quantum gravity, only various research programs. Some physicists expect that spacetime will not appear as a fundamental element of a theory of quantum gravity at all but only as apparent or emergent structure within a physical reality whose basic elements are non-spatiotemporal in nature.

For Further Reading

Geroch (1978) is a classic, non-technical introduction to spacetime and relativity theory. Disalle (2006) explains how philosophical reflection by Newton, Einstein, and others regarding presuppositions about space and time played a crucial role in developments in physics. Dainton (2001) is an excellent and accessible guide to a wide range of philosophical debates about the nature of space and time beyond those discussed here.

Cross-References

- Cosmology
- Physics
- Relativity
- Space
- Time

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Spacetime

- Relativity

Space-Time

- Time

Spandrel

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An emergent trait irrelevant to fitness which is later co-opted for some adaptive purpose. Harvard biologist Stephan Jay Gould coined this term making reference to the architectural design of the San Marcos Cathedral. Where the pillars of the cathedral met the vaulted ceiling an open space was created (spandrel). This space was filled with attractive artistic designs. Aside from their artistic contribution, these “fill-ins” did nothing for the actual design of the building. However, this creative use of otherwise useless space stood as a metaphor for how evolution takes left-over or extraneous structures and finds functional uses for them.

Spatial Dimensions

- [Space](#)

Spatial Hemi-inattention

- [Neglect](#)

Special Divine Action

- [Divine Action](#)

Speech

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Related Terms

[Communication](#); [Production of sounds](#); [Spoken language](#)

Description

Speech is defined as the acoustic, linguistic, and cognitive processes that lead to the production and perception of sounds used in spoken language. Speech is the vehicle that humans use for symbolic communication. No other species possesses the ability to use speech sounds to communicate. Speech is studied by several academic disciplines including linguistics, phonetics, psychology, speech therapy, neuroscience, and computer science. When speech disorders also are included in the definition of speech, psychiatry, neurology and neurosurgery are three other disciplines that utilize knowledge about speech processes. See Lieberman (1996) and Stevens (2000) for further information.

Self-identification

Science

Speech is self-identified as the topic of study for phonetics and phonology. In other words, the fundamental units of speech; phonemes, morphemes and syllables, and their analysis in a speech context make up the characteristics of speech research. Recent developments in functional neuroimaging, with, for example, fMRI, have moreover established a new discipline in neurolinguistics, where localization in the brain of speech production and speech perception is the major focus. The localization in the brain of speech production and speech perception processes has a long history in linguistics, neuropsychology, speech therapy, neurology, and neurosciences, only reinforced by the more recent introduction of neuroimaging techniques. In the nineteenth century, Paul Broca and Carl Wernicke suggested that areas in the left frontal and temporal cortex were the sites of speech production and perception, respectively. Broca's and Wernicke's discoveries came from close analysis of patients with circumscribed brain lesions to the left hemisphere, which also laid the foundation for studies of hemispheric asymmetry and lateralization. The failure to either produce or understand speech after frontal or temporal brain lesion is called motor or sensory aphasia, respectively, and is typically seen after stroke affecting the left hemisphere.

Characteristics

Speech is a distinctive subtopic in studies of language with its focus on the acoustic properties of language production and perception, including an understanding of the anatomical structures that are necessary for producing speech sounds, that is, cortex, vocal chords, vocal tract, and tongue and lip movements. Speech is however also an integrated aspect of linguistics and in some instances not regarded as a discipline of its own but a subdiscipline of language studies. In recent years, studies of speech processes have also been an integrated and distinctive aspect of

neuropsychology and cognitive neuroscience, with important new theories and models for the understanding of how the brain integrates the acoustic input to words and sentences and produces utterances (Hickok and Poeppel 2007; Tervaniemi and Hugdahl 2003; Binder and Price 2001).

Relevance to Science and Religion

Speech and language is the fundamental vehicle through which humans communicate and is as such critical for bridging humanities and natural sciences, also including the study of religion.

Sources of Authority

The study of speech processes, including the acoustic, phonetic, and semantic aspects, has a long history in the disciplines linguistics and phonetics, and more recent in psycholinguistics, neurolinguistics, and cognitive neuroscience. An influential school of study is the Haskins Laboratory, New Haven, USA, where researchers suggested the motor theory of speech perception (Liberman and Mattingly 1985) and that fundamental speech units, like consonant-vowel syllables are differentially identified by the left and right cerebral hemispheres (Shankweiler and Studdert-Kennedy 1967).

Ethical Principles

Studies of speech production and speech perception follow the ethical guidelines put down in the Declaration of Helsinki for research on humans, and most countries have, in addition, their own ethical committees that evaluate and approve research projects before they are conducted.

Key Values

A fundamental key value is to *understand the basic units of speech production and perception* and how they combine to give rise to meaningful

words and sentences that are understood by other humans, and how this is organized in the brain. A second value is to diagnose and alleviate sufferings from brain lesions and disorders that affect speech production and/or perception, for example, stroke, schizophrenia, dyslexia, and specific language impairment. A special variant of a speech disorder is auditory hallucinations in schizophrenia, where the patient is absolutely convinced that he/she is “hearing voices,” although there is no external acoustic input to the brain.

Conceptualization

Nature/World

Nature is conceptualized from a natural science perspective, that is, as an objective reality independent of the processes that are studied.

Human Being

Humans are considered as biological beings and speech occurs as electrochemical signals or impulses that activate single and/or populations of neurons in the brain.

Life and Death

Life is considered from a biological perspective, and speech is the result of the action and functioning of different organs and structures in the body and the brain, which follows the physical laws of how acoustic waves occur and are transmitted through different media.

Reality

Reality is the physical world in an objective manner.

Knowledge

There exists an objective dimension to knowledge, in the sense of objective truth on a probabilistic nature. That is, phenomena in nature are possible to gain knowledge about only in a probabilistic way.

Perception

Perception is the decoding of the phonological structure of an acoustic signal that gives rise to

a conscious sensation of understanding a message sent by another individual.

Time

Speech occurs in a feedforward time perspective, although speech-related flashbacks can occur.

Consciousness

Speech is a conscious process directed toward another individual, either as intended speech output or as the intended recipient of speech input.

Rationality/Reason

Rationality is/reason is the basis of conscious speech processing.

Mystery

Speech is typically a rational human act but can take on mystery as, for example, in auditory hallucinations in nonpsychotic individuals, who frequently experience “hearing voices.”

Cross-References

- [Cognitive Psychology](#)
- [Developmental Psychology](#)
- [Neuroimaging](#)
- [Neuropsychology](#)
- [Perception](#)
- [Philosophy of Mind](#)
- [Semantics](#)

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Speed of Light

- [Relativity](#)

Spirit

- [Soul](#)

Spiritual Intelligence

- [Intelligences, Multiple](#)

Spiritualism

- [Mysticism](#)
- [New Age Religions](#)

Spirituality

- [Mysticism](#)
- [New Age Religions](#)

Spirituality, African

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One unique aspect of African psychotherapy particularly in its indigenous paradigm is the use that

is made of the technique of spiritualization and invocation in the social stage of its interviewing process. This is a direct carry over from the traditional African healing systems (Nwoye 2010). It involves the exercise of beginning every psychotherapy process with a prayer intended to make the client believe that he or she is connected to and in the presence of that power from which all good things come and that the healing process to be entered into is approved by God and the ancestors. To achieve this effect the counselor engages in spontaneous prayer and commits his or her effort to the guidance, support, and benediction of these agencies. One who resorts to this technique recognizes and respects the religious view of the client. In this way, the client is made to believe that there are more powers involved in intervening on his or her case than that of the psychotherapist working alone. The African psychotherapist in this way presents himself or herself as a channel of God's intervention in the client's life, with God being presented as the person in the chair of the intervention process. The expected impact of this enlargement in perspective of healing is the spiritualization of the therapy process and ambience. With the atmosphere of therapy spiritualized in this way, the client starts to see himself/herself as within the liminal space rather than in the ordinary counseling office. In this way, again he or she becomes spiritually persuaded to tell his or her story, as it is, without distortion, believing that there are, apart from the counselor, some unseen listeners to his or her story within the counseling room. Through this, an honest narration of his or her story becomes facilitated.

Cross-References

- [Attachment: Theory and Patterns](#)
- [New Age Religions](#)

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Spirituality and Christian Theology

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Description

In the twenty-first century, the term “spirituality” is utilized broadly and often in opposition to “religion.” However, this current usage has a surprisingly brief history; for centuries, “spirit” and “spirituality” have been closely affiliated with Jewish and Christian religious thought and practice. This entry sketches the etymology, history, and contemporary features of spirituality from the viewpoint of its relationship to Christian theology.

Etymology

Although etymology can only take one so far in understanding the content of Christian “spirituality,” it is a helpful place to begin. Spirituality derives from the Latin terms *spiritus* and *spiritualitas*, which biblical translators used to render the Greek New Testament terms *pneuma* (πνεῦμα) and *pneumatikos* (πνευματικός), respectively. These New Testament terms, in turn, are closely related to the more ancient Hebrew scriptural term, *ruach* (רוח).

Meaning spirit, wind, or breath, *ruach* is connected with *life* in the Hebrew Bible. It is often used in close conjunction with symbols that point toward YHWH's creativity or renewal such as fire, fluidity, and fertility. The authors of the New Testament carried the Hebrew notion of *ruach* into their writings but reinterpreted it in light of their experience of the Spirit as the gift of the risen Jesus to the community of disciples. They called upon the Greek word *pneuma* (“breath of life”) to describe the Holy Spirit of God animating and empowering the community and *pneumatikos* to describe anything under the influence of (or a manifestation of) that Spirit.

Translated into Latin, then, *pneuma* and *pneumatikos* became *spiritus* and *spiritualitas*, from whence we derive spirit and spirituality.

History

The first-century writings of Paul the Apostle suggest that the earliest Christians understood spirituality to mean human life conformed to Christ (Rom. 8:29) and empowered by the Holy Spirit (Rom. 15:13). By participating in the “body of Christ” (or the community of Christian disciples); cultivating the virtues of faith, hope, and love (1 Cor. 13); and appropriating the charisms given to the church by the Holy Spirit (1 Cor. 12, 14; Rom. 12), Christians experienced themselves as being united to Christ and enlivened by the Spirit.

Life “in Christ” and “in the Spirit” was shaped, among other things, by the Greco-Roman culture in which the Christian faith was birthed. In early Christianity (especially monastic movements), contemplative practices from Greek philosophical traditions such as Stoicism and Platonism significantly influenced Christian thought and practice. Early Christian *askesis* (the practice of spiritual exercises) included the deliberate cultivation of such Stoico-Platonic-inspired philosophical therapeutics as attention (*prosoche*), self-mastery (*enkrateia*), and meditation (*melete*) (Hadot 1995). The influence of Greek philosophical categories and practices is notable, for instance, in the theology of Origen of Alexandria (c. 185–253). In his *Commentary on the Song of Songs*, Origen uses Middle-Platonic language to describe the ascent of the soul, which takes place in a threefold manner: *ethike* (amending behavior; keeping commandments), *physike* (recognizing the world’s transitoriness), and *enoptike* (contemplating God in unitive love). For Origen, this threefold contemplative way is the means by which we come to know God, share in God’s divinity (*theopoiesis*), and be thus transformed (Louth 1981).

While we could point to other examples, Origen alone is evidence that early Christianity itself was viewed as a kind of *philosophia* – a

transforming way of life carried out in the power of the divine *pneuma* and in conformity to the divine ► *Logos*. While some chose to carry out this life with special intentionality (i.e., monastics), deification via incorporation into Christ and empowerment by the Spirit was available to all baptized believers. Deification means the process by which humans, already made in the divine image and likeness (Gen. 1:26), are called to become partakers in the divine nature through grace (1 Pet. 1:3–4).

In the Middle Ages, Christian contemplatives writing on spirituality often drew on Platonic and Neoplatonic strains in earlier Christian theologies (e.g., Origen, Augustine, Pseudo-Dionysius the Areopagite), articulating the soul’s inner transformations through symbols of luminosity and ascent. An outgrowth of the *ethike-physike-enoptike* tradition, the so-called threefold way of purgation (purification from sin and its effects), illumination (growth in wisdom and virtue), and union (oneness with God, perfect love) emerged as an important pattern in some strands of medieval Christian thought and practice.

However, spirituality in the Middle Ages was not bound to the contemplative life; *askesis* leading to deification was available to all Christians who pursued the Christ life by partaking in the church’s sacraments and appropriating the Spirit’s *charisms*. As historians of Christian spirituality have shown, through diverse spiritual practices and/or rituals of devotion, and with different theological and scriptural emphases, many medieval Christians (monastic and lay) sought advancement in the spiritual life thereby to attain a more perfect ordering of their soul and a more perfect love of God and neighbor (McGinn 1998).

In the late medieval period and on into the Reformation and post-Reformation eras, *spiritualitas* became exclusively linked with inward, rarefied experiences of the individual soul’s purification, ordering, and exaltation. The concurrent rise of medieval scholasticism with its heavy use of Aristotelian scientific categories contributed to theology’s increased focus on technicality and abstraction. By the sixteenth century, these factors (among others) had resulted

in what some have called a “divorce” between spirituality and theology (Vandenbroucke 1950; McIntosh 1998).

Following this break, the seventeenth- and eighteenth-century Age of Reason strained the relationship between rationality and religion. Moreover, the philosophical “turn to the subject” with its emphasis on individual conscious experience engendered a demand for renewed attention to the subjective experience of religiosity. Thus, post-Enlightenment theologians and philosophers were faced with the problem of finding terminology to describe personal faith in the midst of the double estrangements between spirituality and theology on the one hand and religion and rationality on the other. Able theological minds rose to the task; however, we may point to Søren Kierkegaard, who spoke of “faith” as the absence of despair in which “the self relates itself to itself, and in willing to be itself, rests transparently in the power that established it”; to Friedrich Schleiermacher, who referred to “religious experience” as the “feeling of absolute dependence”; or to Paul Tillich who defined “faith” as “ultimate concern.”

Current Trends

In our late modern situation, disillusionment with institutional religion in the twentieth-century West has, for many, rendered ‘religion,’ ‘religiousness,’ and even ‘faith’ nonviable linguistic options for describing an individual’s experience of self-transcendence and/or transformation. Thus, “spirituality” has become in parts of the academy and the general public a decontextualized placeholder for a large and complex constellation of themes relating to human life, including the search for transcendence, identity, meaning, authenticity, virtue, ultimacy, fulfillment, inner potential, interconnectedness, and morality.

In the last 30 years, spirituality has become an increasingly important topic among Christian theologians. Trends in late modern Christian theology seem to suggest that the breach between spirituality and theology is lessening. Contemporary theologians across biblical, ethical,

systematic, historical, and practical subdisciplines have focused increasingly on spirituality and have treated it in diverse ways according to their particular traditions and scholarly emphases.

However, there is disagreement among recent theologians regarding which overall conception of spirituality ought to be (re)embraced. Some prefer to remain focused on the spirituality of patristic and monastic Christian figures, with concurrent treatments of related doctrinal topics. For example, Hans Urs von Balthasar’s definition of spirituality hews closely to his espousal of a nuptial-Marian ecclesiology; for von Balthasar, spirituality is “the subjective aspect of dogmatic theology, the word of God as received by the bride and developing within her” (Balthasar 1989). Similarly, for Edith M. Humphrey, spirituality is closely tied to pneumatology: “Christian spirituality is the study and experience of what happens when the Holy Spirit meets the human spirit” (Humphrey 2006). These and like-minded theologians would generally be suspicious of notions of spirituality that fall outside the bounds of orthodox Christian teachings.

Other theologians advocate a more broadly circumscribed, less confessional notion of spirituality that is attuned to its meaning and usage in contemporary life. Thus, for Sandra M. Schneiders, spirituality is “the experience of consciously striving to integrate one’s life in terms not of isolation and self-absorption but of self-transcendence toward the ultimate value one perceives” (Schneiders 1990). The upshot of this approach is that it can perhaps more easily accommodate interdisciplinary and/or interreligious exploration and collaboration. Still, others seem to work within a framework that adopts and adapts both specialist (confessional) and pluralist (not or partially confessional) conceptions of spirituality. F. LeRon Shults, for example, carries out a constructive analysis of Christian spirituality that is informed by both doctrinal developments in pneumatology as well as scientific and philosophical insights in contemporary thought (Shults and Steven 2006).

The split between theology and spirituality that began in the Middle Ages and widened during modernity is starting to be healed. But

contemporary Christian theological pluralism and specialization, combined with spirituality's broad and shifting meanings, mean proposed models for reuniting the two are usually complicated and controversial. Most theologians agree, however, that any responsible treatment of spirituality in contemporary theology must be informed by careful historical analyses of Christian spirituality and oriented toward the integration of rigorous conceptual analysis with existentially meaningful experience and practice.

Cross-References

- [Biblical Studies](#)
- [Mysticism](#)
- [Secularization, Secularity, Secularism](#)
- [Systematic Theology](#)
- [Theological Anthropology](#)

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Split-Brain Research

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Surgeries in which the corpus callosum (a thick bundle of nerves connecting the two hemispheres of the brain) has been severed, thereby cutting off communication between the right and left hemispheres, have revealed a wealth of knowledge about the functioning of the brain and the specializations of each hemisphere. In part because of split-brain research, we now know that, in general, the left hemisphere is specialized for language and the right hemisphere is specialized for more nonverbal abilities.

Spoken Language

- [Speech](#)

Sport, Sociology of

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Introduction

Sociologists of sport critically examine the role, function, and meaning of sport in the lives of people and the societies they form and attempt to describe and explain the emergence and diffusion of sport over time and across different societies. In doing so, they identify the processes of socialization into, through, and out of modern sport and investigate the values and norms of dominant, emergent, and residual cultures and

subcultures in sport. On this basis, they explore how the exercise of power and the stratified nature of societies place limits, and create possibilities, for people's involvement and success in sport as performers, officials, spectators, workers, or consumers.

The sociology of sport, while grounded in sociology, also encompasses research in history, political science, social geography, anthropology, social psychology, and economics. Also, the new offshoots of sociology, such as, cultural studies, postmodernism, media studies, and gender studies, are also used. Sociology of sport is both a theoretically driven and an empirically grounded subdiscipline of sociology. It overlaps with, and is informed by, works on the body, culture, and society more broadly and, contributes to the formation of policy that seeks to ensure that global sport processes are less wasteful of lives and resources. Sociologists of sport seek to generate knowledge that will critically examine the costs, benefits, limits, and possibilities of modern sport for all those involved, rather than focus solely on the performance efficiency of elite athletes, and, in studying sport in the same way they examine religion, law, or medicine, they seek to highlight aspects of the general human and societal condition.

Sociological research also seeks to "debunk" popular myths about sport, critically appraise the actions of the more powerful groups involved in sport, and inform social policy toward sport. Sociologists of sport seek to intervene in sport worlds in several ways. They offer expert advice to government agencies, public enquiries, and commission reports on areas such as drugs, violence, and health education. In addition, they act as advocates for athletes' rights and responsibilities. Researchers have sought to provide knowledge for groups who seek to challenge inequalities of gender, class, ethnicity, age, and disability, particularly with respect to access, resources, and status (Collins and Kay 2003). Sociologists of sport have also argued for the better use of human and environmental resources to ensure that there is a sporting future for generations to come. These, then, are some of the aims and tasks that sociologists of sport have set themselves.

Given that sport brings people together, yet also divides them along the societal and cross-cultural lines that already exist, sociologists probe the coexistence of cooperation and confrontation, power and control. The struggles that shape sport provide rich case studies that highlight broader social questions. For example, consider the question "What is sport?" For sociologists, such a question requires understanding the set of social practices adhered to by a set of conventions. That is to say, an understanding of what sport "is" requires an analysis of the society that produces sport. Sport, then, is a form of collective action, involving a host of different people, connected in particular figurations, and creating particular forms of sport products and performances. Attention has been paid to the "conventional understandings" that mark sport subcultures and govern sport practices and which gives sport a relative autonomy, while also critically examining the extent to which sport worlds are "free" from the political and economic context in which they are situated. The intimate and extensive relations between sport and other social worlds must be traced. For example, sport worlds are interconnected with questions of foreign policy, big business, environmental degradation, the medicalization of social life, and the socialization of citizens of different societies (Coakley 2004).

Sport is then both a separate world and a suspension of everyday life, yet it is also highly symbolic of the society in which it exists and is embedded in wider political-economic and socio-cultural currents. In the context of sport people both experience a form of exciting significance that is rarely, if ever, encountered in their daily lives, and also conduct a symbolic dialogue with fellow participants and spectators that reveals things about ourselves and others (Maguire 2012). Sport, then, can be viewed as a modern morality play that reveals fundamental truths about us as individuals, our societies, and our relations with others. Sport, moves people emotionally and matters to us socially. Sports are mimetic activities that provide a "make-believe" separate setting that allows emotions to flow more easily. This excitement is elicited by the

creation of tensions that can involve imaginary or controlled “real” danger, mimetic fear and/or pleasure, sadness and/or joy. This controlled decontrolling of excitement allows for different moods to be evoked in this make-believe setting that are the siblings of those aroused in real-life situations (Elias and Dunning 1986).

Tie-breaks in tennis, penalty shoot-outs in football, and sudden death play-offs in golf evoke a range of emotions, so much so that by the end of the contest we are emotionally drained. And, unlike a well-performed play or well-acted film, we know that what we were witnessing in sport is real and that the outcome was not determined beforehand. Only when sports are associated with matters of deep cultural and personal significance do they become important to fans. Major sporting events are thus mythic spectacles where fans are provided the opportunity for collective participation and identification that serves as a means of celebrating and reinforcing shared cultural meanings. It is precisely because sports are a separate world that suspends the everyday world that they are able to celebrate shared cultural meanings that are expressed through and embodied by sports men and women. The anthem, the emblem, and the flag associated with sporting contests highlight how teams and individuals represent the nation. If social life can be conceived of as a game through which identities are established, tested, and developed, then sports can be viewed as idealized forms of social life. Its rules and codes of play (such as in golf etiquette) allow for a fair contest and a true test of ability. The “true” champion, playing an authentic match, with integrity, is the “best” expression of this. In this context, it is possible to establish an identity with greater consensual and authentic certainty than in social life itself. We insist on the authenticity and integrity of the contest – on the strict formal rules and their fair enforcement – because we want any differences of worth between us to be based on merit. In real life, our class, race, gender, or religion interfere and rig the game of social life and its outcomes. As such, its victors and losers are profane deceptive illusions. But, on the field of play, it is claimed, sport outcomes are sacred, they are real and

authentic. That is also why champions seek to beat fellow champions: That is the true test. Honor and respect are not achieved by knowing in advance that you will beat inferior opponents (Hughson 2009).

Sport is thus a symbolic dialogue: It symbolizes the strict requirements of how a dialogue should be conducted (Ashworth 1971). Sport, then, involves a dramatic representation of who we are and who we would like to be. The stadia is a theater in which we experience a range of pleasurable emotions and exciting significance: the excitement of the played-game, uncertain as to its outcome but its significance lying in what we have invested in it emotionally, morally, and socially. Sportsmen and -women act as our heroes, expressing both the myths, and revered social values of a society, and the sports ethic that underpins involvement in sport. They have to take risks, to exhibit the hallmarks of bravery and courage and show integrity. Yet, there are, as the sociological account of sport reveals, other sides to the sports experience (Jarvie 2006).

Developments in the Sociology of Sport

Although the first texts on sociology of sport appeared in the 1920s, this subdiscipline did not develop until the early/mid-1960s in Europe and North America (Caillois 1961; Loy and Kenyon 1981; Loy et al. 1981; Stone 1971; Yiannakis and Melnick 2001). A small number of scholars from both physical education and sociology formed the International Committee for the Sociology of Sport (ICSS) in 1965. The sociology of sport is internationally represented by the International Sociology of Sport Association (ISSA, formerly ICSS), which also publishes the *International Review for the Sociology of Sport*. This body is a research committee of the International Sociological Association (ISA) and also an official committee of the International Council for Sports Science and Physical education (ICSSPE). From the mid-1960s, symposia, conferences, and congresses were held annually and theoretical and empirical work was presented. Researchers from different sociological backgrounds began to

develop sociological definitions of sport, conduct pioneering work in different aspects of sport, including sport and socialization; sport and social stratification; sport subcultures; the political economy of sport; sport and deviance; sport and the media; sport, the body, and the emotions; sport violence; sport politics and national identity; and sport and globalization. The subdiscipline has now developed a sophisticated understanding of how people become involved in sport; what barriers they face; and how gender, class, ethnicity, and sexual relations work in sport (Hall et al. 1991). In addition, scholars have developed considerable knowledge about how sport is mediated, contoured by a complex political economy, and bound up in global identity politics (Cornelissen 2011; Lawrence and Rowe 1986).

Main Theoretical Perspectives

As the sociology of sport developed as an academic subdiscipline in the 1960s, it is not surprising that the theories that were used to explain sport were those which were dominant at the time (Jarvie and Maguire 1994; Maguire and Young 2002). In North America, and in particular in the USA, functionalist accounts held sway (Lever 1984). Thus, American-based accounts of sport in the 1960s and the 1970s tended to emphasize that sport reflected society and that society itself was based on a social order where consensus and shared values were evident. Functionalist accounts highlighted that society was made up of a system of interrelated parts that contribute to the satisfaction of system needs and thus to social order. In mainstream functionalist accounts, the “social functions” of religion, education, and law, for example, were assessed in terms of their contribution to meeting the functional prerequisites of society. Sport was viewed in a similar vein. Its social function was and is seen in terms of how, as a social institution, and as a source of personal expression, it contributes to social stability and socialization. Parallels were also drawn between the role of sport and religion. Considered in this way, sport functions

as a “surrogate” religion and acts as a form of social glue that brings and binds people together (Coles 1975; Stevenson and Nixon 1972).

While this approach fell increasingly out of favor in Europe and North America in the 1980s, its influence lingered on in Korean and Japanese accounts of sport into the 1990s. More recently, it is arguable that some of the underlying assumptions of this approach have found expression in the use of the concept of “social capital” to assess the potential of sport to “solve” wider societal and indeed global problems (Putnam 2000).

In contrast to the functionalist accounts provided in North America in the 1960s, European sociology increasingly turned to Marxist accounts to explain the conflicts and inequalities evident within and between societies (Bairner 2007). Drawing on the work of Karl Marx, and others, writers such as Jean-Marie Brohm (1978) and Paul Hoch (1972) focused on the role of economic interests and the exploitative relations built into the capitalist system. In Marxist accounts, attention was given to how economic resources were unequally distributed to the role that social class plays within societies and to how power was based on the ownership and control of the economic means of production. In this light, participation in and consumption of sport was seen to reflect and reinforce class relations. The power elite in the wider society had/have their equivalents in sport: The system of sport is used to maintain the interests of the powerful and its consumption viewed as “distracting” the working class from engaging in a more critical stance against the inequalities of the capitalist system. Indeed, sport itself was viewed as being distorted by the role of capital and broader political and economic interests. The play element of sport was undermined and sport had become, much like the role of religion more broadly, the “opiate of the masses” (Rigauer 1981).

While reaching quite different conclusions about the function and meaning of sport, functionalist and Marxist accounts tended to downplay the role of the individual in shaping their lives and sporting involvement: By and large, sport reflected society and reinforced the existing status quo. Critique and counter-critique between

these paradigms remain a feature of sociology of sport to the present day (Morgan 1994). Within Marxist accounts, however, academics began to question whether the account offered was too economic and deterministic. Instead, in the research of Richard Gruneau (1983) and, in the later work of John Hargreaves, (1985) for example, attention was increasingly given to the role of culture. Throughout the late 1980's and 1990's, neo-Marxist and cultural studies accounts of sport superseded "classical" or orthodox Marxist accounts. Consideration was increasingly given to the role of sport as part of wider cultural relations. Power was viewed as contested, exploitation was resisted, and alternative subcultural responses provided. Sport was viewed as a site where culture was produced and reproduced but also transformed. Sporting subcultures were investigated to assess the extent to which people were repressed and/or empowered. Particular attention was given to the resistance offered by people at the margins of societies. Arguably, the sentiments of neo-Marxists and cultural studies scholars found expression in the more postmodern studies of sport that came to the fore in the 1990s and throughout the last decade (Andrews 1993, 2000; Markula and Pringle 2006; Rail 1998). Indeed, postmodern studies, examining sport in terms of identity politics, consumption, the body, and globalization, have become very popular, especially in North America, and in some ways have supplanted classical Marxist accounts of how best to understand to role and meaning of sport in and across societies.

These postmodern accounts have also been influenced by feminist perspectives (Flintoff and Scraton 2002). This perspective developed later than either functionalist or Marxist accounts and has, since the 1970s, changed considerably in terms of the societal basis of patriarchy, the role that sport plays in this regard and what solutions are offered to overcome gender exploitation. As with other perspectives, feminism is not one thing. Yet, all approaches within this perspective are agreed on the centrality of gender in understanding society. This approach grew in prominence in Western societies and in the academy in the 1980s onward. Initially, liberal feminists were

concerned with ensuring that women had equal access to and equal treatment within sport. Throughout the 1990s, a feminist approach grew in popularity. Some scholars, such as Jennifer Hargreaves (1994), combined a Marxist and feminist approach and used a class and gender analysis to raise questions about the role that sport played not just in reflecting the inequality of society but, in some instances, also exacerbating these inequalities. In particular, the impact of hegemonic masculinity and the role it plays in the biased nature of sporting ideology and content was focused on. The solution to this was viewed not simply in terms of access, status, or resources but rather in a reconceptualization of the meaning and function of sport (Hall 1996).

This perspective was also accompanied by a radical feminist critique that questioned the very structure and meaning of sport. Arguing that sport was inherently unequal and unhealthy, radical feminists argued for separate development and alternative body cultures. This latter emphasis gelled with postmodern concerns focusing, as noted, with the body, identities, sexualities, and consumption. More recently, therefore, feminist accounts of sport have combined with postmodern approaches that probe these questions of identity (Markula 2005). By and large, however, they have tended to be a much more prominent feature of Western scholars and, as yet, have not taken a significant hold elsewhere.

While these approaches have tended to emphasize, to a greater or lesser degree, how sport reflects and reinforces society, there is also a long-standing approach, again dating from the 1960s, that examines sport in terms of how society is created through the exchange of meanings, identities, and culture in interaction with others. Drawing on the work of George Herbert Mead (1934), Erving Goffman (1959), and others, a symbolic interactionist approach, while less prominent in sociology of sport, has provided a counterpoint to more macro and deterministic explanations of the meaning and function of sport. Focusing on small-scale social settings, this approach examines the meanings, identities, and (sub)cultures created in and through

interaction (Donnelly and Young 1988). Attention is given to how social worlds, including sport, are socially constructed by the expression, interpretation, and exchange of meanings (Klein 1993). This approach has proved particularly valuable in probing the socialization into, through, and out of sport (Curry 1991; Fine 1987). In addition, the symbolic side of sport, how it represents identities at local, national, and global levels, has been fruitfully explored. Perhaps its biggest weakness, however, is its inability to explain how these small-scale, micro settings in which the agency of the individual is emphasized and meanings constructed and exchanged, relate to wider social structures and issues of power and inequality.

Two other perspectives that directly address this issue of the relationship between individual agency and social structure have also been extensively used in sociology of sport. These approaches derive from the work of European social theorists Norbert Elias and Pierre Bourdieu. Eliasian or figurational/process sociologists highlight the chains of interdependency that people form and live out their lives in. While active in the ongoing development of interdependency, such chains act back on people in enabling and constraining ways. In examining social change, figurationalists probe the power balances within figurations that influence relationships between individuals, social groups, and societies – between the established and the outsiders. Developed by Elias and Eric Dunning (1986) and others, this approach has examined the emergence and global diffusion of modern sport, the expression of violence by participant and spectators in sports, the role that sport plays as a male preserve in affirming masculinity and male power, the connections between sport and the medicalization of the body (Waddington 2000), the significance of global sport on local and national identities, and the meaning and importance of sport in terms of an individuals and groups quest for exciting significance (Maguire 2012).

With a somewhat similar intent as Elias, Bourdieu sought in his general theory to resolve

the tension between the individual and the society. For him, researchers inspired by his framework, the key building blocks for understanding society lay in probing the connections between the accumulation and investment of capital, the formation of a person's habitus and the gaining and maintaining of distinction. Unlike more Marxist accounts, Bourdieu was keen to highlight that the accumulation and investment of capital involved cultural and social elements as well as economic (Bourdieu 1984). That is, while an understanding of the distribution of wealth and income was a necessary part of any analysis, consideration had also to be given to the gaining of cultural capital (formal qualifications and informal high status knowledge) and the presentation of an individual's social capital as expressed in and through their bodies – accent, demeanor, and body language. Together, these forms of social capital construct social fields in which individuals share with others common life chances, experiences, and tastes. The embodied social memories, or habitus, of an individual, reflects and reinforces the ongoing struggle for distinction, power and status within societies. Sport plays a significant role in both the form of a person's habitus and the accumulation of distinction (Bourdieu 1984; Wacquant 1992). For Bourdieu, and others, the social function of sport serves to reflect the different uses and investments of social capital and the differential rewards that flow from such investment. Sport itself is also marked by the struggles to gain and maintain status – different sports and sport settings require and confer differential distinction on its participants and consumers (Kay and Laberge 2002).

There are other approaches that have been used to explain the relationship between sport, culture, and society (Jarvie and Maguire 1994; Maguire 1999; Maguire and Young 2002). The intention here has been to highlight how the sociology of sport both uses and contribute to wider sociological theory. Informed by these theories, sociologists have focused on the following areas:

1. Culture and socialization into, through, and out of sport

2. The relationship between sport and stratification – particularly with reference to social class, gender, and “race”/ethnicity but also disability
3. The body and the emotions – focusing on the able/disabled body, the technologized body, the medicalized body, the consuming body, and bodies and identities politics
4. The role that sport plays in the generation and expression of deviance: violence by participants and spectators; drugs and pain and injury
5. The connections between sport and local, national, and global spaces and places – with particular reference to issues of political economy, migration, national identity, and the media

Why Sport Matters?

Any study of sport which is not a study of the society in which that sport is located is study out of context. In order to make sense of society – and how sport both reflects and reinforces societal structures and subcultures requires theoretical insight and empirical enquiry of the kind outlined above. The facts about sport and society do not speak for themselves: sociological theories both help us make sense of our observations and assist in development of an analysis and explanation for the patterns we observe. The interplay between theory and evidence lies at the heart of the sociological imagination that seeks to make sense of history, biography, and social structures (Sugden and Tomlinson 2002). Hence, the study of sport sheds light on both the subcultures of different sports but also the society in which such sports are located. Through the seemingly mundane and unserious aspects of sport, the sociologist can see the serious and significant aspects of society and the human condition. This can be illustrated with reference to the role and significance of champions in sport. That is, what is it to be a sporting champion and why do they mean so much to people in different cultures and civilizations – be in Western or non-Western cultures? In a simple sense, a champion is someone who is

the first among all contestants or competitors, and in this regard, the word refers to the ability of an individual or team to win a contest or championship. Yet, the origin of the word, in English, indicates a different usage and offers a clue as to why champions are so much more important to us than just their ability to win and why people across the globe attach such meaning to them. Its first usage, in English, emerged in the context of the medieval tournament and referred to the person who would act as a champion of others; who would defend, support, or *Champion* a cause (Hughson 2009). Athletes are not simply champions of their sport, but also of their local community and nation and, sometimes, humanity as a whole. An example of this is the American boxer, Muhammad Ali. A champion is said to possess special gifts and exude a certain charisma: They perform “miracles” and achieve the seemingly impossible. Athletes, for better and for worse, are our modern heroes: symbolic representations of our cultural values and who we would wish to be. Champions are talented individuals, but as heroes, they are people whose lives tell stories about ourselves, to ourselves, but also to people from other nations (Huizinga 1947/1955).

People from different cultures appreciate excellence and have a desire to achieve it, and if not, then at least to share in it. The champion allows us to catch a glimpse of what we could be: By representing us, they make us vicariously fulfilled human beings. They are our modern heroes because sport has become the forum in which communal self-revelation occurs. That is, modern sport is a form of surrogate religion and popular theater in which there occurs the communal discovery of who we are. Sports stadia are contemporary venues in which we can observe champions as heroes and experience the “sacred,” moments of exciting significance, while leaving behind the profaneness of ordinary life. In this sense, society needs its champions as heroes. They perform the manifest function of achieving sporting success for themselves and their local community and nation. But they also perform a more latent role: They are meant to

embody the elements that a society values most. As idealized creations, they provide inspiration, motivation, direction, and meaning for people's lives. Champions as heroes act to unify a society, bringing people together with a common sense of purpose and values. That is how modern sport developed (Guttmann 2004). Pioneers of the nineteenth century linked sport to Western muscular Christianity: unselfishness, self-restraint, fairness, gentlemanliness, and moral excellence. This was itself supplementing traditional notions of chivalry: honor, decency, courage, and loyalty. These qualities are some of the very attributes associated with what people describe as the "true" champions.

Despite this sense of nobility, there are, however, threats to the manifest and latent functions of champions as heroes. This stems from issues associated with authenticity and integrity. The status of the champion relies upon the authenticity of the contest. If the contest is tarnished by corruption, cheating, drug taking, or betting scandals, then the hero is diminished in our eyes. The contest is no longer either a mutual quest for excellence or societies forum in which communal self-revelation occurs. This lack of authenticity also occurs when the sport becomes too make-believe, is rigged, or becomes too predictable. Professional wrestling may produce "champions" but they are not taken seriously, and they are not our heroes. In addition, if the champion represents a state system that the people do not support, then their respect is lacking. Alternatively, athletes can become signs of resistance and offer glimpses of different social systems (Dyck 2000).

The champion can, as hero, embody the elements that a society holds most dear. But the integrity of the champion may also be undermined in several ways. The champion may be a flawed genius – either due to the fact that they suffer from hubris and feel they need not dedicate themselves to the level and intensity of preparation and performance required, and/or because their private lives intrude on their status as heroes. Our idealized image of them as athletes is shattered. In addition, our champion maybe less a hero and more a celebrity – they are famous but not heroic. David Beckham may be seen in

this light. If this be the case, such fame is short lived and they fail one of the tests of a true champion as hero – the test of time. Celebrity sport stars can once be famous, but be neither a champion nor a hero, and is now forgotten. In order to understand why champions mean so much to us and what impact they have, we have to consider the role sport plays in society. This is where sociological theory helps and why the insights from this subdiscipline are so crucial to an understanding of sport and society (Coakley 2004; Tomlinson 2005, 2007).

Cross-References

- [Body](#)
- [Cultural Studies](#)
- [Emotion](#)
- [Media Studies](#)
- [Myth](#)
- [Religion](#)
- [Ritual](#)

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Standard Intelligence

► Intelligence

Statistics and Probability

► Probability and Statistics

Stereotactic Surgery

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A special kind of neurosurgery utilizing a frame attached to the skull of the patient. By referring to a Cartesian coordinate system, every point around the frame could be defined by a x, y, z coordinate system. A special targeting arm, attached to the frame, enables to reach every place or point inside the skull with a high precision. It is used for taking biopsies from the brain, for removing tissue like abscess or hematomas, and for placing electrodes or radioactive tissue within the brain.

Story

► [Myth](#)

Stress

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Stress is a multifaceted construct which can be viewed in three different ways. First, stress refers to a state of the organism in which physiological processes are activated which leads to heightened arousal, including faster heart and respiratory rates, glucose is released into the blood system, and cognitive and skeletomuscular processes are heightened. Second, stress can also refer to environmental challenges which can be physical or psychosocial, such as exposure to environmental toxins, loss, or other threats to well-being. Some researchers distinguish

between strain (state of the organism) and stressors (environmental challenges). Others refer to stress as a transaction between the person and the environment, in which environmental requirements strain or exceed the individuals' resources to cope. In this system, appraisal processes are central, and result from an evaluation process through which the individual decides whether a situation is benign or whether it involves a threat, a harm or loss, or a challenge. Aldwin (2007, p. 24) defined stress as "that quality of experience, produced through a person-environment transaction, that, through either over-arousal or under-arousal, results in psychological or physiological distress."

There are several different ways to assess stress. Trauma refers to situations which are life-threatening or may result in serious bodily harm, either to oneself or others. Life events refer to major changes in living situations, often due to changes in social roles, such as divorce, job loss, or bereavement. Daily stressors refer to more minor problems which occur in everyday life, such as traffic congestion or arguments with friends and family, and are often assessed through daily diaries. Chronic role strain refers to ongoing problems such as poverty, chronic job stress, or caregiving. Finally, microstressors are assessed through ecological momentary assessment, in which individuals are "beeped" and asked to report on what they are experiencing at a particular moment.

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String Theory

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This is a theory that the fundamental building blocks out of which matter is made consists not

of point-like particles as previously thought but tiny vibrating strings. It is the different modes of vibration of the string that gives rise to the particle's properties. It is believed that such strings vibrate in up to 10 spatial dimensions. As we experience only three spatial dimensions, it is claimed that the extra dimensions are curled up too small to be detected.

Cross-References

► [Space](#)

Structure

- [Architecture in Islam](#)
- [Functionalism](#)

Study of Character Strengths

► [Positive Psychology](#)

Study of Intelligence

► [Intelligence](#)

Suffering

► [Dukkha](#)

Sufism

► [Mysticism in Islam](#)

Suggestibility

► [Hypnosis](#)

Suggestion

► [Hypnosis](#)

Supervenience

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A term used to conceptualize the relationship of mental and physical properties within a physicalist perspective, without necessarily reducing mental properties to physical ones. Typically, a supervenience relation is understood to hold if one set of properties (the mental) are understood to depend on another set of properties (the physical), and any change of property at one level entails a change at the other level. An extensive philosophical literature surrounds supervenience, with considerable debate over whether supervenience relations allow for mental causation and whether they support non-reductionist interpretations of mind-brain relations.

Surgery

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Related Terms

[Medical procedure](#); [Surgical procedure](#)

Description

Today in Europe, surgery is devoted to offering detailed diagnostic criteria and therapeutic

regimens for diseases affecting all the body that need a surgical operation. The term surgery was derived by the Greek word *kheirourgos* that means “man that operates (*ergon*) with his hands (*cheir*).” Throughout Europe, surgery became a discipline of its own right at the end of the nineteenth century, being treated as a separate entity distinctive from *medicine*. This development started in the university hospitals and was followed by the establishment of separate departments of surgery in most major community hospitals and, in the second half of the twentieth century, with the development of specialized subdisciplines such as vascular surgery, cardiac surgery, thoracic surgery, etc.

Self-identification

Science

Surgery has self-identified, from its very beginning, as a medical science. It sees itself as a scientific endeavor with the aim to develop the knowledge about the diseases that can be treated with an operation. The disease concepts and related surgical procedures were developed in the twentieth century with the birth of general anesthesia. The increasing knowledge of the surgical pathology is considered as a fundamental basis for specific surgical procedures. Surgery is one of the so-called natural sciences because it applies the scientific methods of the natural sciences for clinical and basic research as well as for diagnostic procedures and therapeutic procedures. Progress in surgery is characterized by the development of specialities such as cardiac surgery, vascular surgery, thoracic surgery, pediatric etc.

This was pioneered by the turn of the century with the clinical triumphs of various English surgeons (R Tait, W Macewen, F Treves), German surgeons (T Billroth, T Kocher, F Trendelenburg, J von Mikulicz-Radecki), French surgeons (J Pean, J Lucas-Championniere, M Tuffier), Italian surgeons (E Bassini, A Ceci, G Tagliacozzi), and US surgeons (W Williams Keen, JB Murphy).

In the second half of the twentieth century, surgery expanded over *organ transplantation* as

the medical basis of these operations became available (immunosuppression).

A new focus of scientific work in surgery has been to elucidate the *role of minimally invasive surgery*. This involves all surgical disciplines.

More recently, surgery was also equipped also with robotic assistance.

Nevertheless, with the discovering of new medical treatment, some surgical procedures were abandoned (e.g., gastric resections for peptic ulcers).

In more recent times, multicenter randomized double-blinded studies have become very important to establish evidence-based guidelines for surgical treatments.

The increase of knowledge in the different surgical disciplines has fostered the emergence of a broad range of independent surgical specialities. This is reflected by dedicated national and international scientific organizations and separate educational pathways. In addition, many specialized societies have been founded addressing specific diseases/operations or research topics. These organizations arrange their regular scientific meetings and in the majority have their own scientific journals. These societies show increasing numbers of members.

Characteristics

Surgery is distinctive among other specialities of medicine because it is based on the surgical therapy. This particular aspect of surgery guides the surgeon in considering all diseases that cannot be treated only with drugs.

In contrast, diseases in *internal medicine* typically are treated with drugs.

Relevance to Science and Religion

Surgery sees itself as relevant *to, interested in, the scholarly area called Science and Religion because in the field of organ transplantation, many religious issues are discussed, but also in the field of surgical indications in high-risk patients, many religious and ethical issues are present (euthanasia).*

Sources of Authority

The authorities in surgery used to be scientifically interested surgeons who were also fundamental for the establishment of famous academic institutions.

For example, the origins and history of the Royal College of Surgeons of England lie in the union of the Fellowship of Surgeons and the Company of Barbers by Henry VIII in 1540 to form the Company of Barber-Surgeons. They maintained a somewhat uneasy partnership in the sixteenth and seventeenth centuries when the degree of surgical intervention was limited. The eighteenth century, however, saw the rise of private anatomy schools and the development of an academic basis for surgical practice through the teaching and publications of the leading European surgeons. As a consequence, the number and importance of surgeons increased, along with a firm desire for independent professional recognition. In 1913, the American College of Surgeons was founded.

Among the great difficult technical problems faced by the nineteenth-century surgeons was that of reconnecting the divided ends of hollow tubes, especially blood vessels and bowel. The successful appendectomy, the Billroth operations for esophageal and gastric cancer, and the improved hernia repairs of Bassini and Halsted, all caused great excitement in the medical world at the end of the nineteenth century.

Before antisepsis was introduced, laparotomy was not usually possible. The basic principle of bowel suture was discovered in the nineteenth century by Guillaume Dupuytren and John Hunter; Dupuytren's student, Antoine Lembert, is known for his suture.

In America, important contributions to the advance of surgery were from the work of Charles McBurney of New York and John B. Murphy of Chicago. Charles McBurney described the point of maximal tenderness in appendicitis and proposed a new incision for appendectomy.

The successful treatment of an abscess of the appendix in King Edward VII of England helped break down the resistance to surgery.

With the advent of the web, electronic publishing, and electronic libraries, original papers in surgical journals have become widespread.

Surgical scientific societies have established guidelines for *good clinical practice* and evidence-based guidelines which are constantly updated for therapeutic protocols of the major surgical diseases.

Ethical Principles

As for every medical subdiscipline, surgery is guided by the oath and law of the ancient Greek physician *Hippocrates* (born 460 B.C.) who is considered the so-called father of medicine. This "Hippocratic Oath" has been supplemented by the rules of the Declaration of Helsinki of 1971.

Key Values

The key value of surgery is treating human *diseases* with a surgical procedure. A second key value in surgery is that of diagnosing, treating, counseling, and guiding patients before and after the operation.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life on our globe. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological being equipped with unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems; death is considered the cessation of such physical functions. A special case, which has raised ethical

challenges for transplant surgery, is that of so-called brain death: bodily functions are partially maintained, but there is no evident brain activity. In this case, it is possible to proceed to organ retrieval for transplantation.

Reality

Reality is considered the world around us that human beings can observe with their senses.

Knowledge

Knowledge is the *wisdom* that can be transferred in a verbal form or has been written down.

Truth

Truth is conceptualized as the supreme reality in accordance or agreement with facts and rules.

Perception

Perception is the *conscious sensation* of the external physical world on living human beings. Anesthesia during surgery cancels or impairs perception.

Time

Time is the fundamental category of ongoing change in past, present, and future. Human perception of time can be affected by anesthesia during surgery.

Consciousness

Consciousness is the responsiveness of human beings to any physical stimulus. Anesthesia during surgery can impair consciousness globally, or in differentiated fashions.

Rationality/Reason

Rationality is a foundation of accountable and *responsible* human comportment. It is impaired in anesthesia during surgery.

Mystery

For definition, surgical diseases have a clear cause that can be treated with a surgical procedure.

In surgery, the only place for mystery is what is as yet unknown.

Relevant Themes

A critical issue in surgery as regards “Science and Religion” is the idea of the surgeon’s “hands” guided by God during their difficult work. Many religious patients and surgeons think that this could be possible.

Cross-References

- [Anesthesiology](#)
- [Child Surgery](#)
- [Ethics](#)
- [Medical Sociology](#)

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Surgery in Childhood

- [Child Surgery](#)

Surgical Procedure

- [Surgery](#)

Survival

- [Biology of Religion](#)

Symbolic Interactionism

- [Social Psychology](#)

Sympathy

► [Empathy](#)

Synapse

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The junction between a nerve and the next cell in an information chain – another nerve, or a muscle or gland cell located to carry out neuronal instructions. At almost all human (and other vertebrate) synapses the signal is conveyed by the extremely rapid diffusion of a “transmitter” chemical across a tiny gap between the cells. Two important properties follow. Firstly, because only the “output terminals” of the transmitting cell have the means to make and release transmitter, and only the underlying membranes of the next cell have the means of responding to it, transmission can occur in only one way across the synapse. And secondly, it is at synapses that the great majority of other chemicals, from hormones to drugs, act on the nervous system. The number of synapses is huge: there are about 10^{14} nerve cells in a human body, and large cells may have 10^4 synapses on their surfaces. It is considered that learning, memory, and many neurological aspects of both development and aging are mediated by synaptic changes.

Cross-References

► [Neuron](#)

System

► [Functionalism](#)

System Assurance

► [Information Security](#)

Systematic Theology

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Overview

Systematic theology (ST) is a scholarly discipline within the context of Christian theology, aiming at relating the contents of faith to the present stand of knowledge. ST presupposes the existence of the Christian religion and relates to this religion in a constructive as well as critical manner. The outcome of the work in ST is a comprehensive articulation of the content of Christian faith within the horizon constituted by contemporary knowledge.

Description

Systematic theology (ST) is the attempt to articulate a coherent and normatively acceptable understanding of the content of ► [Christian faith](#) in the light of the following: (a) the teachings of the ► [Bible](#) and the tradition of the Church and (b) present experience and established knowledge. This task is carried out while reflecting on the conditions for understanding and interpreting the world as well as the teachings of the Bible. Hence, the whole enterprise of systematic theology involves pragmatic, hermeneutical, and contextual considerations.

In a historical perspective, emphasis in systematic theology has shifted from a coherent and encompassing systematization of the usages of the Bible relating to doctrinal topics ((a) above) toward a more philosophically, hermeneutically, and historically reflexive and comprehensive

articulation of the possible content of this faith under present terms of knowledge ((a) and (b) taken together). Moreover, systematic theology has today to be differentiated from ethics and philosophy of religion, which often are seen as the neighbor disciplines of ST within the study of theology. It also cannot be identified with doctrinal theology (a mere exposition of the doctrines of the Church), as it will have to discuss critically the conditions for, and content of, such expositions.

The *pragmatic* scope and context for ST is related to the Christian Church. As a systematic articulation of the content of Christian faith, ST aims at making this faith as transparent and as viable as possible in the light of knowledge from all the sources above, solving the different problems emerging in the present situation from the point of view of Christian faith. The pragmatic dimension implies understanding *how* Christian faith makes a difference in relating to the world, why it makes a difference, and *what kind of difference* faith in the triune God makes.

The *hermeneutical* dimension of ST is constituted by the relation of classical texts of Christianity (the Bible, the ecumenical and confessional creeds) with a normative status to the present-day insights, knowledge, and experience. To interpret the contents of Christian faith within the horizon of the present context is the main task for ST. Hence, ST cannot be understood simply as the summa of what the Church did believe in the past – as such historical reconstructions are never sufficient in order to relate the content of faith to contemporary contexts, with their implicit or explicit conditions for understanding what the faith implies and with what problems the contexts challenge it.

ST is accordingly an attempt to articulate versions of contemporary, viable, and *scholarly and scientifically informed understandings of Christian faith*. These articulations emerge out of different contexts, and are conditioned by the knowledge, the problems, and the traditions of these different contexts, but are nevertheless often done in a manner that also relates to other versions of such articulations, be it from a confessional, socially, or theoretically different

point of view. This engagement across different positions makes it possible to have a *reasonable* and *warranted* assertion of ST that is more than a mere confessional statement of what a given group of people, Church, or theologians hold as their private opinion.

The articulations of ST can be done in a manner that *incorporates* all relevant material and understanding within one (more or less) coherent and explicitly Christian understanding of the world as a given frame of reference (narrative theology, postliberal theology, Barth, Jüngel, Hauerwas) in a manner that tries to explicate the contents of Christian faith over against and in relation to other realms of knowledge (Pannenberg, Tracy, Tillich) and in a manner that is also willing to discuss to what extent there is a possibility for relating the contents of Christian faith to the present amount of knowledge. The latter mode of doing ST is more likely to grant the modern way of looking at the world in a relatively independent normative status, despite the fact that some of the preconditions for a modern understanding of the world is still discussed or put to scrutiny.

Among the more recent developments in ST is the realization that as theology, like any other field of knowledge and scholarly work, is historically and contextually bound in all its different aspects, the modern quest for one coherent and objective articulation of what faith is is left as an unwarranted illusion that neglects the historical and contextual dimension of all forms of knowledge, including theology. Acceptance of plurality and of different theological positions has thus become more apparent and necessary, and it has resulted in discussing the normative status of theology from a lot of different perspectives, where none can claim more privilege than others. As a result, previous types of confessional theology seem, in many places (at least in the academy), to recede to the background.

Another important development in ST is its increasing interaction with other subjects in the university, be it social sciences, natural sciences, or parts of humanities. The interaction with and employment of resources from these areas are today becoming an increasingly more important

horizon for the articulation of theology, be it in everything from understanding the political implications and dimensions of religion over gender studies to the information provided by present results in the natural sciences. In principle, ST should be done within a university or university-like setting in order to fulfill its intellectual responsibilities toward other scholarly and scientific disciplines, as well as its obligations toward the Church for which it is assigned to articulate a viable version of its faith.

Self-Identification

Science

ST self-identifies as a scholarly or scientific enterprise as it relates to and, to a certain extent, has to engage with and interpret the results of science. Without being informed by the results of science, ST would not be able to articulate a viable contemporary articulation of Christian faith. By presenting the articulation in a transparent manner that makes explicit the contextual, hermeneutical, and pragmatic considerations that condition the articulation, as well as what resources and texts it draws on, ST is able to present its conditions and its results as scholarly work that can be discussed, contradicted, or accepted by others. These features condition the scholarly or scientific status of ST.

However, as ST interprets scientific results within the framework of Christian worldview, or as part of what constitutes its contemporary meaning, this does not mean the theology itself is *producing* scientific results in the manner that it makes predictions possible or can explain phenomena in the same manner as does, e.g., natural science. ST provides a possible and as much as possible *understanding* of phenomena within a coherent *interpretative* framework and not a scientific *explanation* of the isolated individual phenomena as such.

Religion

ST self-identifies as part of religion as it is an attempt to make a coherent and transparent articulation of the contents of religion within the

context of contemporary society. It presupposes the existence of religious convictions, faith, praxis, and attitudes as its given basis but reflects on, criticizes, and relates to these givens of religion in all possible ways, both critical and constructive. In this way, it is based on religion, and it can also have impact on present religious view to the extent that what is done as theological work is received and recognized as important in the constitutive pragmatic context of theology, i.e., the Christian Church.

Characteristics

The distinctiveness of ST over against the other historical disciplines of theology is that it is explicitly dealing with how it is possible to articulate a *potentially normative* (i.e., true, coherent, and acceptable) Christian faith in the contemporary world, on the conditions that are given with the present universe of knowledge and understanding. *Historical* theology does not in the same way have the present situation as its constitutive pragmatic context and as their sole hermeneutical horizon.

Relevance to Science and Religion

The understanding of the dimension of human life that expresses itself in religion is something that needs to be addressed, inquired, and interpreted from a multitude of scientific perspectives. It does provide us with a better understanding not only of what it means to be human and of how and why we relate to the world as we do but also of the moral and spiritual dimension of these relations. ST provides articulations that other disciplines can relate to and discuss and may have a clarifying, a critical, and a constructive engagement to offer in relation to the approach to religion that other disciplines have.

ST is interested in the scholarly area science and religion simply because it cannot afford to ignore the scientific horizon as one of the present conditions for interpreting and articulating a contemporary understanding of what Christian

faith is. Moreover, much of what the result of science is both conditions and restricts what kind of articulations of faith theology is able to offer, given that ST works under the requirements set forth by a coherentist understanding of truth. From that position, science is relevant to all areas of faith, including understandings of the origins of the world, of humanity, of morality, of the ecosystem, etc.

As a result, it is hard to see how academic work in ST today can be carried out in ignorance or neglect of the results of other disciplines. Put strongly, it is a requirement for ST as a scholarly enterprise with academic recognition that it relates to and is informed by what takes place in the science and religion debates. Teachings of religion that fails to fulfill such requirements will, at least in a European context, usually not be considered as academically acceptable or satisfactory ways of practicing the discipline.

One of the important consequences of this is that some work in ST is needed in order to overcome the problems emerging from a naïve religious outlook that takes the convictions of a religious tradition to be a competitor to what is the present stand of scientific results. Hence, ST has a mediating role when it comes to relating the content of religious traditions with sciences.

Sources of Authority

The basic source of authority for Christian ST is the ► [Bible](#). As the main source for access to the preaching of Jesus of Nazareth and the Early Church, its status is unchallenged. The main reason for seeing the Bible as authoritative is this content, and it was from early on understood as such by the ► [Church](#) in order to safeguard the main contents of Christian doctrine and preaching. However, in what respect it is authoritative depends largely on what kind of hermeneutical approach one employs when using it. In the modern period, the authoritative status of the Bible does not imply taking anything it says for granted or unquestioned. Many of the conflicts emerging between Christian religion and

modern science do, however, result from a lack of understanding of the historical character of the biblical sources, allowing them to have authority also in matters of science. Recent ST who employs different hermeneutical approaches to the Bible questions and criticizes this use of it and attempts to establish the authoritative elements of Christian teaching (more or less) in consonance with the results of science.

In addition to the Biblical sources, the different ecumenical and confessional creeds of the Christian Churches also play a restricted role as authorities that ST has to relate to. Moreover, in Roman Catholicism, the decisions of the Holy See (the Pope) also have authoritative status.

A generic feature is that the authoritative status of all the above is constantly, in some way, *negotiated* in terms of their relation to the present stand of knowledge.

Ethical Principles

The ethical principles are *fairness* to positions described or discussed, *coherence* with regard to the knowledge established, *reliability*, *transparency*, *openness*, and *corrigibility*.

Key Values

The key value of ST is its result: the presentation of a viable version of Christian faith in the light of contemporary status of knowledge.

Conceptualization

Nature/World

The nature and the world are seen as the result of God's loving creativity.

Human Being

The human being is seen as created in the image of God – i.e., as the being called to represent in a specific way God's love, care, mercy, and compassion for all of creation.

Life and Death

As God is seen as the source of life, all life emerges from God's creative activity. God sustains life through God's own power. Death implies being separated from God's loving power. This separation is usually interpreted as the consequence of sin, meaning that humans reject God and install themselves as God instead. Hence, life and death both have a spiritual and moral, as well as physical, dimension. (cf. below).

Reality

Reality in ST is seen as having a physical, moral, and spiritual dimension. Hence, in ST no priority is given to the physical approach to the world, just as important is the way human relates to reality by moral or spiritual means.

Knowledge

Following the above, knowledge implies more than the mere acquisition of "objective physical facts." It means to take part in and explore the reality of God, in all its different dimensions. Moreover, the knowledge established within a specific scientific discipline is not regarded as sufficient to provide full understanding of reality, as reality basically cannot be fully understood without reference to God.

Truth

In ST, truth must be understood as that which emerges from a coherent interpretation of reality, given the different sources for knowledge and insight. A coherentist approach to questions of truth allows for ST to take fully in the results of different sciences and to be informed by them when it articulates what Christian faith means in the contemporary world.

Perception

Perception is a way of taking part in the world of God.

Time

Time is one of the dimensions in which God allows for the world to exist.

Consciousness

Consciousness is among these capabilities that ST usually describes as soul, although the soul also comprises the subconscious and the emotional dimension.

Rationality/Reason

Reason is the capacity to share in the reality of God and to acquire knowledge of it. However, in ST reason is not reduced to what follows from perception or logical deduction – reason also implies taking into account the moral and spiritual dimension, following the common rules of argumentation, deduction, and inquiry. To be noted is the fact that reason presupposes understanding us as being part of God's creation, not as standing over against it. Hence, reason has its created limits.

Mystery

Mystery is (a) God, (b) the fact that the world is, and (c) anything that goes beyond what human reason has the capacity to explore fully – which from a Christian point of view means literally everything. Hence, in one way, ST is articulating the contents of the mystery of the world by trying to articulate what can and cannot be said.

Relevant Themes

What does creation mean in the light of evolution?

The origins of the world and of life

Human uniqueness

God's agency with and relation to the world

The question of the openness of the future (vs. determinism)

Cross-References

- ▶ [Christianity](#)
- ▶ [Constructive Theology](#)
- ▶ [Truth](#)

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field of behavioral medicine. A system is considered to be a whole, comprised of a set of parts, whose unique properties or behaviors as a whole emerge out of the interactions among the parts as well as out of the interactions of the system with its environment. The parts (or levels) may be arranged in a hierarchical manner. This model was originally proposed by physicists in the 1930s.

Systems Theory

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Systems Approach

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The systems approach provides the philosophical foundation for the biopsychosocial model of human functioning that is fundamental to the

A term for a related set of disciplines developed in the late twentieth century to describe complex, nonlinear, dynamical systems. It involves the development of new terminology (such as components versus physical parts; structure versus organization). It employs the resources of nonlinear mathematics (i.e., equations that require iterations such that the result of the first calculation is entered into the second calculation, and so on).

T

Tale

- [Myth](#)

Taoism

- [Daoism](#)

Tawhid

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Literally “affirming the one”: monotheism. Unicity of God, Oneness of God. Monotheism is the cornerstone of Islam. The doctrine of Tawhid signifies total obedience and submission to God in worship and in deed. Tawhid designates the oneness of God (Divine Unicity), his absolute existence, and that he has no equal. It is embodied in the first profession of faith in Islam: “there is no god but Allah’ (la ilaha ilia Allah).”

Technology

- [Functionalism](#)
- [Science and Scientific Knowledge, Sociology of](#)

Technonature and Theology

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To access nature, we have recourse to a few analogies: nature as organism, nature as machine, nature as history, nature as cybernetic information-processing entity, and nature as a product of discourse. Not so long ago, scientifically minded humans tended to understand ► [nature](#) as an objective, causally determined realm of matter-energy in motion, void of meanings and inwardness.

New scientific knowledge, from astrophysics to evolution to genetics and molecular science, has occasioned various reconstructions of the idea of nature. Nature has turned out to be not an eternal object but inherently an unstable concept, prone to change dependent on the cultural and historical context. No single image, model, or metaphor does convey the complexity of nature or its meaning for humans.

Neither is there an inclusive image for the human nature and culture, nor ► [technology](#). Technology is usually thought to be about a set of skills, techniques, and activities for the shaping of materials and the production of objects for practical ends. Traditional technologies arouse not from science but from experience and experimenting. Since about the 1850s, technology has been increasingly based on science. And vice versa, instruments and technologies play an ever increasing role in science. Our science is technoscience, and our nature is technonature. The growth of science was paralleled by the emergence of a strong tradition in the philosophy of science and science-and-religion dialogue; the ecological crisis occasioned a variety of philosophies and theologies of nature, whereas the corresponding technological innovations did not generate comparable explosion of philosophies or theologies of technology even though technology figures more prominently and often more problematically in the lives of most people than does pure research science. Since the 1990s, Donna Haraway, Don Ihde, Bruno Latour, Andrew Pickering, Katherine N. Hayles, Sandra Harding, Philip Hefner, and others have been talking about technoscience. The studies in technoscience are deeply interdisciplinary, stretching from philosophies of science and technology to sociology of science to literary and cultural studies to semiotics to theology. All these studies are immensely interested in materiality, all emphasize non-neutrality and ethical-political aspects both in their research areas and their own work. Technoscience and technonature force us to realize that the technology is not so easily distinguished from the “human” since it can be within the body and outside; we can inhabit it (a climate-controlled room) or it can inhabit us (a pacemaker). Discussions of technology are inevitably the reverse side of the coin in debates about human nature.

Theological idea of nature has emphasized that nature is creation. In biblical language, nature (“the heavens and the earth”) is created by God. As a theological construct, nature is a space in which the encounter with God becomes

possible. The full theology of God’s creation involves both the gift character of creation (*creatio ex nihilo*) and the ongoing gracious presence of God in creation (*creatio continua*). The human creature is created of the earth as creatures who alone are created in “the image of God,” the idea of which has several interpretations in the Christian tradition (*imago* as freedom of the will, reason, external or internal likeness to God, capability to have personal relationship with God, of being God’s counterpart, dominion over the earth). Both nature and human nature were basically determined by their beginning.

In 1927, Paul Tillich wrote, concerning the place of mythos of technology in the ultimate meaning of life, “We no longer have a mythos that expresses itself in symbols as past times had. We cannot determine a place for technology as they did. We can only contemplate the matter itself and interpret it and hope that in the interpretation something resonates from the hidden, symbol-less mythos that sustains our time and gives it meaning” (Tillich 1988; Paul 1988, 59). In 1928, he presented his “The Technical City as Symbol” for his age. It can be argued that in the *cyborg* figure, a symbol has been found to interpret our time and our technologies and ourselves.

This Donna Haraway’s most famous “figure” or metaphor or symbol for the role of materiality in human life combines more than humans and machines; it brings together events and dimensions which include technologies, social enactments, and modified biological processes – everything from genes to the socialized military-industrial powers. The cyborg is unfaithful to its origins in the military and Cold War space research context; scientific and medicinal use of the cyborg was rapidly joined by its use as a metaphor of cultural semiotics. Just as the cyborg is about control, and high technology, it is also about the “lived social and bodily relations in which people are not afraid of their joint kinship with animals and machines” (Haraway 1991, 157).

The cyborg destabilizes knowledge to make space for faith that human being is undefinable, fictional, factual, and fantastic – because it is capable of putting one’s own mode of being into

question. The cyborg has many forms, and none of them is “necessary” – it is variously a man in space, or chimpanaut Ham; a socialist feminist; an ecofeminist; a woman of color; a postmodern collective and personal self; a character in a feminist science fiction; a trickster; and a vampire. Technonature consists of innumerable hybrid objects. Transuranic elements and transgenic organisms are at the same time ordinary, natural, and artificial productions of technoscience, invented and copyrighted nature. They challenge the sanctity of life, the well-defined self, and the “purity of kind” thinking. They transform nature into culture. Technonature means that nature cannot symbolize any more immutability, cannot be a symbol for the given parameters of human existence, and cannot found immutability of social relations system – kinship.

If we look for nature outside of ourselves and our practices, we may lose both ourselves and nature. Technonature is a topic which has not been stabilized yet, and thus, we can influence what is going to count as “normal” and “natural”: what forms of life will make up nature for us. Technology can be understood as natural in a double sense – as something rising naturally out of the nature of the humans in the most extensive way, on the one hand, and as a part of “all” that exists, on the other hand. Philip Hefner (Hefner 2003, 34–40) has discussed technology as the mirror on the wall that reflects back to us who we are: we want technology to do things for us; it shows us that we are finite, frail, and mortal, that we create technology in order to bring alternative worlds into being – and that we do not know why we create or according to what values, and thus, we have to discover the reasons and the values. And it shows that we do not agree on these reasons and values. As this mirror reflects the humans, it reflects also God. One just has to recall discussions over transhumanism and the posthuman future in its utopian and dystopian versions. These discussions, however, do not cancel our location in technonature. Technology is not something external to us, and theology/religion must encompass both cyborgs and technonature.

Theology of technonature is inherently transdisciplinary, creating connections where things

were previously disconnected or seemed unrelated. It also implies the effort to relate in novel ways and accountability for one’s articulations. It is a quest for a situated knowledge, fuelled by the desire to locate ourselves in our world.

A theology of technonature implies intense intimacy and collapse into each other of the terms “nature” and “culture”; nature and culture are border terms which require explanation and cannot be taken as self-evident “objects over there”; there is no break in the continuum (except those breaks we ourselves determine). A theology of technonature must understand the concerns of the (techno-)culture (e.g., epistemological concerns, environmental crisis, ambiguity of technological advances, the role of desires and imagination) that occasioned the theological response. It has to be in recognizable continuity with Christian tradition (i.e., it is based on more than current cultural preferences), but it has to recognize that technonature is the only place where cyborgs can meet God. In this sense, technology itself has become a sacred space.

Cross-References

- [Cultural Studies](#)
- [Cyborgs](#)
- [Imago Dei](#)
- [Myth](#)

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Teleological Ethics

- [Utilitarianism](#)

Television Writing

- [Creative Writing](#)

Temper

- [Emotion](#)

Temperament

- [Emotion](#)
- [Personality Psychology](#)

Temples

- [Landscape](#)

Theater

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Related Terms

[Drama](#); [Implicit religion](#); [Narrative](#); [Performance](#); [Performance event](#); [Performativity](#); [Ritual](#)

Description

The academic study of theater falls into two disciplines. *Theater studies* approaches theater as an art form, focusing on written texts (drama), as well as theater's history, aesthetic conventions, formal characteristics, styles, and genres. Theater studies examines plays and performances from world theatrical traditions such as Japanese Noh

and Kabuki, European fourth-wall realism, Indian dance drama, Beijing opera, and Balinese shadow puppetry. Folk theater and performance art are also objects of study as are hybrid genres such as magic realism, a blend of mystical Chicano folk theater with European realism. Theater studies takes its interpretive methods from humanistic disciplines (history, literature, aesthetic theory, philosophy, and arts criticism). *Performance studies*, a newer discipline, has its roots in anthropology and folklore. Performance studies views theater as a social practice constituted in and by culture. The focus in performance studies is on performance events. J. L. Austin's notion that language is performative (rather than descriptive) is foundational. Performativity is the analytical paradigm through which performance studies interprets events such as sports contests, religious pageants, parades, military displays, political demonstrations, circuses, civic rituals, demonstrations of scientific discoveries, digital performance, and museums. Theater is understood as one mode of performative behavior among many. Performance studies takes its methods from social science disciplines (including anthropology, ethnography, sociology, folklore, and media studies) as well as literary theory, language theory, and cultural studies. Both disciplines can interpret theater's engagement with science and religion.

The academic study of theater and performance does not belong specifically to the fields of science or religion. As practiced in academic departments and institutes for the study of theater, theater and performance studies seek to understand the relationship between theatrical performances and the social worlds in which they function. Plays and performances that reflect the natural world fall in the domain of science; speculations into the supernatural enter the domain of religion. Science and religion are topics for theater and performance scholarship to the extent that plays and performances present observations and speculations in either domain. The remainder of this entry identifies tensions between religion and science in theatrical aesthetics and history as suggested by theater studies and performance studies over the past three decades.

In most world cultures, archaic theater is linked directly to religious practices. Tragedy was performed at the Athenian festival of Dionysus in the fifth century B.C.E., a civic event that invoked the Greek pantheon and Bronze Age legends of the Achaean civilization. Athenian tragedy was systematically analyzed and classified by Aristotle in the *Poetics* (c. 325 B.C.E.), a scientific treatise which became the blueprint for the development of secular theater in the European Renaissance. Sanskrit drama emerged in India in the first century C.E. from temple dances, narrative songs, and storytelling performances of the *Mahabharata*, *Ramayana*, and other sources of legends. The *Natyasastra*, a treatise composed between 200 B.C.E. and 200 C.E. by the sage Bharata, details the spiritual dimension of theater, asserting that it was created by the god Brahma. The *Chronicles of Japan* (712 C.E.) relates a Shinto myth in which one goddess performs for another goddess *kagura*, roughly translated as “entertainment of a god.” Shinto and Buddhist beliefs are evident in the stories performed in Japan during the period of the shoguns. The patronage of the fourteenth-century Ashikaga court produced a highly refined theater, Noh, which became the theater of the elite. The aesthetic and spiritual qualities of Noh theater were described at the time in the *Kadensho* by Zeami Motokiyo. Biblical reenactments of the Christian narrative were performed in European churches, monasteries, and towns from the tenth century until the secular academies reconstructed Athenian tragedy in the fifteenth century. There is no known treatise describing the religious aesthetics of biblical drama. Numerous examples of theatrical traditions with ties to religious ceremony, beliefs, and stories are found worldwide. Many originate in localized religious practices, including shamanism and masked dances. Of the traditions given here as examples, each integrated an altar, shrine, or other religious focal point (Brown 1996; Banham 1998).

Most theatrical styles originating in religious traditions used masks, exaggerated gestures, chant or metered speech, and other means to distinguish theatrical presentation from everyday reality and to depict deities and supernatural

occurrences. Realism, the dominant mode of theatrical representation in Western societies, replicates rather than exaggerates or transforms the material, observable world. The aesthetics of theatrical realism are rooted in both religion and science. In Christianity, the unadorned, unmasked human body had theological and iconographic significance. Medieval theatrical representation followed the theology in its depiction of lived human experience. Medieval religious theater did use symbolism and presented nonhuman characters (devils and angels). However, its mode of representation relied on reconstructing the biblical quotidian in order to reinforce humans’ ongoing interaction with incarnate divinity. This preference for “true to life” theatrical representation persisted through the Renaissance and Enlightenment, severed from its religious origins.

Scientific realism influenced theatrical practice in Europe after about 1860. Theater practitioners responded to discoveries revealed by the scientific method and research in anthropology (“primitive” cultures), biology (bacteria, health conditions, and disease), genetics (evolution, inherited diseases), medicine (addiction), social theory (the asylum), and psychoanalysis (the unconscious). These discoveries opened debates about the influence of society, genetics, social institutions, and evolutionary tendencies on human behavior. The effect was to render nature and human society subject to rational, scientific analysis and to reinforce experimentation and objective observation as methods for arriving at empirical truths. The dissemination of scientific knowledge into popular discourse in the nineteenth century joined scientific realism to an established aesthetic for accurately representing human behavior and emotions. Theater provided a mechanism for reconstructing societies, the physical world, and human behavior for the purpose of observation and analysis.

As medical “theaters” allowed spectators to witness surgical procedures, theatrical stages became “laboratories” for the analysis of human beings. Heinrich Ibsen, August Strindberg, and Emile Zola conceived of theatrical performance and playwriting as experimental procedures for

testing the effects of social and biological conditions on human behavior. Plays could demonstrate how human behavior is the result of people's psychological makeup, genetic inheritance, position in society and environment, and physiological constitution. The conventions of realistic representation were held superior to aesthetics that used symbolism, poetry, religious imagery, and other techniques to evoke the supernatural, religious beliefs, or transcendent experiences.

An evolutionary model in theater history prevailed until the 1980s. In that model, religious theater or ritual was construed as a precursor to modern, realistic theater. The evolutionary model tended to exoticize non-Christian, non-Western, and folk theater grounded in religious belief or spiritual practices. The ritual-to-theater progression was challenged in the 1980s, with the emphasis on how Eurocentric definitions of drama and theater had influenced perceptions of non-Western theater forms. Challenges to the ritual-to-theater model and the dominance of realist aesthetics came from an increasing number of cross-cultural projects, such as Patrice Pavis' edited collection, *The Intercultural Performance Reader* (Routledge 1996), which rejected the perception of nonindustrial cultures and religious theater as "primitive." With the emphasis on multi- and intercultural theater in the 1980s, religious theater and ritual performances gained status as cultural statements.

In theatrical practice, the modernist turn away from religion was counterbalanced by explorations of eastern and folk religions in the early twentieth century. In an effort to preserve or recoup theater's capacity to present spiritual themes, as well as to escape narrowly positivist readings of plays and performances, some Western theater practitioners and scholars sought alternative aesthetics. William Butler Yeats, for example, wrote a series of plays imbued with spiritual themes based on the Japanese Noh drama. Heinrich Ibsen and August Strindberg explored spiritual themes in their symbolist work. Other playwrights invested in realism, such as Eugene O'Neill investigated and were influenced by Asian religious traditions.

After the Second World War, theorists and scholars evinced suspicion of the scientific paradigms that had grounded realism. In the 1960s, amid social unrest in the United States and Europe, critiques of theatrical realism, scientific positivism, and the industrial ends of scientific research opened theater studies to explorations of theater's ritualistic, if not specifically religious, capacities. The study of ritual as performance came into theater studies and performance studies from anthropology with the work of Victor Turner in the 1960s. Richard Schechner's experimental performance piece *Dionysus in '69* (1969), for example, attempted to recuperate ritual as a function of theater. Theater artists such as the Jerzy Grotowski and Peter Brook devised theater styles that infused secular theater with the components of religious rituals from Western and non-Western traditions. These included apotheosis, catharsis, a sense of sacredness, stimulation of the senses, mythologies, and transformed perception (if not religious transcendence).

Postmodern theories were widely deployed in theater studies and performance studies from the 1980s through the early twenty-first century. Postmodern theory denied a unified, verifiable reality that could be represented and held that reality was in fact constructed, deconstructed, and reconstructed by competing systems of representation (language, architecture, and mediatized performance). The goal was to reveal how meaning is socially constructed and supported by hierarchies of power (including those of religious institutions and industries supported by scientific research). Modernism had construed art as an autonomous domain of aesthetics, the emotional effects of which were distinct from the effects of religion. Postmodernism likewise rejected metaphysics along with scientific positivism, scientific progress, and technological utopias in the effort to view all claims to knowledge (scientific or religious) as contingent. Postmodern theories did, however, account for religion, popular religious expression, and internally experienced spirituality as constructed by institutional power and as an axis for identifying cultural difference. In the early twenty-first century, theater and performance

studies have begun to recognize religion as constitutive of social and political identities, along with race, gender, ethnicity, sexuality, culture, and socioeconomic class.

The academic study of theater often separates science and religion, favoring science as a model for inquiry and analysis. In the secular orientation of research universities, the potential for religious traditions to offer epistemological frames for themes, narratives, or theatrical aesthetics has not been prominent. A suspicion of religion's "antitheatrical prejudice," a preference for rigorous science-based analysis, and modernist claims of the autonomy of art also contributed to the tendency to dismiss religion.

Self-identification

Science

Science, as a mode of inquiry dependent on experiment and the quantification of the physical world, is often set against the arts and humanities, which are construed as descriptive, interpretive, and invested in human interaction, social formations, and culture. In theater and performance studies, postmodern theory offered highly technical, specialized vocabularies, theoretical models, and methods for such research, which in many ways emulated scientific discourse. Neither theater studies nor performance studies, however, characteristically employs experimentation or quantitative methods and thus rarely identifies as scientific inquiry. Science and theater are linked in four distinct ways.

1. Science as a guide to theatrical aesthetics. Theatrical practice can respond directly to knowledge derived from science to create new artistic forms. The experimental theater of Robert Wilson and Richard Foreman in the 1970s illustrated broadly accessible scientific concepts such as the general theory of relativity, timeframes intersecting, the relationship between energy and matter, and the uncertainty principle, as well as the "concept" of scientific discovery in the figure of Albert Einstein. Such experiments in form and

content take principles of science to guide the development of nonrepresentational aesthetics. The artists mentioned above deployed computational, algorithmic, and geometric logic as well as principles of modern physics to devise innovative ways of moving objects and organizing stage space.

2. Science plays as a genre. Michael Frayn's 1998 play *Copenhagen*, which dramatizes meetings between Niels Bohr and Werner Heisenberg and explores both the uncertainty principle and complementarity, has been widely noted as emblematic of a new genre of "science plays." These are plays that represent scientific discoveries, lives of scientists, scientific concepts, debates about the uses of science, or the culture of science and scientists. Such plays might offer critiques of science and scientific agendas (Friedrich Dürrenmatt's *The Physicists*, 1962), engage scientific ideas (Tom Stoppard's *Hapgood*, 1988 and *Arcadia*, 1993), present events in the history of science (Bertolt Brecht's *Life of Galileo*, first version c. 1937), examine scientific enterprises and the culture of scientific inquiry as a profession (Stephen Poliakoff's *Blinded by the Sun*, 1966), use science to investigate human relationships (David Auburn's *Proof*, 2001), dramatize the personalities of individual scientists (Peter Parnell's *QED*, 2002), and place science or scientists in imaginary situations (Steve Martin's absurdist comedy, *Picasso at the Lapin Agile*, 1993). Scientists and mathematicians who have turned to playwriting and theatrical performance as a technology for distributing mathematical and scientific ideas include cosmologist, mathematical sciences professor and recipient of the 2006 Templeton Prize for research in religion, John Barrow (*Infinites*, 2002); chemist Carl Djerassi (*An Immaculate Misconception*, 1999 and *Oxygen*, 2001); and biologist Alain Prochiantz (*Biology in the Bedroom*, 1995). Science plays and performance pieces cross genres. Some playwrights, scientists, and performance artists adapt language, dramatic structure, staging requirements, and character interactions so that the play performs the

scientific concepts through its structure (Timberlake Wertenbaker, *After Darwin*, 1998) (Shepherd-Barr 2006). Others are crafted in the conventions of realistic representation and linear narrative.

3. Pedagogy. Playwriting and theatrical performance can be used to foster scientific literacy. Such plays seek to make scientific or mathematical principles accessible and meaningful by putting them in the context of human experience. They generally engage audiences in general or simplified concepts rather than present specific formulas, calculations, or experimental designs. For example, the PULSE Initiative, a result of research at the Centre for Applied Theatre Research at the University of Manchester (2002) and funded by the Wellcome Trust's public engagement effort, uses theater in service of scientific literacy. Performance studies would include museum exhibits, "science shows," planetarium displays, science fairs, public demonstrations of scientific anomalies, and scientific experiments themselves as a kind of theater (See Barbacci 2005).
4. Theater technology. Science and theatrical practice intersect in theater technology. Lighting, sound, set, and costume design rely on research in optics, computer science, mechanical and electrical engineering, robotics, textiles, acoustics, and electronics. Innovations such as DMX512 (digital programming for movable lights, hydraulics, and other stage effects), first developed in 1986 by the Engineering Commission of United States Institute for Theatre Technology (USITT), are the result of artistic and commercial theater collaborating with applied sciences and industry. Interpretive methods used in theater and performance studies, such as semiology and aesthetics, are sometimes referred to as "science." They are not, however, experimental nor do they test theories using empirical measures. "Science" here refers to analysis of performances as phenomena.

Religion

Religion, as a mode of knowing, seeks a transcendent reality or truth. Religious truth is not proven

by experimentation but is revealed by signs or texts, expressed in ritual, and verified by subjective experience (spirituality) or belief. In practice, theater can engage similar affective domains of human consciousness as religious experience (wonder, insights, strong emotions, feelings of being transported beyond mind and body). The work of Nina P. Azari argues for a neurological difference between emotions recorded in the limbic brain and sensations identified as spiritual. In work such as that of Ralph Yarrow, "sacred" is identified not with emotions but with states of consciousness (*Sacred Theatre*, Intellect Books, 2008). The modernist rejection of transcendence in art and suspicion of facile, bourgeois religious sentimentality still operates in theater and performance theory, despite postmodernism's high tolerance for ambiguity. Religion and theater are, however, linked in four distinct ways.

1. Reinforcement of belief tradition or cultural artifact. Reconstructions of Sanskrit drama, Noh plays, forms of Chinese opera, Athenian tragedies, and medieval European passion plays reference the religious traditions in which they emerged historically of their origins. They may or may not assume that performers, and audiences share the religious beliefs depicted. Some dramatic performances, such as Easter pageants performed in Christian churches, use drama to reinforce religious beliefs shared by performers and audiences. Theatrical rituals, ritualized theater, and theater that expresses religious beliefs are performed today all over the world. In a religious context, they are defined by function (propitiation, commemoration, invocation, cultivation of mystical experience, healing, magic). Genres may include storytelling and praise poetry recitations, shamanic ceremonies, spiritual masquerades, masked dance dramas, reenactments of myths, healing ceremonies, and impersonation of deities. Korean masked folk plays, Tibetan monastic drama, North American Easter dramas, and African shaman ceremonies serve as examples of theatrical forms serving religious functions. These types of performances support the notion that theater and religion are coextensive in practice, or at

least analogous. “Sacred theater” is sometimes construed as a therapeutic practice.

2. Religion as object. Commercial theater has engaged religion outside a ritual or religious context. Large-scale, successful musical productions include *Jesus Christ Superstar* (Tim Rice and Andrew Lloyd Webber, 1972) and *Godspell* (Stephen Schwartz and John-Michael Tebelak, 1973). Both musicals set Christian narratives with contemporary language, costuming, and music and were highly successful. Terrence McNally’s 1998 play *Corpus Christi* took a similarly updated approach but used theater to challenge Christian dogma by presenting biblical figures as homosexual characters. *Corpus Christi*’s challenge to Christian heteronormativity was controversial, and the play received harsh criticism from the Anglican Church and other Christian groups.
3. Pedagogy. Theater can serve pedagogical purposes beyond reinforcing a particular belief system. One such isolated example is James Still’s *A Long Bridge Over Deep Waters* (Toni Weingarten, “Theater Seeks Common Ground for Intersecting Faiths,” *The New York Times*, June 11, 2005). This drama takes as its topic religion in a heterogeneous society and documents ten religious groups in Los Angeles. In 2005, the production was part of a 5-year initiative by the Los Angeles Cornerstone Theater Company to use theater to foster interreligious understanding. The play’s performance in the John Anson Ford Amphitheater challenged a 1964 prohibition against religious performance in a public county venue. Another example is the work of Nicholas Bhekifa Mamba whose activist theater addresses how systems of religious beliefs differ and how those differences can affect attitudes toward the disease itself, AIDS, polygamy, homosexuality, and gender hierarchies. Mr. Mamba was a lecturer and featured participant in class conversations at the Yale Divinity School in the spring of 2009 (<http://www.yaledailynews.com/articles/view/28386>).
4. Implicit religion and spirituality. Some secular theatrical traditions aim to evoke feelings

associated with religious or spiritual experience (unity, sense of divinity, wonder, glimpses of an ineffable reality) or speculations associated with religious quests (meaning, morality, existence of a guiding power influencing human actions, free will). These can fall into the domain of *implicit religion*. Ritualistic theater practices developed in the 1960s, the European symbolist movement of the 1930s, Peter Brook’s notion of “holy theater,” and post-World War II existentialist theater, are examples from Western theater theory and practice.

Characteristics

The study of theater and performance is distinctive in that it applies interpretive frameworks and methods of analysis to cultural practices that are themselves interpretive and reflective. Theater and performance studies engage in meta-analysis or meta-critique in the effort to understand how and why people perform and what meanings performances have in and beyond their contexts. Whereas sciences and religions seek ultimate truths, the study of theater and performance seeks the truths or questions a performance seeks to present and how the performance communicates that (scientific or religious) truth.

Relevance to Science and Religion

The last decade has seen an increase in the number of plays dealing with science. Renewed interest in religion since 2001 has prompted scholars to seek religious influences on playwrights, to examine performance practices such as outdoor pageants, and to reexamine the relationship between theater and religious expression. Plays that dramatize the collision of science and religion, such as Jerome Lawrence and Robert Edwin Lee’s realistic *Inherit the Wind* (1955) and Bertolt Brecht’s epic *Life of Galileo* (first version c. 1937), suggest that theater studies and performance studies can participate in the larger discourse on the interplay between science

and religion and that theater practitioners can find ways to take up aspects of cultural debates through the medium of performance.

Sources of Authority

The comprehensive and definitive study of science plays is Kirsten Shepherd-Barr's *Science on Stage: From Doctor Faustus to Copenhagen* (Princeton: Princeton University Press, 2006). Shepherd-Barr includes an annotated, categorized list of science plays written over the past 400 years with cogent discussions of how these plays and performances engage science. Performance studies has been influenced by Robert P. Crease's 1993 monograph, *The Play of Nature: Experimentation as Performance* (Bloomington: Indiana University Press), which uses a theatrical model to examine the phenomenon of scientific experimentation, scientific discovery as Aristotelian *anagnorisis*, narrative processes at work in developing scientific theory, the laboratory as stage, and performativity in the culture of scientific practice.

New journals, *Ecumenica: A Journal of Theater and Performance*, *The Journal of Religion and Theatre*, and *Performance and Spirituality*, provide outlets for the study of religion and theater. These journals have helped overcome the notion that religious theater is an evolutionary precursor to secular theater, inherently conservative, or characteristic of non-Western or ancient cultures. The Association for Theatre in Higher Education focus group, Religion and Theater, has helped overcome biases against bringing religion into academic discussions. Richard Schechner's *Between Theatre and Anthropology* (1985) remains the foundation for studies of ritual and performance. Schechner's analysis of cross-cultural performance covers a wide range of ritual performance practices, the annual Yaqui Easter pageant in Arizona, Balinese trance performance Ramlila of Ramnagar, tourist performances at Plimoth Plantation, and ritual theater. Richard Schechner's definition of performance as "twice behaved" or "restored" behavior gives religious rituals and performances equal place with secular,

artistic theater. An increasing willingness to investigate religion as an epistemological foundation for theater is evident in books such as *Theatre and Religion on Krishna's Stage: Performing in Vrindavan* by David V. Mason (New York: Palgrave MacMillan, 2009).

Ethical Principles

Performance studies, which often requires interactive field work, follows the ethical principles set out in the subdisciplines of anthropology and ethnography. Field work is subject to institutional review board approval, which protects human subjects. As with documentary filmmaking, participant observation methods account for the effects of the researcher's presence.

Key Values

The core value of both theater studies and performance studies is making explicit the means and meanings of human social activity. Both disciplines focus on activity that is intended to elicit response and which requires conscious display. Performance is construed as material and accessible to the senses, embodying truths but not truth itself.

Conceptualization

In the last three decades, theater and performance scholarship has regarded concepts such as truth, knowledge, nature, ontologies and teleologies, the notion of "human," and reality as products of social and cultural forces. Their meaning is not considered to be transparent.

Nature/World

Theater as a practice is generally thought to reflect aspects of the social world and to depict human emotions and relationships. Because theater deals primarily with human narratives, nature appears as a theme rather than an object for representation. Theater is construed not as

a Cartesian mirror of nature but as a method by which fragments of situated perceptions of nature are refracted and contested.

Human

Human experience is at the center of most plays and theatrical performances. The aestheticized depiction of human decisions, struggles, adventures, passions, relationships with others, ordeals, and other kinds of experiences allows observers to make connections between events represented theatrically and “real” life.

Life and Death

The work of American theater scholar and practitioner Herbert Blau offers insights into the complexities of theatrical representation with regard to life and death. Theater creates ephemeral characters, places, and worlds. These die, metaphorically, when the performance ends. Conversely, whatever reality the performance displaces in the process of representing it also dies as soon as the materiality of the performance displaces it. Herbert Blau’s influential work, in particular *Take up the Bodies: Theatre at the Vanishing Point* (Urbana: University of Illinois Press, 1982), posits life and death as subjects represented in narratives about human experience and as the condition of theater itself. It is the thought of death that prompts the corporeal act of theater and the awareness of life from which theater emerges. Theater is a physical means of confronting death as an unknown (Kubiak 2004).

Reality

Theatrical artifice can create visual, aural, and tactile worlds that appear to alter the laws of physical realities proven by science. Theater can also depict imaginary realities described by religious myths and texts in which, for example, animals speak, objects fly through the air of their own accord, and dead people speak with the living. Insofar as theater reflects the interplay between the physical world and human experience, its mechanisms of artifice can defy, challenge, reinforce, critique, or interpret the truth claims of both science and religion.

Knowledge

In practice, theater rarely presents as discourse the intricacies of scientific and mathematical problem-solving, which results in new knowledge about how the world works. Theater can reinforce religious beliefs, demonstrate the resolution of religious conundrums, or generate feeling that can ground a kind of knowledge about the world. The modality is evocative rather than discursive. Theater reflects and refracts existing knowledge of humans’ relationship to the natural and supernatural worlds.

Truth

Science and religion seek to make and represent accurate truth claims. Theater, in contrast, relies on artifice, metaphor, simile, and approximation to present perspectives on truth. Western realistic theater, though modeled on practices and ideas drawn from the sciences, disguises the artifice and can appear to present truth directly. Insofar, as both science and religion seek to understand and articulate ultimate, universal truths, theater’s inherent artifice produces a tension between truth and its presentation.

Perception

Theater has the capacity to alter perception. Many theatrical styles present an exaggerated or fantastical reality through stylized or symbolic gesture vocabularies, elaborate costumes and makeup, heightened or poetic speech, designated performance spaces, manipulation of time and space, and vocal techniques such as chant or pitched speech. Theater can also use technologies of performance (curtained stage, fixed seating, props, sets, artificial lighting) so that observers perceive stage action as “real life.” An intense emotional or intellectual release of tension, theater produces a shift in perception called, from Aristotle, catharsis.

Time

Narrative theater can reverse chronologies, move back and forth in time, represent multiple time frames simultaneously, and alter the perception of time (“stage time” vs. “real time”). Studies of plays such as August Strindberg’s *Dreamplay*,

Tony Kushner's *Angels in America*, or Tom Stoppard's *Arcadia* (referenced above) require analysis of shifting time frames and the relation of stage time to real time.

Consciousness

Consciousness is a vast subject for theater and performance. Theater may attempt to represent the complex and illogical workings of human consciousness visually as in the work of Richard Foreman and in August Strindberg's 1901 exploration of dream consciousness, *Dreamplay*. Shakespeare's *Hamlet* (1603) could also be considered an example of a play working out a character's logical, linear consciousness, whereas Tony Kushner's *Angels in America: A Gay Fantasy on National Themes* (1990) shows characters, such as the mentally disturbed Harper, who experience and speak from fragmented, disjointed consciousness. Acting training emphasizes performers' consciousness in a wide variety of ways: conscious emotional and physical unity with a character (American "method" acting), cultivating a meditative state (Noh theater), mind/body consciousness and presence (Suzuki technique), expression of corporeal consciousness (Butoh dance drama) are some examples. For some theater practitioners, the performance itself should transform an audience's consciousness through shocking visual imagery and sensory stimuli. For Western practitioners and scholars, Asian consciousness has offered an alternative mode of consciousness. Two studies are foundational. *Staging Consciousness: Theatre and the Materialization of Mind* by William Demastes (University of Michigan Press, 2002) takes theater as the meeting point between mind and the material world. This study rejects Cartesian dualism and analyzes a variety of plays and performances to show consciousness as fluid, nonlinear, and multivalent. In *Theatre and Consciousness: Explanatory Scope and Future Potential* (Bristol, UK: Intellect Books, 2005), Daniel Meyer-Dinkgrafe covers aspects of consciousness and theater including inspiration, creative process, representation of consciousness, acting, audience reception, Indian theater

aesthetics, and Western interpretations of Hindu consciousness.

Rationality/Reason

The modernist rift between religion and art is linked historically to the turn toward scientific rationalism and causality in the eighteenth century. The Kantian idea that aesthetic judgments are objective, rational, and universal is articulated in the *Critique of Reason* (1790). By the mid-twentieth century, the aesthetic theory of Theodor Adorno reiterated the problem of transcendence and interrogated notions of universal beauty. Postmodern theory regards theater as a material process distinct from any transcendent or supernatural reality. In this philosophical trajectory, emotional response is thought to be subject to reason or constituted by social and cultural forces.

Mystery

Theater and performance scholarship influenced by postmodernism emphasizes the displacement of "the real" in sequences of signifying images produced by the dramatic text or performance event. Notions of an inner self, undiscovered knowledge, truth, or mystery, are considered imagined or constructed fantasies. Peter Brook's influential *The Empty Space* (1968) identified "holy theater" as that which makes the invisible visible, the mysterious known.

Relevant Themes

In the last 20 years, the study of theater and performance has combined analysis of texts with analysis of performances situated in culture and history. Much scholarly work has been done on theater as a refraction of human behavior, societies, perceptions, and consciousness. Studies of corporeality, the body, embodiment, and agency continue to emphasize optics, semiotics, and visual signification. As a corporeal practice distinct from film and other reproducible media, performance (including ritual) elicits and produces physiological responses without attention to the biological body. Neuroscience,

neurotheology, and cognitive science can be joined to philosophies of corporeality, embodiment, and agency to better understand why religious narratives and ideas are given expression in the corporeal form of theater across a wide range of cultures. Such studies need not be reductionist or narrowly materialist.

Cross-References

- [Body](#)
- [Critical Theory](#)
- [Emotion](#)
- [Humanities](#)
- [Media Studies](#)
- [Religion, History of](#)
- [Ritual](#)

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Theemithi

- [Fire-Walking](#)

Theism, Classical

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Related Terms

[Orthodox theism](#); [Perfect being theology](#); [Traditional theism](#)

God has been conceived of differently in different religious and philosophical traditions. The term “classical theism” is often used in philosophy of religion textbooks to designate a way of conceiving of God that is standard in historical Christianity and is expressed in the writings of major Christian theologians, for example, Augustine of Hippo’s *The City of God* (1998) and Thomas Aquinas’s *Summa Theologica* (1948). According to this conception, God is the perfect being, which means or entails that God is, among other things, necessarily existent, eternal, changeless, almighty, all-knowing, supremely good, distinct from creation, and the creator of everything distinct from himself. God is also said to be absolutely simple, which means that the above-listed attributes are identical to God’s being and, more generally, that there is no ontological complexity in God.

Classical theists also conceive of God as triune, as Father, Son, and Holy Spirit: three persons but one being. But since the term “classical theism” is used almost exclusively in the context of natural theology as opposed to revealed theology (or in the context of philosophy of religion as opposed to systematic theology), Trinitarian doctrines are rarely cited in discussions of classical theism.

When classical theism is understood in the above way, it contrasts with conceptions of God associated with, for example, pantheism's claim that God and creation are nondistinct, process theology's claim that God can undergo change, open theism's claim that God does not know all future events, and the claims of various liberal theologians to the effect that God is not a being with attributes. There is disagreement, moreover, as to whether prominent analytic theists such as Nicholas Wolterstorff and Alvin Plantinga are properly describable as classical theists. The evidence goes both ways. On the one hand, these philosophers see themselves as traditional Christians and at odds with various modern theologies. On the other hand, their quest for philosophical coherency has sometimes led to substantial revisions of and even departures from key classical theistic doctrines. Thus Wolterstorff (1975) rejects Divine eternality in the classical sense, and Plantinga (1980) rejects absolute simplicity. In view of these and other departures from the classical tradition, some authors, such as Brian Davies (2004), deny that the above thinkers are classical theists. Others, such as Michael Peterson et al. (1991), tend to regard them as classical theists but delimit the list of Divine attributes a classical theist need subscribe to (the resulting list is often taken to include only Divine almightiness, all-knowing, and moral perfection). A problem with the latter strategy is to show that such delimitations are not *ad hoc*.

A further question concerns whether non-Christian monotheistic religions such as traditional Sunni Islam are properly describable as classical theistic. Since traditional Sunni Islam, following the school of al-Ashari, rejects absolute simplicity, not to mention the doctrine of the Trinity, it seems that this is not the case. If, however, the list of Divine attributes a classical theist must subscribe to is limited to, say, almightiness, all-knowing, and moral perfection, the answer should be affirmative. But one has then of course subtracted something essential from historical Christianity's conception of God.

Cross-References

- [Christianity](#)
- [Metaphysics](#)
- [Monotheism](#)
- [Philosophy in Islam](#)
- [Philosophy of Religion](#)

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Theistic Naturalism

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“Theistic naturalism” is a term used to label an approach to divine action in which theistic belief is upheld but descriptions of events that invoke divine interference with the world are rejected. Historically, theistic naturalism is associated primarily with the deism of the eighteenth century, in which God was seen as little more than the world's designer, and both miracles and the efficacy of intercessory prayer were denied. More recently, however, other kinds of theistic naturalism have been proposed.

One of these reflects classical deism insofar as any kind of temporal divine interference with the world is denied, but it differs from deism because the way in which it has been expressed – in terms of a “single act” account of divine action or of a distinction between primary and secondary causes – has seemed to some to allow for a broader scope to divine action than classical deism was able to acknowledge. However, this kind of scheme has seemed problematical to many for a number of reasons. One is that it still seems to posit the “absentee landlord” of the deistic understanding. Another is that the model, by itself, has no specific answers to the questions of how God’s will is brought about through natural causes and of what the scope of this mode of divine action might be. A third is that – even in its more specific forms – the model raises questions that have usually been answered only inadequately. When expressed in terms of primary and secondary causes, for example, the model has been seen as mixing levels of description illegitimately, and as denying the reality of contingency and free will.

As a result of problems of this sort, a second kind of approach to divine action represents the majority position within the current dialogue of science and theology. This has relied on a conceptual scheme, which speaks of God acting in a way that is analogous, in many respects, to the way in which any other personal agent acts. In this understanding, a clear distinction is made between “general” providence, which arises straightforwardly from what a benignly designed cosmos will do “on its own,” and what will happen if God chooses to “respond” to events in the world, bringing about an event of “special” providence by interfering with those workings. This interference need not, according to many of the contemporary advocates of special providence, invoke supernatural intervention. Instead, they claim, it simply requires some kind of “causal joint,” which allows God a way of manipulating the processes of the natural world without setting those processes aside.

Some advocates of this approach have put great emphasis on general providence, especially

in relation to the cosmos’s physical development and to the evolutionary history of life on our planet. They have also, in their exploration of the “causal joint” model, made great efforts to propose plausible candidates for this causal joint, so as to emphasize that the laws of nature are never broken in events of special providence, but are instead manipulated in a way consistent with the nondeterministic understanding of modern science. Because of this stress on naturalistic processes, this approach has sometimes been seen as a form of theistic naturalism, and one of its advocates, Arthur Peacocke, has chosen to label himself quite explicitly as a “theistic naturalist.” (Clayton and Peacocke 2007).

However, it is important to recognize that what is envisaged by Peacocke, and by others who pursue this causal joint understanding, is not the kind of “strong” theistic naturalism in which it is held that there is no temporal divine interference with the world. Advocates of this kind of model insist, at least implicitly, that there are two possible outcomes to any situation. One is that which will occur if general providence alone is involved – that is, if God simply continues to sustain the world and the laws of nature obeyed by its components. The other is that which will happen if God – seen here at least implicitly as a temporal being – chooses to “respond” to the situation in the world at any given time (for example, to the need to communicate with his creatures).

The subtle form of divine interference that is envisaged here – in which the laws of nature are not set aside, as in traditional models that invoke the supernatural, but rather are used by God as tools – has led some to speak of this model as a “noninterventionist” one. However, while no event is seen by this model as involving a breach of the laws of nature, and so does not envisage supernatural intervention in the same way as did late medieval models, the way in which the cosmos sometimes follows one path rather than another is seen in this approach as being due to a choice that God has made about whether or not to “respond” to a particular situation, in order to bring about an event of special

providence. This temporal divine response thus represents, for this approach, a causal factor in events of special providence, and as such constitutes interference with the world. The fact that those who advocate causal joint schemes sometimes adopt the “noninterventionist” label, to indicate that they are no longer speaking of supernatural intervention, is therefore potentially misleading, as is the “theistic naturalism” label that Peacocke has adopted – unless, that is, it is qualified by an appropriate adjective. The causal joint approach represents, at most, what we might call a “weak” theistic naturalism, very different to the kind of “strong” theistic naturalism in which any sort of temporal divine interference is denied.

The reason that defenders of causal joint models reject the strong version of theistic naturalism is, most commonly, that they identify it with the deism of the eighteenth century, in which the scope of general providence is seen as extremely limited. It is arguable, however, that the limitations assumed by classical deism are not intrinsic to a purely naturalistic approach, which, in itself, assumes simply that the cosmos develops according to “fixed instructions” of a law-like kind. The possibility that such instructions can, by themselves, bring about subtle and appropriate “responses” to events in the world cannot be precluded in principle. As Christopher C. Knight (2007) has argued in his book, *The God of Nature*, not only can we conjecture specific naturalistic mechanisms for providential “response” to needs, but we must also recognize that the possibility of a nondeistic strong theistic naturalism does not depend on the validity of any particular mechanisms that may be suggested in this way. It depends, rather, on acceptance of the general belief that lies behind the search for such mechanisms (and also behind many of the arguments about emergent levels of complexity that have arisen in the context of recent debate about reductionism.) This belief is that the inbuilt “fixed instructions” of the created order are far more subtle and complex than our present scientific understanding indicates. Once this is accepted as a possibility, it follows that

a strong theistic naturalism can in principle be constructed in such a way that the scope of divine action is not limited in the way that the deists assumed.

One of the main objections sometimes voiced to a strong theistic naturalism is that it must envisage the essentially “absent” God of the deistic model. However, this is only true if we accept the separation of God from the world that has characterized most Western philosophical theology, and ignore the force of the arguments that have been used to challenge this concept of separation in recent years. Panentheism – the notion that the cosmos is to be seen as being in some sense “in God” – is in fact finding increasing favor from a number of different perspectives, and if a panentheistic position is adopted, the argument about an “absent” God immediately fails, for if the cosmos is within God’s self, then God can hardly be said to be absent from it. In this sense, it is ironic that a panentheistic understanding has been advocated by many – including Arthur Peacocke and Philip Clayton (2007) – who have also defended a causal joint understanding of special divine action; for, by taking up a panentheistic position, they undermine what might otherwise have been a major argument against the sort of strong theistic naturalism that they oppose.

Knight’s own panentheistic proposal is based in part on strands of Eastern patristic and Byzantine theology. We can, he suggests, avoid a deistic restriction on the scope of divine action without recourse to either supernaturalist or causal joint thinking, by reviving and revising the concept of teleology. This is possible, he argues, through a consideration of the scientific factors that are relevant to current discussion of the anthropic cosmological principle and of the predictability of biological evolution. Just as it is possible for Simon Conway Morris (2003) – in his book *Life’s Solution*, – to talk about “evolutionary convergence” in terms of predictable, functional solutions to problems of adaptation – “attractors” “analogous to those in chaos theory – so here teleology is understood, not as in medieval philosophy, but in similar terms to those that Conway Morris has outlined.

The interaction of chance and the laws of nature is such, it would seem, that certain developmental paths are in practice very likely to be followed, and these “attractors” may, in a theological perspective, be explicitly understood as a component of the God’s design of the universe.

Through this kind of neo-teleology, it may be argued, we can speak of an intended final end while avoiding the sort of quasi-vitalistic framework in which the components of the universe are seen as being drawn toward that end by some external agent or force. “Attractors,” in the sense in which Conway Morris uses the term, do not literally attract through some kind of force or influence that they exert. They are simply likely outcomes of laws of nature acting on the components of the universe, and may be understood, scientifically, in terms that make no reference to these outcomes themselves. We may, in a theological context, choose to speak of the reality of these attractors in terms of God’s design of the entire universe, but, if we do this, it is important to recognize that the tendencies we identify as part of the divine design are, at the level of scientific description, still absolutely intrinsic to the components of the universe and to the laws that they obey. Theological interpretation of these tendencies in no way impinges on their scientific description, so that the notion of God’s design of the cosmos is quite different here to that envisaged by the advocates of so-called Intelligent Design.

Theistic naturalism has, then, moved far beyond its deistic roots in recent years. While some theistic naturalists still argue for an approach that tends to limit the scope of divine action in a deistic way, others – either through a causal joint or a neo-teleological approach – argue that a rejection of supernatural causality does not limit divine action in the way that the deists assumed. The advocates of causal joint explanation – implicitly assuming a temporal model of God’s being and rejecting the traditional notion of God’s nontemporal character – insist that we can still speak of special providence as well as acknowledging the kind of general providence to which deistic thought limits itself. By contrast, recent developments of the

neo-teleological approach, while rejecting special providence, suggest that we can develop an understanding of general providence that is far richer than either the deists or advocates of special providence have recognized. All events that have previously been attributed to special providence may, according to this latter view, be seen as due to God’s general providence, so that a strong theistic naturalism can be adopted without denying the historicity or possibility of “miraculous” events. God’s involvement in the world is not denied in this approach, but is interpreted in terms of a panentheism that is compatible with the traditional notion of God’s nontemporal character.

Cross-References

- [Deism](#)
- [Divine Action](#)
- [Panentheism](#)

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Theodicy Problem

- [Evil, Problem of](#)

Theological Anthropology

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Description

Theological anthropology (TA) is a part of theology dealing with the Christian understanding of human beings. It is a modern invention, resulting from the coming together of two former treatises present in traditional theological curricula: humans as created beings and original sin, and the meaning and influence of grace. The new synthesis follows the “anthropological turn” that took place at the end of the nineteenth century and emphasizes the central role of human beings in the understanding of religious faith. All the formerly scattered treatises concerning the person have been brought together in an attempt to signify the centrality that is now attributed to humans and their role in the religious process, which was previously excessively focused on the reality of God or the “objective religious dimension.”

The present content of the discipline is quite standardized. The first part deals with humans as created beings in the image and likeness of God; this first section – also called “fundamental TA” – describes the personal traits which better reflect this human condition: the ► [soul](#), ► [freedom](#), rationality, and ► [love](#). The second part deals with the hard issue of “original sin” or the negative dimension of human beings, a strongly disputed field related to the problem of evil. The third part deals with the question of ► [grace](#) or divine, positive, and regenerative power that is a consequence of the process of redemption. As a result of it, people are called to a new life grounded in ► [faith](#), ► [hope](#), and ► [love](#).

Theological anthropology has been one of the most disputed fields in modern theology. Christian denominations have arisen and diversified along the lines of distinct interpretations of anthropological issues, such as the reach of original sin and the effects of grace. These

differences still characterize theological elaborations along confessional lines.

TA has been an established discipline for some time now, within the traditional theological pattern. A first influence with impact on the discipline has been the reception of new philosophical anthropologies, matured during the twentieth century: existentialism, phenomenology, and particularly the ones stressing openness and dependence on others – “otherness.” More socially driven philosophies have weighed in strongly in the field. Some psychological developments were adopted on a small scale (e.g., psychoanalysis and other more humanistic disciplines). Other developments take into account the connections with alternative representations of the human being in different religious traditions (Ward 1999).

Things have changed in a radical way in recent years, especially as a result of contact with science. Several issues have been called into question and have undergone a deep revision, as the Christian view of humans should take into account the discoveries of paleoanthropology, evolutionist biology, genetics, behaviorist, and cognitive sciences. It is possible to understand the present state of TA as a field of fertile reception and discernment of scientific inputs, where several theologians develop their original proposals, often outside confessional divides (Philip Hefner, Nancy Murphy, Wentzel Van Huyssteen, Philip Clayton).

Self-Identification

Science

TA will not be identified as a “science” so long as confessional theologies do not apply scientific standards in their methods. Nevertheless, TA (as well as some brands of theology) intends to become more “scientifically oriented” because its subject matter – the human being – lends himself to observation and experiment. We could even say that TA is one theological subdiscipline in a good position to become better adapted to scientific standards. Three main reasons can be provided for this: firstly, its statements are easily

subjected to empirical testing, as aspects of humans are directly observable; secondly, it is easier to incorporate inputs from other scientific disciplines involved in the study of human beings; and thirdly, it is better equipped to go into a truly interdisciplinary dialogue or to provide views readily connected to the wealth of knowledge describing human reality. TA draws together a long historical experience concerning human nature that provides a hermeneutical insight that many other disciplines lack.

However, the deep and confessed dependence on a theological or even confessional framework makes TA into some kind of “enclosed discipline,” unable to rid itself of some basic tenets. TA is better described as a hermeneutical discipline providing an authoritative experienced view, inside the Christian tradition, and capable of engaging in a fruitful dialogue with science and enriching the sometimes very limited perspective adopted by other theories.

Religion

TA is a “reflective aspect of religious tradition.” TA is no object of prayer or religious cult, but a way of rationally engaging with the believer’s experience. In the Christian tradition, at least, theological endeavor is not just a rationalization of what is otherwise experienced at a deeper, nonobjective level, but also an extension of the experience of faith achieved by other means. In that sense, the aim of theological work is to enable a real experience of God’s ► [revelation](#) and love. However, some theologians may consider this view to be too close to denominational positions and too far removed from scientific endeavor. An alternative way of avoiding such strictures is to undertake “religious studies” – a more neutral or less religiously committed approach – open even to nonbelievers.

As it becomes apparent from the former descriptions, theology in general and TA in particular may be conceived as being half way between the two extremes represented by a scientific discipline and a subjective religious experience. Ideally, TA attempts to strike a good balance between the two above extremes, while

attempting to incorporate the best aspects of both. The real question is how realistic such a program can be.

Characteristics

What makes TA more distinctive is that it is, at the same time, a very theological discipline (one of the main topics in the theology curriculum), and one that is more sensitive to scientific developments. This approach is thereby transferred into the field of theology; TA deals with humans in relation to God, while other theological treatments have precise objectives. TA’s distinctiveness concerns its status and method too: on the one hand, TA is a discipline subject to the principle of revelation (i.e., to truths we access through a scriptural tradition); on the other hand, it needs to consider human experience and perception. Over the years, this has often occurred, when theologians have tried to combine what they had learned from biblical scholarship with what they were experiencing in their own life or through historical developments. The cases of Augustine, Luther, Pascal, or Kierkegaard are good examples of this struggle to account for both: a fixed corpus of ancestral wisdom and the experienced reality of one’s own world and relationships. In each of the above cases, it is possible to identify new important developments that result when this interaction is articulated and delivers deep insights of historical relevance and unsurpassed value.

Relevance to Science and Religion

As mentioned above, TA is very involved in the area of “science and religion,” together with theological cosmology, the scientific study of religion, and the methodological issues concerning truth and meaning. The interest lies in the possibility of deepening and updating the traditional Christian doctrines about human nature and meaning. Many of these traditional views were originally framed inside a

mythological (at first) and a metaphysical (subsequently) framework, as these were the available cognitive patterns at the time of the compilation of the Bible or, later, during medieval and early modern developments. The new framework is strongly configured along scientific lines; the unavoidable consequence is a displacement of former insights, still subject to the old mindset, or unable to evolve into the new patterns. One of the primary interests of TA in that dialogue is to provide a more updated account of Christian beliefs, even at the risk of some degree of change.

A second reason of interest concerns the possibility of benefiting from the many scientific developments concerning issues of religious faith and human understanding. TA goes beyond the need for updating its own ideas better to fit the new scientific frame; it draws on inspirations, methods, and contents. Many examples can be provided of how new scientific approaches help improve the understanding of some of the negative dimension of a human being, even from genetic and neurological standpoints; others can assist in the reconstruction of the process of religious faith.

A third reason of interest is to reciprocate, in an intense and sometimes conflictive dialogue with scientific development. There are many issues at stake, and theologians are required to play a conscious role in the recent struggles concerning the definition of human identity and meaning. Science provides a partial view that can never expect to be a “complete theory” and can account only for some dimensions of the very complex human reality, a crossroads of many disciplines, and a much disputed field. TA cannot desert this open field of theoretical confrontation, if it is to vindicate its own perspective and to contribute by its cumulative wisdom.

In its present state, the discipline is opening up more space for areas of study related to “science and theology,” though the attitude varies across the different cultural settings and theological schools, with some of them being more conservative and closed to influence outside their own tradition, while others are prone to cross-fertilization and are not wary of engaging in the dialogue. A lot depends on how theology’s

relationship with science is conceived. Usually, the conflictive model is less frequent in theology or divinity faculties, but the so-called “incommensurability” model has very often isolated theology from science and developed a model of TA devoid of that concern.

At the opposite end of the scale are those who are too inclined to submit to science-based interpretations. A happy medium should be sought, in order to achieve a more fruitful and mutually critical approach.

Sources of Authority

The most authoritative sources for TA are those of Christian revelation, the Bible and the developments of Christian tradition, as codified in normative texts of recognized authority: the statements of councils and Popes, the liturgical rites and practice, the most outstanding theologians, etc. There is not an explicit canon of authors or sources, but a broad consensus reigns among many theologians concerning the value of works or thinkers which constitute landmarks in the discipline: some are ancient, as Irenaeus and Augustine; some medieval, as Thomas Aquinas, Bonaventure, and Scotus; some reformers, as Luther and Calvin; some modern, as Pascal, Schleiermacher, and Kierkegaard; and finally, some are contemporary, as Karl Barth, Karl Rahner, Hans-Urs von Balthasar, and Wolfgang Pannenberg.

Beyond this point and especially with regard to the impact of science, it is hard to establish landmarks or texts of particular significance. A first attempt at listing authors and works relevant for this endeavor could take the following into account: Wolfgang Pannenberg, *Anthropology in Theological Perspective* (1985); Philip Hefner, *The Human Factor* (2000); Wentzel van Huyssteen, *Alone in the World?* (2006); Philip Clayton, *Mind & Emergence* (2004); and Nancey Murphy, *Bodies and Souls, or Spirited Bodies?* (2006).

What makes all these sources authoritative in some way is – as in other disciplines – the consensus they have met with among academics working in the field.

Ethical Principles

The ethical principles guiding TA are the same as in other theoretical disciplines in the theological realm. Indeed, some traits become specific to these disciplines and distinct from other scientific fields. It shares with general science the commitment to truth and the conviction in its expanding character. Furthermore, it is committed to rigorous methods in achieving that goal, in submitting its interpretations to general scrutiny, and in accepting correction, as a result of scientific advancement, in order to increase knowledge for the benefit of humanity. However, the theological dimension of TA is committed to faithful engagement with Church teaching and tradition, to the service of communities of believers and to the deepening of individual faith or religious insight. In particular, TA's commitment to the deep value of the human person (in the image and likeness of God) generates its profoundly ethical aim of supplying an anthropological view that helps to deter any attempt at diminishing man's dignity and special position in the world. A theologian's sense of responsibility, while allowing them to make relatively bold propositions, should keep them wary of causing possible damage to the commonly shared faith. This field of theology is therefore continuously torn between being loyal to the objective search for truth and to the faith shared by the particular community of believers.

Key Values

The key values of TA descend directly from the above-mentioned ethical rules: truth, fidelity, commitment, and openness. Perhaps the present ideal for this discipline is to be able to provide a bridge between science and theology, both dealing with the mysteries and complexities of human beings and both trying to deliver the best available knowledge in order to promote human freedom and dignity. A frequent misunderstanding of TA is to view it as disjoined from such values, which are in line with modern humanism. TA's engagement with science moves from a deep

conviction aimed at helping human beings to flourish and to reach their fullest potential, in line with religious hopes.

Conceptualization

Nature/The World

Nature or the world is the environment where humans exist and develop. From TA's viewpoint, nature is God's work, traditionally defined as "► [creation](#)," and therefore related to God's plan and purpose. It is an axiom of TA that the material world acquires meaning only in relationship to its highest reality: the human person. The idea converges with modern theories, such as "the ► [anthropic principle](#)" or the dependence of the existing cosmos on an intelligence that is capable of understanding it. The Jewish and Christian revelations, stressing the centrality of humans in the creation process, understand the former steps of constitution of an ordered world as the conditions required to serve human nature. Biblical narratives are very clear, as they state the ontological dependency of real world firstly on God and secondly on humans (as some kind of "delegates"; God has entrusted the created world to humans, not for its limitless exploitation but as a mission of stewardship and sustainability, extending God's creativity).

A further way of interpreting nature through TA harks back to an ancient tradition that values it as a second "revelatory book": for those able to realize and deepen its meaning, nature becomes an open textbook, in which the divine reality and intention may be sensed or followed. Thus, nature constitutes a kind of interface between humans and God; God being a transcendent reality, beyond human grasp, nature becomes – as his work and manifestation of his creative plan – an indirect path to reach his presence. This path has been described in many religious traditions, in which nature evokes experiences of awe and wonder and of revelatory content.

Human Being

Human beings are the subject of TA. They are defined by their origin in God, in whose "image

and likeness” they have been created. Despite this optimistic and exultant description, TA introduces a corrective element of realism, assuming a negative dimension, traditionally described as the result of “original sin.” In a sort of dialectical movement of thesis and antithesis (*image of god* and *sinner*), the synthesis is provided by the doctrine of grace, which restores and even improves the original condition, once the weight of sin and negativity have been taken on and redeemed in Christ. Under the effect of grace, the human being may live a new life of faith, hope, and love. At least, this is how the Christian narrative runs: a model to represent and manage the complexity of humans and to answer their deepest needs. From a Christian point of view, humans indeed carry the weight of negativity and evil and need to restore balance in their life through the relationship that Christ can provide.

Human beings are furthermore conceived as free, conscious, able to love, social, and destined to an immortal life after death; these conditions are sometimes hard to test in the light of science.

Life Origins and Death

The origins of life are clearly inscribed in the program of creation already described: life is, in the Biblical tradition, a divine prerogative, as all life comes from God, and He is its author and regulator. This magnificent view is called to adapt to scientific insights, where life is seen as an emergence from chemical processes. Nevertheless, in the new theological model, this is still one step behind the higher emergences of human ► [consciousness](#) and even higher levels pointing to transcendence.

Life being an essential characteristic of humans, biblical accounts better define human flourishing in terms of fullness of life or life affirmation.

TA describes humans in the struggle between life and death, with life representing a sign of the positive (or divine) dimension and death as the symbol of all that is negative (or opposed to the divine). Death is identified as linked to sin or the human negative side. In any case, restoring life means – again in our model – overcoming

death and opening a horizon of transcendent life, providing a higher quality of hope.

Reality

TA does not per se determine a proper representation of reality. In broader terms, there is an inevitable pluralism, both in the way humans are understood and how reality is conceived. The traditional and orthodox model works with a concept of metaphysical realism, as opposed to “idealism” and “constructivism”: humans are real beings in a real world, which provides the basis for knowledge and mediates religious experience. Inside this tradition, reality depends ultimately on God, who gives consistency to the real world, and warrants human existence and knowledge. The traditional system requires this perception, as a condition of theological development. On the other hand, the Christian concept of reality somehow reduces its reach, as the real world (present to us) is deemed a passing one, even a temporary limited thing, which should give way to a definitive and superior form of reality, which is projected into the ► [eschatological](#) realm.

Recent theological developments work with different conceptions of reality, and so, humans may receive a plural qualification; the description of man as “the image of God” is deeply affected. The issue is not only epistemological, but defines how human beings, their world, and God are mutually related.

Knowledge

Knowledge, in TA’s perspective, is not just the best way to represent or provide accurate models of reality, but rather has a “salvific value”: human knowledge should help to improve our understanding of our dependence on God and guide us into the mysteries of human existence, in order to overcome our sinfulness and reach eternal life; it should also improve the human condition in this life, in ones relationship with others. This somehow more pragmatic view links knowledge as a scientific neutral endeavor to knowledge as a kind of wisdom or spiritual insight, so as to lead to an understanding of the limitations and potentials of the human

condition and to receive a positive revelation able to provide lasting hope. However, in this case, as in many others, a clear pluralism may be identified, as long as the theological tradition is divided between optimist and more skeptical (apophatic) positions. At present, the lines may be drawn to separate those who are more confident in the power of rational inquiry (rational theology and foundationalism) and those distrusting it and pointing to exclusive revelation. Hans Frei has tried to better classify these positions in a typology of five models (Frei 1994), describing the different ways that theology relates to standard forms of reason.

Truth

Truth is the result of knowledge and shares its formerly described characteristics and pluralism. A more pragmatic stance (Lindbeck 1984) states that true interpretations of canonical texts should be identified through positive performance at the level of living communities. In a similar fashion, truth should be linked to its heuristic power or could be seen as an attribution of the claims providing the best explanations, aimed at understanding human nature, avoiding shortcomings, ensuring human integrity and dignity, and preserving man's identity as a creature related to God. Truth is linked in any case to testing processes, as the result of historical experience and ongoing observation of what helps humans to flourish and avoids distress and evil. Other views conceive truth in continuity with the scientific objective and tried and tested theories (McGrath 2004). In other cases, truth is deeply linked to scriptural canon, as its only norm (Vanhoozer 2005). And still other theologians stress the value of truth as fallible and ever vulnerable to external criticism, more in line with critical epistemologies (Neville 2006).

Perception

TA has developed a sense of perception as a mix of immediate contact with reality through the senses and inspiration (as an "inspired insight or awareness").

Perception is mediated by faith or inscribed inside a framework of general notions concerning

the order of reality, purpose, and meaning. Perception can hardly be isolated from a set of former experiences and a global orientation conferring sense or placing each percept into a schema or meaningful pattern, which, for TA, means related to God's will or plan.

Perception may be linked to religious experience, as the proper way to perceive God's presence in one's own life. The question of its epistemological value has been much disputed, as several scholars defend its veracity, while others do not deem it worthy of greater significance, since it should be validated through broader processes going beyond the individual experience, and tested by more objective means.

Time

TA shares a common idea of time with general theology: time is assimilated into a history of salvation, a process in which humans experience God's love amid the trials and struggles of life. Time is measured in theological terms as the advancement of God's salvific plan or of its didactic interaction with humans. Besides this, time is limited by the concept of eternity, which belongs to God, and defines the end of time, the eschatological bliss or a transformation of reality, no longer submitted to the logic of time and corruption, but lived in a new condition of freedom from every limitation. Obviously, a theology of time built inside an anthropological framework is much more complex and requires a more phenomenological analysis, as the relationship between time and the promise of eternity prompts a special consciousness and a way to conduct one's life. Authors like Antje Jackelén have explored more thoroughly that dialectic (Jackelén 2005).

Consciousness

Over time and with reflection, TA has developed its own understanding of consciousness. It emerges as a result of introspection, especially in the work of Augustine, and relates to the inner presence of God in human beings. After an appropriate revision of the concept of "soul" in TA, due to recent neurological insights, consciousness seems to be best suited to take on the traditional

concept of soul. Nevertheless, despite this positive outlook, the theological view is rather distant from the modern one, which is more inflationary, and assumes too great a role for consciousness as the key factor in every emancipation or progress. However, it does not lead to espousing the “eliminationist” positions of those who have recently tried to discount this faculty as somewhat secondary or illusory. The Christian view limits the range of consciousness, as it assumes a statute of dependence and limitation. Consciousness appears as the result of an external calling, awakening a sense of self, and is developed in a process of constant interaction. It is limited because of the shortcomings and failings of the human condition, perceived as far removed from any standard of fullness and consequently, requiring restoration. In any case, so long as consciousness takes the place of the old “soul,” it still is a more substantial entity and as a result, can hardly be reduced to the material level. Recent explanations by theologians engaged in the dialogue with science point rather to the soul as a form of “emergence” which cannot be reduced to the material substrate but nevertheless should not be identified as a “spiritual reality,” giving way to forms of dualism that are hard to digest down to standard scientific views (N. Murphy, Ph. Clayton). However, the issue is far from settled, as alternative views claim the unavoidable dualism that is entailed by any substantial view of consciousness. The discussion shows not only the unavoidable pluralism in this area, but the close correspondence with other theological issues, like those concerning a more naturalist vs. transcendental view of the divine. The theological understanding of human nature and its predicaments becomes a plural field, especially when confronted with scientific challenges. Furthermore, taking into account other religious traditions – most notably Buddhism – a still more deflated view of consciousness may be obtained.

Rationality/Reason

In the perspective of TA, reason is traditionally the human trait considered more related to God or the one giving specific content to the

claim of humans as “image and likeness of God.” Sharing with the divine this property, reason has been exalted, at least until modern times, as a faculty that better characterizes human identity and differentiates us from other species. Inside a realistic pattern, reason has played a major role as a faculty able to grasp the meaning of reality, to understand intuitively its divine origin and destiny, and to appreciate the “natural moral law.” Reason is perceived less as a neutral tool providing true knowledge and more as a faculty that enables humans to know God and to make their way toward him. Indeed, classical TA has stressed, in line with ancient Greek wisdom, that reason points us in the right direction, while passions or feelings usually do not. Modern views are more balanced, and reason has lost some of its theological appeal (after the major revival it enjoyed during the Enlightenment). As has been already stated concerning other epistemological issues, pluralism is now the norm; it makes way for distinct positions and generates a richer panoply.

Mystery

Mystery has a double meaning in the realm of TA: one negative, as it is applied to the limitations of our knowledge; one positive, as it opens our mind to dimensions of reality beyond our rational grasp and tuned to higher experiences. Mystery is applied to the reality of human persons so long as we cannot offer a “complete” model of their identity and behavior because of their complexity and unpredictability. To acknowledge the sense of mystery in our approach to humans means at the same time to be called to respect this reality as out of reach of any effort for total control or management, an aspect that further confirms their close relation to the mystery of God. Mystical experience can be accounted as a way to fully acknowledge the place of mystery.

Relevant Themes

Human Origin and Evolution

For many years, TA has been engaged, together with paleoanthropological studies, in the task of

reconstructing the picture of human origins. Once the issue of monogenism was settled, thanks to mitochondrial studies, the biological narrative seems to have been nearer to the theological one, despite the many issues still to be settled. TA accepts the biological representation of human origins as a product of evolution from former existing species. Beyond this point, things are more confused. For example, it is not obvious how this process has proceeded and what has guided it, whether sheer adaptation and survival of the fittest or whether other factors were involved.

We are still a long way away from developing a complete and coherent picture of the evolutionary tree that brings from first hominids to *Homo sapiens*. Nevertheless, the present evolutionary hypothesis is the more convincing. TA tries to see a divine purpose in this long process or at least to interpret its outcome as something that corresponds with the divine will. Perhaps a theory of emergence may bridge the gap between the two: the natural biological theory and the theological view, as it creates room for several interpretations.

Naturalizing human origins and evolution is not, in principle, incompatible with a theological position committed to perceive God's hand and a salvific plan. In any case, every description of that evolution should take into account the fact that once intelligence, symbolic ability, and learning reach a certain critical mass, all the history of human evolution needs to be deeply rethought, and new powerful variables determine that evolution in a sense that escapes the logic of sheer adaptation, promoting a different kind of being, less bounded by biological strictures and endowed with an infinite range of new possibilities and abilities (among them, the prospect to transcend the limits of physical reality). Some of the quoted authors like Wentzel van Huyssteen, Philip Clayton, and Simon C. Morris (2003) have dealt in very inspiring ways with these issues, providing insightful views and alternative ways of dealing with the theological understanding of human beings inside the evolutionary framework. In broad terms, the symbolic capacity, the emergence of superior traits, and the

convergence toward some point are the respective theoretical new grounds offered for further exploration.

Freedom

In TA, freedom has been seen as a human condition among those describing our similarity with God. It has been identified as a capacity to decide one's own line of action, to accept or refuse God's offer. Even if the Reformed tradition has discredited this attribute of human nature, as a consequence of human corruption after original sin, it is still kept as an essential ingredient for the fulfillment of human potential. Modernity has shown several factors weighing down human free will, and biology, genetics, and behaviorist psychology, among others, have produced strong skeptical arguments against it. As a result, a more nuanced view of human freedom emerges, more realistic and situated in a network of influences and levers. TA claims that the true identity of a human person includes free will – as one of its main characteristics, perhaps now more as a call to negotiate with different kinds of conditions: genetic or environmental. Freedom is the outcome of the perceived complexity of factors intervening in human behavior and the consequent high level of contingency.

Love and Altruism

For TA, love is one of the most distinctive traits of human nature, but recent research has highlighted how various forms of love may be explained in naturalistic terms. Affective love (*eros*) has been linked to biological reproductive strategies, and its operation has been explained in chemical terms. Neighbors love (*agape*) finds several biological explanations, pointing to genetic interests (*selfish gene*) or to strategies of cooperation and hence to group fitness. Recent neurological research has shown some dynamics presiding this complex process and its natural avenues. Other studies stress biological, ethological, and cognitive factors influencing forms of love. Surely, all this research helps to improve the understanding of its character but could miss one important point as it ignores some of love's specific human traits in the logic of gratuity,

sacrifice, and gift, which probably require a different theoretical framework. The aim of TA is to show the intrinsic character of love, challenging the logic of sheer self-interest and gain. Love points to a divine experience of gratuity and gift, which loses the greater part of its appeal when reduced to something practical. In this experience, humans express something more specific and unassailable, something that many people deem essential for “a life worth living.”

Sin and Evil

Evil is a part of human perception. A model of a human being would be absolutely inaccurate without dealing with this negative dimension. TA's approach to this is through the issue of “original sin”: some kind of negative dimension whose onset is lost in the remoteness of human origins, some ill-defined “wrong,” which still affects the human condition. Recent research has pointed to some genetic and neurologic traits of human nature, in which violence and an affirmative leaning had been critical for early survival. After humans evolved to become more socially oriented or cooperative, some imbalance weighed down on human beings. Human nature is viewed in a more realistic way, less prone to the idealism of more modern ideologies or naïve anthropologies. Nevertheless, this research does not exactly legitimize the traditional narrative of TA, i.e., the ancient fault of the first ancestors, but rather reveals a kind of unfinished state, something that triggers new theological questions. To date, the best study and presentation of this issue, combining our current biological knowledge and theological insight, is given by Daryl P. Domning and Monika K. Hellwig (2006).

Religion

The scientific study of religion has opened many new paths to the understanding of this human trait, which TA has always identified as an inborn ability for transcendence and for receiving a divine revelation. Things become more complicated as the biological, neurological, and cognitive approaches sometimes try to deconstruct this original proposition and to

show its derivative character (an epiphenomenon) or its adaptive character, at least in an earlier stage of human evolution. TA's present endeavor is to offer a more open picture, taking into account the new research and aiming to restore that human ability as a genuine dimension giving access to true transcendence. “Explaining religion” in natural terms should not mean eliminating it or “explaining it away.”

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Theological Critical Realism

► Critical Realism in Theology and Science

Theological Determinism and Indeterminism

- [Determinism and Indeterminism](#)

Theological Liberalism

- [Liberal Theology](#)

Theological Metaphysics

- [Natural Theology](#)

Theological Revisionism

- [Liberal Theology](#)

Theological Views and Judaism

- [Theology in Judaism](#)

Theology

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(In northern Europe) a non-confessional systematic scholarly work – historical and contemporary, descriptive, critical and constructive – focusing on religious beliefs or dogmas; often named Systematic Theology and primarily dealing with the Christian tradition.

Cross-References

- [Religious Education Theory, Roman-Catholic, Southern Europe](#)

Theology in Judaism

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Related Terms

[Jewish science and theology](#); [Theological views and Judaism](#)

The Ancient Near Eastern picture of what is deity in relationship to humanity and the rest of the world underwent significant change as the state of Judea became a more or less integrated part of the culture of the Mediterranean empires of Greece and Rome. These changes were largely due to the way Platonic and Aristotelian conceptions of God as a first principle of reality modified the biblical conception of God as the creator of the world. Once absorbed the new rabbinic understanding of theology was further, possibly more radically, modified by the influence of medieval Jewish natural philosophers into what in modern times would be recognized as the traditional or Orthodox doctrine of God. At the core of what emerges as Jewish dogma in this area is a synthesis of Platonic and Aristotelian theology in the light of medieval commentaries, both philosophical and kabbalistic. However, no sooner formalized as foundational doctrine, modern scientific conceptions of the divine radically undercut and thereby challenged not only contemporary belief in God in particular, but other traditional rabbinic so-called dogmas as well. The most serious challenges have arisen from modern physical reductionist interpretation of science in general as well as from modern philosophical interpretations of epistemology under the influence of the new neurosciences. The most difficult points of comparison have to do with the influence of the new cognitive sciences on theories of rational evidence, mathematics on interpretations of infinity, and accounts of causation in all the physical sciences.

At least four issues about the traditional Jewish conception of God can be isolated because of the hegemony of modern mechanist-mathematical science over the premodern Platonic-Aristotelian science of classical Jewish theology. First and most obvious are challenges that arise from modern physical astronomy. Here the most glaring issue turns on the size and age of the universe in connection with traditional doctrine of divine providence. Given what we know about astronomy, how can we understand the traditional claim that God governs the entire universe, both at the level of its smallest components and at the level of its largest components? With specific reference to the largest objects in the universe, at the level of galaxies, what we know calls into question all we thought we knew from medieval Jewish philosophers about the nature of divine control, since in premodern astronomy stars and constellations were viewed as living angelic beings and not just as earth-like rocks or conscious-less cauldrons of fire floating through space.

The second challenge comes from Quantum Mechanics. At the level of the microscopic, the suggestion is that the laws of nature at least at this smallest realm of beings are probability equations. What does this say about traditional claims about the perfection of divine knowledge and God's concern for every creature, no matter how small, since truth in terms of real probabilities is simply reasonable opinion about the future, and probability laws hold for sets of individuals but not for the individuals within the sets. Hence, if Quantum Mechanics provides a correct description of the universe as God created it, then it is hard to understand what it means to claim that God in any sense cares about individuals of any kind, especially about human beings. If the answer is that he does not, then this judgment significantly undercuts the rationale for liberal as opposed to traditional Judaism, since the heart of the development of liberal Judaism lies in the primacy of the value it places on the individual, in contrast to traditional Judaism's emphasis on the primacy of community, i.e., of the collective Jewish people.

The third challenge comes from physics, especially with reference to the principle of

inertia. What is at stake here is the authority of the traditional Aristotelian proofs of the existence of God shared by Jews with Muslims and Christians. Put in its simplest terms, Aristotelian science assumes that the normal state of objects is at rest, so that some cause is needed to account for their activity or change, whereas, specifically because of the principle of inertia, modern physics assumes that the normal state of objects is in motion, so that some cause is needed to account for rest (e.g., friction). This difference goes to the heart of why the traditional proofs of God's existence, whose validity was apparent to premodern natural philosophers, are clearly not persuasive to modern scientists. This distinction might be even more fundamental to the difference between modern and premodern science than the issue of whether teleological, purposeful explanations in contrast to mechanical, mathematical explanations can count in science. The issue is: Do you need a cause of infinite potentiality to account for an infinite number of finite entities and states of affairs? The answer is no, if an effect can be greater than its cause, and it was this affirmation that the premoderns found unintelligible. However, given the principle of inertia, there is no reason why an infinitely long effect or series of effects cannot follow from a distinctly finite cause.

The fourth and final issue relates to the changes from premodern to modern theories of logic and language. Drawing from an Aristotelian account of meaning, all of the classical Jewish (as well as Christian and Muslim) natural philosophers took for granted that what something is given in a definition, a definition predicates at least two attributes (a genus and the specific difference) of the subject, and these attributes are universals that exist within the substance of their subjects. This so-called internal notion of predication becomes especially problematic when speaking about God. The philosopher who highlighted this paradox was Moses Maimonides in his *Guide to the Perplexed*, and his solution, called "negative theology," has dominated Jewish philosophy since the thirteenth century.

Briefly stated, God must be "one" because if he were not he could not be the first cause of

everything in the universe. A first cause is an entity whose existence is dependent only on what the entity itself is. But if there is complexity in the entity, say, for example, that it was defined by two distinctly different attributes, then the first cause would not be first, since as a compound, its existence is determined by its essential components. Consequently, the creator God of the universe, by definition, must be so simple that he has one and only one essential attribute, and that attribute is identical with him. The consequence of this analysis is that in principle, any statement about what God is, when taken literally, says nothing but “God is God” and therefore gives no information. In fact, we can know nothing about whom or what God is; only whom or what God is not. Hence, all meaningful statements about God are equivocal in meaning. What they say about God is what he is not, and what they say positively has only human moral content. So, for example, we do not say that God is ignorant, because ignorance is a human deficiency. Rather we say God is “all-knowing,” because, all factors being equal, knowledge is a human virtue. Hence, the statement “God is all-knowing” says nothing about God. What it says is that God is not ignorant and humans ought to seek wisdom as a virtue.

However, as we have said, negative theology rests on certain assumptions about language, none of which apply to modern non-Aristotelians accounts of meaning. What is most important is that adjectives are not statements of universals that actually exist within substantive subjects. Hence, there is no obvious reason why simple positive statements about God, true or false, cannot be made, and classical Jewish philosophy cannot guide us in how to make them, because of its no longer applicable account of meaning and language.

One consequence of this negative judgment about the implicit semantics behind traditional works of Jewish theology has been to free Jewish theologically and linguistically from the restraints imposed by Maimonides. To be sure, Jewish philosophers continue even in theology to be guided by their rabbinic predecessors, but they are not controlled by them. Hence, for example,

Benedict Spinoza can speak of God in literal, positive terms as an “infinite substance,” while Martin Buber can speak of God within his phenomenological language as “an Eternal Thou,” in radical opposition to Spinoza, for Buber’s deity, while “eternal,” which is comparable to being “infinite,” is in no sense a substance. Similarly, Franz Rosenzweig captures the modern (Whiteheadian) sense of God as the origin and end of all motion while remaining true in some sense to Maimonides’ negative theology when he claims that whatever is not God, so that everything that comes to be defined God by not being him, so that at the end of days God will fully be as what he is not.

Cross-References

- ▶ [Astronomy in Judaism](#)
- ▶ [Bioethics in Judaism](#)
- ▶ [Creation in Judaism](#)
- ▶ [Ecology in Judaism](#)
- ▶ [Feminism in Judaism](#)
- ▶ [Judaic Studies](#)
- ▶ [Judaism: an Overview](#)
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- ▶ [Natural Sciences in Judaism](#)
- ▶ [Philosophy in Judaism](#)
- ▶ [Physics in Judaism](#)
- ▶ [Progressive Judaism](#)
- ▶ [Psychology in Judaism](#)
- ▶ [Redemption in Judaism](#)
- ▶ [Revelation in Judaism](#)
- ▶ [Science and Kabbalah](#)
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Theology and Media

► [Mediatic Societies, Theology in](#)

Theology in Islam

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Related Terms

[Qur'an](#)

Description

In its formative medieval period, Islamic theology, defined as a systematic discourse about God carried out by Muslims, evolved as part of the premodern world's most internally diverse cultural sphere. The vast territorial range of the religion, combined with its inability to generate an authoritative church-like hierarchy to define and impose doctrine, ensured that acceptable Muslim ways of speaking about the divine evolved over centuries by largely consensual processes, and that no formal list of creedal essentials was ever generally promulgated.

Properly speaking, therefore, there are multiple Islamic theologies, rather than a single discrete tradition with settled canons of orthodoxy. Of these, three have substantially survived in the majoritarian Sunni context: Ash'arism, Maturidism, and Hanbalism, all of which are generally regarded as valid. In the context of Shi'ism (approximately 10% of Muslims), the medieval Mu'tazilite school, rejected in Sunnism, continues to have wide authority.

The unifying principle, however, is invariably the theological content of the Qur'an. The Muslim scripture, seeking to disprove polytheism and to rectify Trinitarian and incarnationist views in Christianity, teaches a radically monotheistic

doctrine. God (Allah) names himself as Compassionate, Loving, Creator, Willer, Guide, Knower, and Raiser of the dead, in a cosmic vision of divine power and providence. Humans are created to love and worship God, and will face a Day of Judgment where God will send sinners to hell and the righteous to eternal reward and to a beatific vision of His face. Salvation is by grace, not works; but the latter are nonetheless seen as hugely important expressions of submission to the Divine will.

The fondness of some Enlightenment thinkers for Islam, which they saw as a rational and non-superstitious faith, has encouraged many modern Muslim theologians to assume that modernity need not impose radical revisions to Islamic metaphysics. However, there have been two major departures from the three classical Sunni schools in the past century: Firstly, a modest revival in Mu'tazilite fortunes on the assumption that Mu'tazilism allows a greater use of reason in interpreting scripture, and that its view of natural causality is hospitable to modern physics. Turkish and Indonesian divinity schools have been most influenced by this trend. Secondly, the movement known as Wahhabism has gained in currency among some thinkers who believe that the medieval incorporation of Greek reason, and traditional pieties surrounding belief in the saints, must be replaced by a return to the literal sense of scripture. In this way, Wahhabism may be compared to the Protestant Reformation.

Self-identification

Science

The terms "science" and "religion" are both Eurocentric and have limited relevance to Islam. Islamic theology does not see itself as a "science" in the European sense. However, it has evolved complex definitions of matter, usually based on a belief in atoms, and discussions of the reality of natural causality that are of scientific relevance. To the extent that arguments from design lie at the center of Muslim arguments for the existence of God and appear in the Qur'an itself, Islamic theology may be said to propose a general system

for the methodical derivation of facts about the material world from first principles, appealing to human observation.

Religion

Islam defines itself with the Arabic word *din*, meaning a transaction between humanity and God. In a general sense, then, Islam is a religion. However, *din* implies not only “religious” aspects of life, such as belief and worship, but an all-encompassing commitment to the Creator, expressed in a sacred law (Sharia) which has no clear equivalent in Christianity, despite resembling canon law in some principles. In this respect, Islam as a religion resembles Judaism more than Christianity.

Characteristics

Islamic theology generally contrasts with non-monotheistic theologies in its insistence on a personal creator God who is close to His creatures and may be approached through prayer. It is distinctive from Judaism in its belief in Jesus as messiah, and in Muhammad as the final prophet (“Seal of the Messengers”), and in its belief that the sharia is a facilitated divine law that replaces the Mosaic code. It differs from Christianity in that it regards the Trinity as compromising the full unity of God (► [Tawhid](#)) and as imposing difficulties on worshippers as they seek to conceptualize the deity. It also rejects the Christian belief in the atoning sacrifice of Christ, holding that God forgives sinners directly, without requiring a substitute or mediator.

Relevance to Science and Religion

Perhaps the commonest apologetic claim in contemporary Islamic theology takes the form of the idea that Islam is the scientific religion *par excellence*. Popular and semipopular writers, such as Maurice Bucaille and Harun Yahya, who seek to show the Qur’an’s compatibility with modern cosmology and embryology, are hugely popular across the Muslim world. Some more

academic theologians have created the genre of al-i‘jaz al-‘ilmi, roughly translated as “scientific apologetic miracle studies,” which seeks to use alleged Qur’anic anticipations of modern science as arguments for the Qur’an’s divine authorship. The quality of this literature is variable, but at its best, it is of genuine intellectual and scientific interest. Journals such as *Islam and Science* try to show the relevance of traditional cosmologies to modern scientific paradigms.

Sources of Authority

God is cited as its sole authority. He is believed to express His qualities and His will through “signs” (Ayat), both in the natural world and in the scriptural revelation of the Qur’an, which is taken to be the literal and uncreated word of God. A further source of revelation is the ► [Hadith](#), documents which record the sayings and acts of the Prophet Muhammad. Reason (‘Aql) is also seen, particularly in late Ash’arism and in Maturidism, as a key source of knowledge about God, and logic is intensively cultivated.

Ethical Principles

Hanbali and Ash’ari theologies typically adopt a “command ethic” approach. Good and evil may be intuited but are authentically known only through revelation. Those unreached by revelation are therefore not subjects of moral judgment. Maturidi and many Shi‘i thinkers hold that moral axioms are intrinsic, and that human natural knowledge of good and evil is sufficient to render us genuine moral agents accountable to God, even in the absence of scripture.

Key Values

The list of virtues and vices is generally shared with the other monotheistic theologies. In contemporary contexts, Islamic values are typically conservative, with a great majority of believers opposing sex before marriage, homosexuality, and some forms of feminism.

Conceptualization

Nature/World

Revered as a complex of signs indicating the qualities of God. There is no concept of original sin.

Human Being

Created to be God's representative on earth, reflecting aspects of the divine nature and called to worship, to marry, to live in families, and to respect the aged.

Life and Death

Most Muslim theologians believe that the Qur'anic account of the origins of life is compatible with science. A controversy over Darwinism exists but is not as salient as in Christianity. Humans originated in the divine presence and will return to it for judgment and (for the blessed) in eternity.

Reality

Material reality, for Ash'aris and many Maturidis, is occasionalistic: particles exist only instantaneously and not continuously. Causality, properly understood, is God's direct action through apparent proximate causes.

Knowledge

Knowledge is to be integrated in a system in which knowledge of God lends meaning to all else and defines the relationship of the sciences. Knowledge may also come through religious experience, and Islam has a complex mystical tradition (► [Sufism](#)).

Truth

This is a Qur'anic name of God. For Muslim theologians, without God, the term is of merely logical or arithmetic value.

Perception

Muslim theology inherited Aristotelian theories of sense-perception and its interpretation by the brain; these are now substantially amended. There can be a direct perception of God in the next world.

Time

Time is part of God's creation; the theologians dispute whether time is a continuum or a series of disconnected moments.

Consciousness

This reposes in the soul (*ruh*) created by God but indestructible in humans.

Rationality/Reason

Muslim theology uses this to prove metaphysical claims and to defend the coherence of doctrines such as resurrection which cannot be proved by reason.

Mystery

The essence of God is "veiled," but there are no formal "mysteries of the faith."

Relevant Themes

The Qur'an's repeated invocation of natural phenomena as signs of God's power and existence ensures that Muslim theology today is closely engaged with science. In general, the simplicity of this system and the absence of mystery ensure a fairly constructive encounter between science and faith for most thinkers.

Cross-References

- [Allah](#)
- [Humanism in Islam](#)
- [Islam: An Overview](#)
- [Logic in Islam](#)
- [Monotheism](#)
- [Muhammad, Prophet](#)
- [Mysticism in Islam](#)
- [Names of God](#)
- [Philosophy in Islam](#)

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Theology of Liberation

- [Liberation, Theology of](#)

Theoretical and Practical Reason

- [Wisdom \(Philosophically\)](#)

Theoretical Chemistry

- [Molecular Modeling](#)
- [Quantum Chemistry](#)

Theoretical Psychology

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Related Terms

[Cognition](#); [Constructionism](#); [Hermeneutics](#);
[Personhood](#); [Psychology](#); [Science](#)

Description

Theoretical psychology (TP) is a subdiscipline as well as a general orientation to psychology. It has come to fruition especially as an expression of post-positivism beginning in the 1960s. It concerns itself with foundational questions in psychology, the application of the philosophy of science to psychological research, and the critique of the social implications of the discipline. Cognitive science and philosophy of mind clearly form one set of interests in TP. In addition, it has branched widely into historical and critical analyses of psychology including those of a critical realist, hermeneutic, feminist, social constructionist, poststructuralist, and postmodernist variety (Gergen 1985; Richardson et al. 1999). Hence, there is no single orientation that describes TP, but, instead, it is a subdiscipline that concerns itself with the critical analysis of psychology as a theoretical enterprise and as a discipline (Robinson 2007).

More recently, TP has concerned itself with the globalization of psychology, the nature of subjectivity as a broad category of analysis, the question of the place of the neurosciences in psychology and the notion of neurophenomenology, the emergence and limitations of such movements as positive psychology and evolutionary psychology, the contemporary expressions of psychoanalysis, and more.

Characteristics

TP is the one subdiscipline that is directly concerned with an overall analysis of the problems and foundations of psychology. It has from time to time critiqued the mainstream, suggested alternative approaches to psychology, or created new fields of inquiry. It also joins with others in psychology, for example, in cognitive science, to discuss, analyze, or engage working scientists in new work. TP often interests itself explicitly in interdisciplinary work by crossing boundaries and working in adjacent fields of sociology, philosophy, anthropology, and so on.

Relevance to Science and Religion

Theoretical psychologists are, in general, sympathetic to an understanding of the relationship between religion and science. Some of these psychologists take this up explicitly in the guise of a relationship between religious aspirations and ethics or in the form of normative considerations as understood in psychology and the religious impulse in human activity. Given TP's general critique of positivism in science, it is also sympathetic to alternative forms of investigation of all human phenomena, including religion. However, TP's critical stance can also apply to religious concerns and the expression of religiosity. In addition, there are many in TP who are not directly interested or concerned with the nature of religious phenomena.

A number of individuals who self-identify as theoretical psychologists hold positions in denominational colleges and universities and hence work explicitly on the relationship between psychology as a science and religious questions, broadly conceived.

Sources of Authority

As a relatively small subdiscipline of psychology, most theoretical psychologists begin their careers with training in another field of psychology. Crucial to TP is the importance of the philosophy of science and either analytic philosophy or continental philosophy of the last approximately 100 years. Some theoretical psychologists take their inspiration from the traditions of Edmund Husserl, Martin Heidegger, Maurice Merleau-Ponty, and Jean-Paul Sartre, whereas others are more enamored with the traditions of Bertrand Russell through Ludwig Wittgenstein, and forward, to contemporary philosophers of science and mind. In addition, there are others who are clearly either informed by various forms of critical theory inspired by such authors as Michel Foucault, Jacques Lacan, or Gilles Deleuze; feminists of various orientations; and cultural theorists. All of this is put to the service of understanding, analyzing, critiquing, or rebuilding psychology, subjectivity, or human activity.

Ethical Principles

On the one hand, ethical principles are somewhat less germane for TP than they are for fields that engage in active research with people or nonhuman animals. Normally theoretical work does not encroach on the private lives of those investigated. However, more broadly conceived moral considerations form part of the traditions of theoretical psychology if only because a number of theoretical psychologists believe that psychology is a "moral science" as that term was used in the nineteenth and early twentieth centuries. That is, essentially human characteristics on this view always entail questions of how we ought to live and hence invoke questions about what constitutes the mores and norms of human life. This is a position that was already well developed in, for example, the work of John Dewey.

Key Values

TP seems to have a critical wing and a more salutary, pedagogic wing. The critical wing of TP has been in existence for some time and, with a long tradition of critique in philosophy and social theory, examines psychology for its covert commitments to individualism and support of the status quo. Sometimes, this wing goes by the name of critical psychology, and it has strong affinities with the Frankfurt School, postmodernism, the work of continental thinkers such as Michel Foucault, second-wave feminism, and the New Left of post World War II. It values criticism and analysis of psychology's social commitments in the name of an emancipatory psychology.

The pedagogic wing of TP is concerned with the analysis of the philosophical commitments of psychology and generally supports the espousal of "good science." In that vein, it is more concerned with an elaboration and elucidation of issues in psychology that can be clarified through the judicious use of the philosophy of science, including such issues as reductionism, determinism, the nature of the mental, and so on (e.g., Kukla 2001).

Conceptualization

Nature/World

Theoretical psychologists are not so much concerned with nature per se as they are with the question of just what constitutes a natural category or if, indeed, it is possible to ever know just what is “natural” about human existence. This is a question about whether it is even within our capacity to distinguish that which is “natural” from the long legacy of evolutionary, social, and historical existence and whether such a question even makes sense. Although not always a concern for theoretical psychologists, it is an ongoing feature of many of the debates that constitute the field.

Human Being

Unlike most of psychology, theoretical psychologists have generally taken a special interest in what it means to be human or with the related question of personhood. The functional orientation of most of psychology, that is, the indeterminate nature of functional categories in psychology (e.g., memory, attention, cognition, personality), does not commit itself to a perspective on what it is to be human. A long history of human science scholarship in philosophy and psychology has led to considerations from Wilhelm Dilthey through Martin Heidegger and into contemporary psychology of just what constitutes human experience, thought, action, and embodied existence. On the other hand, this tradition is also the focus of considerable critique, especially beginning in the 1980s when “liberal humanism” was viewed as Eurocentric and patriarchal. In a related vein, the human/nonhuman distinction has itself been a question of considerable debate as psychology considers just what it is that is unique about the experience of various kinds of species.

Life and Death

The question of life itself is not a special focus of TP, but the nature of death has been a major preoccupation in the existential literatures that have spilled over into psychological debates in the 1960s forward. The manner in which the possibility of death shapes our understanding of

life, or even “the denial of death” in Ernest Becker’s words, continues to be a source of concern precisely because it is knowledge of death, argue some scholars, that makes human beings psychologically unique beings in the world.

Reality

Notably forms of realism and antirealism have been the focus of attention for the past two or three decades in TP. Social constructionism in various forms has taken up an antirealist stance that led to a vigorous defense of realism by both cognitivist and post-Marxist scholars. In recent years, these debates have settled into a truce since neither side appears to have been successful in compelling a change of view among its opponents; furthermore, there have been few if any new arguments.

Knowledge

The creation and dissemination of new knowledge has been a focus of considerable investments in TP. Influenced by the sociology of knowledge and the social studies of science, the question here revolves around the nature of empirical knowledge in psychology and its relationship to socially implicit or explicit agendas for knowledge construction. For example, a long-standing issue is the nature of individualism in psychology, the preference for explanations at the individual level, and how this has limited the possibilities of other forms of knowledge that understand psychological accounts as inherently praxical, collective, and linguistic.

Truth and Perception

The question of truth and perception is related insofar as theories of perception can be divided into “representational” or “direct.” Representational theories of perception have constituted the mainstream in psychology and have frequently been taken as the establishment version of psychological perception. Truthful or accurate knowledge is a matter of inference from representational knowledge; in this case, “truth” is not directly knowable. “Direct” theories of perception, however, have a realist cast and make access to a knowable world a standard feature of their take on perception. Elsewhere in TP, discussions

of “truth” are not much in vogue if only because they are often seen as leading to intransigence and are viewed as essentially irresolvable.

Time

For some theoretical psychologists, time has a special place in their lexicon because of its place in the work of philosopher Martin Heidegger and his influence on existentialism and humanism. Access to the world is through history, never outside it. This has been taken up in various ways in contemporary theory either through a hermeneutic understanding or indirectly via postmodernism.

Consciousness

That consciousness has returned as a topic to psychology with a surprising vigor is now clear. Having made up the core of psychology in the late nineteenth century, it vanished under behaviorism and mid-twentieth century experimental psychology. With the emergence of consciousness as a *biological* and *philosophical* problem in the 1980s and 1990s, psychology has returned to the question of consciousness in order to investigate the problems of cognition in the context of consciousness and brain function. TP has followed suit and is engaged in many of the same debates as philosophers of mind on, for example, such issues as “the hard problem” of first person consciousness.

Rationality/Reason

Neither rationality nor reason has a particularly special location in the work of TP. However, reason remains a feature of cognitive psychology and by association has remained of some interest to theoretical psychologists.

Mystery

With the exception of occasional references to wonder, mystery or the *mysterium tremendum* in the psychology of religion, TP has shied away from approaching these issues. Although reflecting, perhaps, a lack of genuine concern, it is more likely that it reflects psychology’s long inhibition concerning matters religious other than in the most obvious and superficial way (e.g., as demonstrated in survey research).

Relevant Themes

The problems of language generally and the special case of a discursive psychology have been taken up in a major way by TP in recent years. By this is meant the way in which psychological phenomena can be investigated in discourse. Secondly, it claims that some topics in traditional psychology (e.g., attitudes, memory) can be reconceptualized as problems of discourse.

The problem of embodiment has also been taken up of late under a range of influences that have seen a return of the body as a vehicle of expression psychological existence, the site of power, or the foundation of a gendered life (Stam 1998).

Cross-References

- [Emergence, Theories of](#)
- [Epistemology](#)
- [Functionalism](#)
- [Methodology in Psychology](#)
- [Phenomenology](#)
- [Psychoanalysis/Depth Psychology](#)
- [Reductionism](#)
- [Science and Scientific Knowledge, Sociology of](#)

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Theories of Governing

- [Political Theory](#)

Theories of Government

- [Political Theory](#)

Theories of Light and Color

- [Prismatic Theology](#)

Theory of Empathetic Understanding

- [Simulation Theory](#)

Theory of Games

- [Game Theory](#)

Theory of Knowledge

- [Epistemology](#)

Theory of Meaning

- [Meaning, the Concept of](#)

Theory of Mind

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Related Terms

[Mentalizing](#); [Mindreading](#); [Theory of mind debate](#); [Theory theory](#)

While all animal species have social capacities, the human species has particular social skills, one of these skills, perhaps the most important, being the capacity to read the minds of others. Humans possess the cognitive capacity to attribute mental states, that is, beliefs, intents, desires, pretending, knowledge, etc., to themselves and others as well as to understand that others have beliefs, desires, and intentions that are different from their own. Human beings have developed the ability to understand other persons as “minded creatures” (Stueber 2006, 1). To put it differently, they understand that others also “see what is in front of them, remember things that happened to them in the past, deliberate about what to do in the future; they can feel pain, be happy, feel depressed, guilty, ashamed, or proud” (Stueber 2006, 1). Furthermore, human beings know that the way people act correlates with the state of mind they are in at the moment of action. Hence, a person knows the state of mind of another person; she can predict (at least to a certain degree) how the other person is going to act in a certain situation. For example, if I know that one of my students is terrified of getting blackouts whenever he has to take an exam and I know he is a very engaged student, I can predict that he probably will take some tranquilizer some hour before the examination takes place.

Understanding, knowing, or predicting other’s minds and action is known as mentalizing or mindreading. In Alvin Goldman’s words, “It is mind thinking about minds” (Goldman 2006, 3). Human beings, it is argued, are mindreaders. Some refer to humans as Machiavellian primates and mean that human beings read other’s minds in order to predict their behaviors and thus to outsmart them. Others maintain that the human capacity to read other minds is innate for survival purpose. There is also a large agreement that empathy is one core capacity of mindreading. (See article on “► [Empathy](#)” by Karsten Stueber in this encyclopedia.)

Reading and understanding one’s own and other’s minds is also referred to as the *Theory of Mind (ToM)*, which, at least originally, is a philosophical theory. The ToM is *folk Psychology* as a theory. Briefly, folk psychology can be

formulated as follows: If x wants y and believes that z is necessary to obtain y , then obviously, x will do z . If you (x) want to give a good lecture (y) and you believe that in order to do this, you need PowerPoint presentations (z), you will create such presentations (z). Philosophically, mindreading consists in first-person and third-person mindreading. First-person mindreading is directly given and non-inferential but vulnerable to first-person modification (which I call *mindwriting*). In relation to other persons, we have the possibility to disguise or fake our states of mind. To put it with philosopher Pierre Jacob's words, relying on the classical view of mindreading held by philosophers as well as psychologists, "[a] first-person mindreading consists in forming a belief about (or in metarepresenting) a psychological state of one's own" (Jacob 2009, 572). Following the classical view of mindreading again, "a task of third-person mindreading consists in forming a belief (or judgment) about (or in metarepresenting) another's psychological state" (Jacob 2009, 572).

Today, the problem of, or rather the complexity involved in mindreading cannot longer be grasped from only one disciplinary angle. On the contrary, at least three disciplines may be recognized as major contributors to the understanding of mindreading, namely, philosophy, psychology, and neuroscience. Philosophy contributes with its theories based on analyses of, reflection on, and argumentation about observations of human behavior. Psychology (social and developmental psychology in particular) contributes with experimental studies concerning how the capacity of mindreading evolves and develops during infancy and childhood. The contribution of the neurosciences exists in findings from studies of brain injuries, lesions, brain deficiencies (e.g., autism), etc. Cognitive neuroscientists have the advantage of having access to brain imaging technologies, which enable them to study the brain-correlations of different aspects of mindreading in healthy people (e.g., disgust, fear). This implies that different methods are applied to answer the following questions:

1. How do people mindread others – that is, attribute mental states to them?
2. How do people mindread themselves?

3. How is the mindreading capacity, or skill, acquired?

4. What are the contents of people's concepts of mental states? How do they conceive the difference between belief and desire, anger and disgust? (Goldman 2006, 21)

In addition:

5. How does the story of mentalizing fit into the larger story of human cognition? What is the cognitive architecture of mentalizing, and how is it related to the architectures of other cognitive domains?

6. What is the relationship between mentalizing and other forms of social cognition? For example, how is it related to empathy and imitation? What is its relationship to clinical problems such as autism and psychopathy?

7. What is the evolutionary story behind human mentalizing? (Goldman 2006, 21)

It becomes obvious that several theories have emerged in order to try to answer these questions.

The Theory Theory of Mind

One of the dominant theories today is the *Theory Theory of Mind (TToM)* or the *Theory Theory Paradigm*. Roughly, according to the advocates of this theory, our capacity of mindreading is entirely dependent of our capacities to theorize. More precisely, that we understand others and ourselves is due to theoretical reasoning and the causal laws of folk psychology.

This theory comes in two main versions: the *Modularity Approach* and the *Child-Scientist View*.

The Modularity Approach

Simon Baron-Cohen outlined four distinct but interrelated mentalizing modules for understanding mindreading, not least for understanding the capacity of mindreading in autistic persons. These modules are part of a general evolutionary psychology approach (Baron-Cohen 1997). A person has to acquire all four modules in order to develop a full-fledged theory of mind.

The first module is called the *Intentionality Detector (ID)*, which is understood as a kind of perceptual device for interpreting motion in terms of goals and desires. The ID module is based on David Premack's idea that goal detection is hard-wired into the human species (Premack and Woodruff 1978). Hence, it is primitive and survival-related, that is, should one approach or avoid the moving agent. Therefore, it is activated whenever there is any perceptual input that might identify something as an agent (with goals and desires), that is, anything with self-propelled motion or anything that makes a non-random sound. However, Baron-Cohen also included inanimate motion (not self-propelled motion) into the picture. Even if this can lead to false interpretations, for the sake of survival, it is better to spot a potential agent and check its desires and goals than to ignore it (Baron-Cohen 1997, 34–35). The intentionality detector is senses-related, namely, vision, touch, and audition. The intentionality detector is similar to what Leslie calls the infant's Theory of Bodies, and even more similar to what he calls ToMM1 (theory of Mind Mechanism, System 1) (Leslie 1994).

The second module is the *Eye-Direction Detector (EDD)*. This module only works through vision and has three functions: *detecting eyes*, *detecting the direction of eyes*, and *interpreting gaze as "seeing."* The first function is activated whenever the EDD detects eye-like stimuli. Two-month-old infants look almost as long at the eyes as at a whole face but look significantly less at other parts of the face (Baron-Cohen 1997, 38–39). The second function can be translated into: "Are these eyes directed at me or at something else?" Six-month-old infants look two to three times longer at a face looking at them than at a face that looks at something else. Furthermore, the infants will smile, because eye contact triggers smiling and positive emotions (Baron-Cohen 1997, 40–41).

The third function includes knowing from experience that eyes can see. From very early on, infants presumably distinguish seeing from not-seeing; or seeing A from seeing B (Baron-Cohen 1997, 42–43).

The third module that has to be in place in order to develop a full-fledged theory of mind is the *Shared-Attention Mechanism (SAM)*. This important module is responsible for *triadic representations*, in other words, the relationship between an agent, the self, and a (third) object or agent. For example, daddy sees I am watching you! This module is a further development of the Eye-Direction Detector. Nine-month-old toddlers begin to use protodeclarative-pointing gestures. For example, the infant points with an outstretched index finger at an object, gazes at it, looks back and forth a few times to the other person in order to make sure that the other person is looking at the same thing (Bates et al. 1979). Hence, the SAM is also related to the Intentionality Detector (Baron-Cohen 1997, 44–50).

The fourth and perhaps the most important module is the *Theory-of-Mind Mechanism (ToMM)*, after Alan Leslie's theory (1994). The function of this module is to employ a theory of mind, that is, to represent the epistemic mental states such as pretending, thinking, knowing, believing, imagining, dreaming, guessing, and deceiving. This is the "agent-attitude-proposition" function. For example, John believes "it is raining" (Baron-Cohen 1997, 51). Leslie calls these *M-representations* (Leslie 1994). M-representations are crucial to the ability to represent epistemic mental states. This is so because, the attitude is directed toward a proposition, and the proposition can be false while the whole M-representation is true. For example, the proposition "it is raining" will be false if it is not raining, but the whole M-Representation can still be true if John actually *believes* it is raining. Hence, the ToMM allows for *referential opacity* (or non-substitutability), which is a key property of epistemic mental states (Baron-Cohen 1997, 52). The second function of the ToMM is to gather all knowledge into a coherent whole in order to make a useful theory of mind, which is needed to be able to interpret social behavior rapidly and flexibly. The epistemic mental state young children come to understand first is "pretending." From the age of 36–48 months, an infant shows additional epistemic states such as knowing, and

that knowing is a product of perception (Pratt and Bryant 1990). At the same age, they come to understand both true and *false beliefs* (Wellman 1990; Perner 1991). They come to understand deception and grow the ability to deceive others (Sodian and Frith 1992; Frith and Frith 1999).

In summary, at the age of 9 months all infants acquire the Intentionality Detector and the basic functions of the Eye-Direction Detector but the only type of representations they are able to make are dyadic. Between the age of 9 and 18 months, the infants master the Shared-Attention Mechanism and hence their representations become triadic. Between the age of 18 months and 4 years, the child develops a Theory of Mind Mechanism (Baron-Cohen 1997, 55–56). Autistic conditioned children do not (or do not fully) develop the ToMM, which is one of the reasons for why they experience difficulties in socializing.

The Child-Scientist Theory

The child-scientist theory dictates that young children's performance on mentalizing task changes over time as a function of changes in their grasp, or understanding of mental concepts. These changes in concepts, or conceptual understanding, reflect successive stages in children's theories of mind. Therefore, mental concepts must be theoretical concepts. Hence, all determinations of the instantiation of mental concepts in both self and others must be inferential in character. Indeed, it is argued that we attribute mental states to others and ourselves by way of analogical inference. Roughly explained, the analogical inference principle is the idea that other human beings are "very like me" (Melzoff and Moore 2007). In the language of logic, we induce the other from ourselves. Simply put, *x* observes *y*, *y* is like *x*, hence *x* understands *y*. This is Andrew Meltzoff's *theory of imitation* in a nutshell (Meltzoff 2005, 56). For instance, several psychologists have observed that when newborns are put in an environment together with other babies, they try to comfort other crying babies by way of motor mimicry (imitation of behavior) and that some even try to capture the attention of their mother in order to lead her attention to the baby

in need (Goleman 1997, 13–26). In other words, baby A sees baby B crying, thinks "baby B is like me. When I cry my mother comforts me, thus baby B needs mother. When I cry mother will come and comfort baby B." Babies from 42 min to 71 h old are perfectly capable of *reproducing or mimicking* facial movements of others. Psychologists observed that the infants perfectly reproduced tongue protrusion and other facial displays modeled before them (Melzoff and Moore 1983, 703).

The Simulation or Empathy Theory

Another theory of mindreading is known as the *Simulation or Empathy Theory (ST or ET)*. The hybrid version of this theory is perhaps the most liberal since it does not exclude that there may be mirror-neuron mechanisms at work in mindreading nor does it exclude the importance of theorizing for that purpose. Nevertheless, paradigm simulation theorists refrain from the idea that we need theories in order to understand our own and others' mental states. The mental process *p* is a mental simulation of the target mental process *P'*. What the advocates of the hybrid and the paradigm version have in common is the assertion that we put ourselves in another person's mental shoes by way of simulation, imagination, and projection (Goldman 2006; Stueber 2006). (See article on the "► [Simulation Theory](#)" by Henrik Bohlin in this encyclopedia.)

The Rationality Theory

The last theory is the *Rationality Theory (RT)*, which argues that human beings are rationalizers. Humans assume that their fellow humans are rational and seek to map their thoughts and choices by means of this rationality postulate. This theory also comes in two versions, namely, a strong (SRT) and a weak version (WRT). In the strong version, attributors will always assign some belief *P* to a target and also assign to her beliefs in all the logical consequences of *P* (Goldman 2006, 55). To cite Daniel Dennett,

“we aspire to rationality and without the myth of our rationality the concepts of belief and desire would be uprooted. Folk psychology, then, is *idealized* in that it produces its predictions and explanations by calculating in a normative system; it predicts what we will believe, desire, and do, by determining what we ought to believe, desire, and do” (Dennett 1987, 52). According to him, to assume that something is an intentional system is to assume that it is rational. Hence, the assumption that *x* believes *p*, *q*, *r* . . . also implies that *x* is supposed to believe what follows from *p*, *q*, *r* If an intentional agent believes the truths of logic, he is also supposed to follow the rules of logic (Goldman 2006, 55).

Weaker forms of the rationality theory are proposed by Edward Stein (among others) (Stein 1996, 133–134). A first variant is that “attributors interpret targets as always conforming to *some* normative principle of reasoning” and the other variant is that “attributors interpret targets as *sometimes* conforming to *some* normative principles of reasoning” (Goldman 2006, 58). Christopher Cherniak would call these proposal variants of a *minimal rationality* (Cherniak 1986). According to him, this line of thinking avoids the problem of inconsistencies in a set of beliefs. The problem is that the theory becomes rather vague (Goldman 2006, 58).

These theories of mind being presented, I want to challenge the reader to find out whether the six questions mentioned above can be answered by way of applying these theories. In my opinion, none of them can tackle all questions. Hence, the remaining quest is: “Which theory is preferable for in order to answer which question?”

Cross-References

- Autism
- Emotion
- Empathy
- Experience
- Imagination
- Neuroscience

- Perception
- Psychology
- Self
- Simulation Theory

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Theory of Mind Debate

► [Theory of Mind](#)

Theory of Relativity, The

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The theory was devised by Albert Einstein. It is divided into two parts. The special theory deals with the effects on space and on time of relative motion. It leads to the formulation of spacetime. One of its consequences is that no physical object can be accelerated to a speed exceeding that of light. Another is that matter is a locked-up form of energy, a proportion of which can be released in nuclear reactions, like those taking place in the Sun. The general theory embraces the special theory but also includes the effects on space and time of gravity and accelerated motion. It replaces the notion of gravitational forces with a curved space and leads to the prediction of black holes. The general theory is the model used to describe the universe as a whole.

Theory of Vision

► [Optics in Islam](#)

Theory of What There Is

► [Ontology](#)

Theory Theory

► [Theory of Mind](#)

Theosophy

► [New Age Religions](#)

Therapy

► [Counseling Psychology USA/Europe](#)
► [Occupational Therapy](#)

Theravada Buddhism

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Theravada (“The School of the Elders,” the most important and only remaining school of the “Hīnayāna” tradition, meaning “The Small Vehicle”) is the oldest surviving Buddhist school and has a widespread following in Sri Lanka and Southeast Asia. Accordingly, it is relatively conservative and generally closer to early Buddhism. Theravada implies meditation techniques like samatha and vipassanā. In Theravada, the individual realization of bodhi (awakening) is the ultimate goal and usually equated with the term “nirvāṇa.” On the contrary, in nondualist Mahāyāna and partly Vajrayāna tradition, nirvāṇa does not stand for complete enlightenment, since it still implies an opposition (saṃsāra).

Thermodynamics

► [Chemical Thermodynamics](#)

Thorn of Alterity

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The idea of the “thorn of alterity” expresses the conviction that alterity (or otherness) is not something that is added to the self or adds to the self. Rather, it denotes a basic characteristic of the self because it is not grounded or founded in or by itself and cannot be thought without the o/Other. It turns against the idea of an autonomous or “glorified” self but refers to the fundamental human experience that one’s own existence is given, unindebted, and not at our disposal. Art, media in general and media art in particular, can sensitize the human being for the alterity or otherness and discuss questions of human existence that are theologically relevant. These questions deal first and foremost with the meaning of human life and the “from where” and “whereto” of human existence. What exactly the o/Other is, if it is another person, or an ultimate reality – often referred to as God – is open to philosophical and theological discourse.

Time

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Related Terms

[Arrow of time](#); [Creation](#); [Dark energy](#); [Flow of time](#); [Inflation](#); [M-theory](#); [Planck time](#); [Relativity theory](#); [Second law of thermodynamics](#); [Space-time](#); [Time reversal invariance](#)

Time According to Relativity Theory

We owe our modern understanding of time to Einstein’s theory of relativity. Einstein showed that two observers in uniform relative motion do not agree about estimates of time nor of distance. For example, an astronaut on a space mission to another planet would disagree with the mission controller as to the time the journey takes and also as to the distance traveled. According to the mission controller, time passes more slowly in the moving space craft than it does on earth. This effect is known as time dilation. At speeds encountered in normal everyday situations, these differences are too small to notice, but at speeds approaching that of light (300,000 km/s), they become noticeable.

These differences can be understood once one abandons the idea that 3-dimensional space and 1-dimensional time are separate entities. Instead they are to be regarded as welded together to form a 4-dimensional ► [space-time](#). As ordinarily perceived, space and time are but projections of that 4-dimensional reality. And just as a 2-dimensional image (a photograph, say) of a 3-dimensional object depends on the viewpoint adopted, so the time interval between two events (the launch and subsequent arrival of the space craft) will depend upon one’s viewpoint – in this case one’s speed.

Though observers disagree over estimates of time and of distance, they do agree about the separation of events in 4-dimensional space-time. For this reason, many physicists are inclined to accept that what is real is space-time; space and time separately are but appearances of that reality.

For further information as to the way time is viewed in relativity theory, see entry ► [Relativity](#).

The Flow of Time

Nothing about space-time changes. It is quite static. For something to change, it must change in time. But space-time is not in time; on the contrary, time is in it. Because of its static

nature, space-time is sometimes referred to as the block universe.

And yet, of course, we are all aware of a *flow of time*. This notion of things changing comes not from the physics of relativity theory, but rather from our conscious awareness of space-time. Consciousness is sometimes described as directing a searchlight beam onto the time axis of the block universe. The point it picks out is what we call the instant “now.” We are consciously aware only of this one instant, and that it is why it is singled out to be special. As far as physics is concerned, however, there is nothing at all special about it; it has no different a status to any other instant of time. No sooner has the searchlight beam of consciousness identified this particular instant of physical time to be labeled “now” than it moves on, in the direction labeled “future” to alight on the next instant of time. And so on.

A “flow” involves a change of something in a given time. The flow of a river is a measure of how much water has passed a chosen point in a given time. But what do we mean by a flow of time? How much time has passed in a given time? That does not make sense. Not unless we are talking about two types of time. How much physical time, as measured on a clock, has elapsed in a given span of internally assessed mental time? That *does* appear to make sense, and gives rise to the idea that we are indeed dealing with two types of “time.”

Physical time belongs to space-time. We measure it with a clock. The mental time of consciousness appears to have its own ways of being measured – or at least of being roughly estimated. If we sit still, with our eyes shut, we cannot see a timepiece, we are still aware of the passage of time. We become aware of how long we have been sitting there with our eyes shut – at least to the extent of knowing whether we have been doing it for a short time or a longer time. We might even hazard an estimate as to how long we have been doing it in terms of seconds and minutes. We can then, on opening our eyes, compare that internal mental estimate with how much time has passed in the physical world according to a reading on a clock. Sometimes we

underestimate the physical time, whereupon we talk of “time flying”; on other occasions (particularly if we are bored), time appears “to drag.”

How we make internal mental estimates of time is not understood. It might have something to do with the progressive fading of distant memories. So if our recollection of an event is somewhat hazy, it is likely to indicate that a significant passage of time has elapsed since then. Another suggestion is that the estimate might be related to how much has happened since the event in question. If, for instance, one knows that one has had many different thoughts, feelings, and emotions since deciding to sit still with one’s eyes closed, then that too is an indication of how much time must have passed in order to accommodate so many mental experiences. Perhaps the mind is unconsciously keeping track of various bodily sensations, such as one’s heart beat or breathing, and these provide quantitative guidance as to how much time has passed. These are but guesses. One simply does not know how we do it.

The Beginning and End of Time?

The universe began with a big bang. Distant clusters of galaxies are still receding from us in the aftermath of that explosion. But the big bang was no ordinary explosion. It did not take place at a given point in space, the debris subsequently spreading out into surrounding space that had previously been unoccupied. There was no space outside the big bang. It is space itself that is expanding and carrying the galaxies along with it – in much the same way as small coins glued to the surface of a balloon would move apart as the balloon was inflated.

It would thus appear that not only would all the contents of the universe be squashed down to a point at the instant of the big bang but also all of space. Space initially had no volume; there was no space. For this reason, it is believed that space came into existence at the instant of the big bang. And not only space. Because of the intimate connection between space and time (seamlessly welded to each other to form space-time), it is

also believed that the instant of the big bang saw the coming into existence of time.

This, however, is not certain. There is a theory called M-theory that envisages that our big bang might have originated out of a previously existing universe. A tiny region of that universe suddenly underwent a rapid expansion called ► [inflation](#) and our own universe came into being. Likewise, a small region of our universe might at some point in the future undergo inflation, giving rise to a further daughter universe. If this scenario is correct, then there would indeed have been time before our big bang. As for the universe that originally spawned our known universe, it too might have originated from an even earlier universe. Indeed, this process of producing universes might go back indefinitely, there being no beginning to the process, and hence no beginning to time.

What of the future? One idea was that the expansion of the universe might come to an end one day. This would require the mutual gravity operating between the receding galaxy clusters to be strong enough to bring them to a halt. Thereafter, they would be drawn together again, resulting in a big crunch and the elimination of the contents of the universe, of space, and of time. It is now known, however, that there is an additional effect at work – a repulsion due to ► [dark energy](#) (a property of space itself). This is actually causing the clusters to accelerate away from each other. The current consensus is that the expansion of the universe will continue indefinitely. This in turn means that time will have no end; it too will continue indefinitely.

The Arrow of Time

We turn now to the ► [arrow of time](#). Imagine that you are viewing a film. It begins with a cloud of dust swooping down upon a pile of rubble lying on the ground. The cloud disappears from sight, and the rubble leaps up into the air spontaneously. It comes together miraculously to form a factory chimney. Flames and smoke are sucked into a hole at its base. The hole seals itself, and we end up with an intact chimney – intact apart from some sticks of dynamite sticking out of its base.

It is, of course, obvious what is going on. Play the film the other way round and we begin with a chimney and dynamite sticks. There is an explosion sending out flames and smoke from the base. The chimney collapses to a pile of rubble, sending up clouds of dust which gradually disperse. Such behavior makes sense. Clearly this is the correct way of playing the film. The fact that we can tell which way the film ought to be played, i.e., which is the correct way to show the direction of time, is called the arrow of time. With regard to any event, we are able to distinguish which other events in the sequence lie in its past, and which in the future of that event.

Or can we? Let us view another film sequence. This time the camera is placed above the center of a snooker table, pointing directly down. Two snooker balls enter the field of vision traveling at the same speed – one from the top of the frame, the other from the bottom. They collide in the middle and go out of frame in opposite directions, left and right respectively. Now the film is shown in reverse. The two balls enter from the sides of the frame left and right, collide in the center, and go out in opposite directions, top and bottom. Which was the correct way to show the film? Provided the balls show no detectable signs of slowing down, it is impossible to tell. Both renditions of the collision look perfectly feasible. There is nothing to choose between them.

What of a third film, this one showing the swing of the pendulum of a grandfather clock: left, right, left, right, etc.? Play it backward and we get right, left, right, left, etc. Again it is impossible to tell which is the correct way to show the film; both alternatives look equally plausible.

So some processes (a chimney collapsing) look all right one way but not the other, whereas others (snooker balls colliding, and a pendulum swinging) do not. The intriguing point is this: Complex objects such as chimneys and rubble are made up of atoms and molecules. If we were able to film two atoms colliding and bouncing off each other (like the snooker balls), we would not be able to tell which was the correct way to show the film. Physicists call this property of fundamental particles ► [time reversal invariance](#). The same would go for a film of an atom vibrating.

Again (as was the case with the vibrating pendulum), there would be nothing to distinguish one direction of time from the other.

So, we have the situation where we put together a whole lot of individual atomic processes – none of which gives us any clue as to the direction of time – and we end up with a chimney sequence where we *do* know the direction of time! Somehow the arrow of time has sneaked its way in. But how?

In fact, there is no mystery. Let us return once more to the snooker table. Earlier we described a pair of balls coming into view from the top and bottom of the frame, colliding in the middle, and exiting left and right (or it might just as well have been the other way round – we could not tell). We continue to watch the film. A second pair of balls enters, this time from opposite corners of the frame. They exit left and right. They are followed by further pairs, coming in from random directions, but always leaving left and right – exactly. An odd coincidence? It seems as though something is “sucking” them out along those left-right directions. But in reality, we know of no such behavior.

Now we play the sequence in reverse. This time the balls enter left and right, along the exact same paths, and then leave in random directions. This *does* make sense. We deduce that there are two players positioned out of shot, one to the left and the other to the right. They are deliberately aiming the balls at each other, which then scatter randomly. From this we learn that it is possible to take a whole collection of events, none of which individually contains any information on the direction of time but, from the way the events *are oriented relative to each other*, we can get to know the direction of time. It is not that the reverse sequence is impossible. A relative orientation such that the balls come from random directions and all end up going in the same direction is clearly possible, but unlikely – highly unlikely. It is simply that an orientation of collisions the other way round is more probable.

And this is what is happening at the atomic and molecular level during the chimney sequence. It is far, far more likely that atoms, at the start, in the shape of a chimney plus sticks of dynamite, will

end up as rubble and dust, than the other way round. Nevertheless, the reverse is possible. It has to be. Time reversal invariance guarantees that.

The fact that time has an arrow is where the ► [second law of thermodynamics](#) comes in. There are various ways of expressing this law, but essentially it is saying that disorder increases with time. A chimney is an ordered state of matter; a higgledy-piggledy pile of rubble is not. Because of the degree of order, there are relatively few orientations of the bricks that would constitute a recognizable chimney. On the other hand there is a vast – indeed limitless – number of orientations of the bricks that would make up a disordered pile of rubble. Suppose we are shown two photographs, one showing a chimney, and the other a pile of rubble, and are asked which came first. We know that one of the relatively rare combinations of atoms known as “a chimney” is much more likely to end up as one of the limitless number of combinations known as “a pile of rubble,” than the other way round. If one started out with one of the combinations known as “a pile of rubble,” that would almost certainly be succeeded by one of the other many combinations known as “a pile of rubble” rather than by one of the rare combinations known as “a chimney.”

But you might argue that disordered piles of bricks do sometimes become chimneys. True. But this tends to happen only in the case of *open systems* – meaning only for situations that are open to influence from outside. In the present case, it is the outside influence of construction workers. The second law of thermodynamics applies only to *closed systems* where one takes into account all relevant factors. The bricks and cement do not assemble themselves into a chimney. It is done with the help of builders. The builders use up energy. The energy comes from the breakdown of food and the conversion of oxygen into carbon dioxide through breathing. The food was grown with the help of an input of energy from the Sun. The dissipation of heat and light from the Sun is a process causing a great increase in disorder. (This can be readily appreciated if you were to think of the reverse: heat and light scattered randomly throughout space all converging by chance, in an orderly fashion,

onto a single location – the Sun.) Thus, to arrive at an effectively closed system – one to which the second law can legitimately be applied – we must take all these factors into account, including what is happening to the Sun. Once we have done that, we can rest assured that *overall* the second law has been obeyed and there has been a net increase in disorder. As long as the overall closed system operates in accordance with the law, localized increases in order, such as the building of a chimney, are permitted.

How does this second law of thermodynamics fit in with the block universe idea? The law is often stated in the form: Disorder increases with time. So, does that not imply the dynamic passage of time? No it does not. All that the second law tells us is there is more disorder toward one end of the time axis (that labeled “later,” and having, by convention, the higher values of the time coordinates), than there is toward the other end (the one labeled “earlier,” and having the lower values). But that in itself does not require that we mentally experience events sequentially in the direction toward the end labeled “later,” rather than the reverse. The second law is solely concerned with describing the physics of the situation – and in particular that the time axis is asymmetric as regards order and disorder, not how a conscious being might perceive it.

A Smallest Unit of Time?

We divide up time into ever smaller intervals: years, months, weeks, days, hours, minutes, seconds, milliseconds, and so on. But is time infinitesimally divisible, or is there a smallest unit of time? Do we eventually get to a basic unit of time that is no longer capable of subdivision?

At present we have two great physical theories: quantum theory and general relativity. The eventual aim is to reconcile these two into a combined theory of quantum gravity. Such a theory is bound to depend very heavily on three fundamental constants: (1) the gravitational constant, G , governing the strength of gravity in both Newton’s theory of gravity and Einstein’s general theory of relativity; (2) Planck’s constant,

h , governing the size of quantum fluctuations, and (3) the speed of light, c , which figures prominently in both relativistic and quantum physics. If there were to be a smallest division of time, then it is expected that there would be some formula for it. And such a formula would involve these three fundamental constants. Using these constants, the German physicist Max Planck, one of the founders of quantum theory, found that there was a unique way of using them to define a quantity with the dimensions of time:

$$t_P = (hG/2\pi c^5)^{1/2} \approx 5.3 \times 10^{-44} \text{ s}$$

This is named the ► **Planck time**. It is expected that, apart from some unimportant small numerical factor, this would broadly speaking be the form of expression for the smallest unit of time – assuming there were such a thing. Unfortunately, the Planck time is almost inconceivably small compared to any time interval that has ever been measured, or is ever likely to be measured. The shortest time interval measured is 10^{-16} s – a factor 10^{27} bigger than the Planck time. It therefore appears that the question of whether there exists a smallest unit of time is likely to remain unresolved.

Time and Religion

The idea that there might not have been time before the universe had been created is not new. St Augustine reached that conclusion long before today’s cosmologists. Augustine, of course, knew nothing about the big bang nor about space and time forming a 4-dimensional space-time, such that one could neither have space without time nor time without space – and hence the argument that if space originated with the big bang, so might time also.

Instead he argued along the following lines: How do we know there is such a thing as time? It is because things change in time. If nothing changed, or had ever changed, would we know what “time” was? No. It would be a meaningless concept. *A fortiori*, if there were no things at all, changing or otherwise, because they had not been

created, the concept “time” would indeed be devoid of meaning. In this simple way, Augustine recognized that time was as much a property of the world as anything else and hence would have had to have been created along with everything else. Thus Augustine did not believe in a God who had always existed, and then at some particular point in time decided to create a universe.

Turning to our modern-day understanding of how the universe came into being, and God’s role in this, we are not to regard God as the cause of the big bang. Cause follows effect. In this context, the effect is the big bang, so its cause must have occurred before the instant of the big bang. But where the big bang is concerned, there is no before. Thus it is meaningless to talk of it having a cause. It was this that led Stephen Hawking in his best-seller *A Brief History of Time* to pose the rhetorical question “What place then for a creator?”

In doing so, Hawking is confusing two words which, although in everyday conversation might be used interchangeably, in theological discussion they acquire their own distinctive meanings. The words are “origins” and “creation.” The former is all to do with how things got started – how the universe originated. This leads to a consideration of the big bang, and as such, comes within the province of the scientist. The creation question on the other hand is altogether different: “Why is there something rather than nothing?” It is to do with the ultimate reason as to why anything exists. It is as much concerned with existence at the present instant as at the first instant. It is concerned with what is keeping us in existence. In the phrase coined by the theologian Paul Tillich, God is The Ground of All Being. And because this is seen as a continuing activity on God’s part, rather than a one-off action at the beginning, theologians tend to refer to God not only as the Creator, but also as the Sustainer of the world.

Such then are reflections arising out of the possibility of there being no time before the big bang. But what if M-theory is correct, and there was not only time before our own particular big bang, but universes and their daughter universes stretch back in time indefinitely so there was no beginning nor end to this process? Would that get rid of the need for a Creator God? Hawking, in his

later book, *The Grand Design*, thinks so. In it he claims to have now answered the question “Why is there something rather than nothing?” His answer? M-theory. But, of course, that merely raises the question “Why M-theory?” Why indeed are there any laws of nature? Why is the world intelligible rather than being chaotic, with anything and everything happening? Might it not have taken an Intelligence to put it all in place?

Finally, various thoughts with a bearing on theological matters are prompted by the idea of a block universe. These are dealt with under the entry ► [Relativity](#), to which you are referred.

Cross-References

- [Astronomy](#)
- [Cosmology](#)
- [Quantum Theory](#)
- [Relativity](#)
- [Space and Time](#)

Time Dilation

- [Relativity](#)

Time Reversal Invariance

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This refers to a fundamental symmetry of the laws of motion, such that reversing the motions of a set of objects leads to a possible state of motion. For example, if one considers the motions of a pair of colliding subatomic particles to be reversed, we would get another example of a possible collision. A video showing the vibration of a pendulum looks perfectly natural whether it is shown normally or on rewind. The fact that usually when a recording is played backward it

looks strange is because we generally observe a complicated system moving from a highly ordered state to one that is disordered (in accordance with the second law of thermodynamics).

Cross-References

► [Time](#)

Tipiṭaka (Pāli)

► [Buddhist Canonical Literature](#)

Tissues

► [Histology, Cytology](#)

TMS

► [Transcranial Magnetic Stimulation](#)

Top Down

► [Reductionism](#)

Torah

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The first five books of the Hebrew Scriptures, which is what by tradition is transcribed on the two tablets that the Book of Exodus says was transmitted from the mouth of God to the nation Israel on Mt. Sinai.

Talmud

A major collection of rabbinic discussions, collected between 200 CE and 500 CE, of the meaning of the Mishnah.

Traditional Theism

► [Theism, Classical](#)

Trance

► [Hypnosis](#)

Tranquility

► [Buddhist Meditation Practices](#)

Transcendence and Immanence

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Transcendence is a philosophical and theological concept of an ultimate origin or instance that is separated by an ontological gap from what it “causes,” “releases” from itself, or brings into being (Szlezák 2002). Usually, it is the difference between the “world” and the “otherworldly” principle or personal being that this term implies. What is transcendent cannot be at anybody’s free disposal so that one might even say that transcendence does not let itself to be defined. The opposite of transcendence is the concept of immanence: where the foundational origin is not something separate from the “world” but is contained and present within it. Transcendence is a term denoting (Szlezák 2002) this absolute

difference, (Worringer 1953) this “otherworldly” principle itself, and (Nicolis and Prigogine 1977) the activity of a limited being or even a person through which it goes beyond its nature. The latter is called a transcending act. There are no simply entirely transcendent or immanent religions. The main question is what in a certain philosophy or religion transcends what and whether and how this act of transcending affects or even changes the agent/subject and the transcendent being or principle itself. Even a religion with a strong sense of transcendence should make the latter in one or another way accessible (and so immanent), and all the issue is what the chances and limits of this approaching are. The term “transcendence” is used in theology, philosophy, anthropology (it is not supposed to have a specific religious meaning here), and mathematics (transcendent numbers). Pre-Socratic thought and late Hellenistic philosophy are immanentists. Anaxagoras’ talk of separation of the *nous* (intellect) from all things might be regarded as approaching the idea of transcendence. The concept of transcendence is developed in Plato in two steps. First, souls emerge from the cosmos to contemplate the “super-heavenly place,” i.e., they transcend the world of the senses through the vision of ideas (Phdr 247bc). Secondly, in the hierarchically ordered world of ideas, an ascent takes place in stages to the presuppositionless “principle of all,” i.e., to the idea of the good, which is distinguished from other ideas by the fact that it is no longer *ousía*, “being,” “but extends beyond the being in rank and power” (Resp. 509, 511b, 517b). There have been debates about the ontological qualification of this “beyond,” namely, should it be understood as gradual “surpassing” of other ideas by the idea of the good or by means of a minimalist interpretation pointing out the absolute otherness of the idea of the good. According to Plato’s *Timaeus*, God is another term for the world soul whose body is the entire cosmos of non-divine things and persons, which can be seen as an explicitly immanentist trait. Forms in Platonic philosophy are immanent (present in many instances) and transcendent (separate from them), and the former implying the latter, there is coincidence of both. The paradigm

is transcendent to and immanent in images of the forms. The properties of the instances are appearances of transcendent forms. The transcendence of forms is but priority of intelligible reality in relation to sensible appearance of that reality. Forms being in instances as their properties imply both transcendence and immanence, and instances being images of the form imply both as well. Transcendent idea is present in all the instances as their determining character. Aristotle applies the phrase “extends far beyond in power and rank” with relation to the Platonic idea of the good to the intellect (*nous*), which for him is not yet “beyond” *ousía*. He contemplated the question of whether God might be “something beyond the *nous*.” The “otherworldly” principle was kept alive in Neopythagoreanism and gnosis, both of which were ultimately inspired by Plato; for Pythagoras, the divine order is immanent in the cosmos and may be encountered there; for Plato, the purified intellect is needed to have access to transcendent metaphysics of forms. The possibility to know the deep structure of the world was guaranteed for Pythagoreanism and Platonism by mind’s essential kinship with its archetypal structure. The notion of transcendence was significantly developed by Plotinus. The soul transcends the world of the senses toward the *nous*; in transcending the *nous* itself, the One can be comprehended as the origin of being, living, and thinking. It remains nevertheless inexpressible in words. This experience of the absolute overcomes the duality of that which thinks and that which is thought while also eliminating the boundaries of the self. This kind of experience offers a basis for some sorts of mystical ascending and ecstasy. Proclus maintains gradualism in this ascending by distinguishing between the relative transcendence of the higher hypostases and the lower and the absolute transcendence of the One (Procl. *Theologia Platonica* 2,5). For the Christian Middle Ages, Pseudo-Dionysius Areopagita, who was influenced by Proclus, was the most important exponent of the concept of transcendence, and since then, the negative theology developed by him has been acknowledged as mostly favoring transcendent traits. Later Neoplatonists enhanced immanentist traits,

believing that there are correspondences between microcosm and macrocosm; they, if properly invoked, would allow them to dispose of psychic energy immanent in the living universe (or its lower strata). This practice of ritual magic, called “theurgy,” is representative for Jewish mysticism as well and rather emphasizes an immanentist view of reality, for transcendence does not lend itself to manipulation. Jewish cabalists would assume that there is a profound affinity between a name and the entity it designates, a phenomenon that is given the name of linguistic immanence. Thus, the one who knows how to decode the Torah as the blueprint of nature can manipulate the physical environment.

The term transcendence is traditionally used in Western religious tradition and emphatically stressed in Protestantism, Judaism, and Islam. The question whether non-European religions are transcendent or immanent lies completely within the Western frame of reference and is more difficult to answer because it depends on the use of other relevant termini in non-Western religions. However, some scholars found this questioning reasonable, especially for comparative purposes and in the context of modern religious dialogue so that some identification with the one (transcendence) or another (immanence) category has been established for some non-European religions by now. Nevertheless, these attitudes lack sophisticated explications of relationship between the two terms so typical in Western theologies and metaphysics. Also, it has to be shown how to translate “transcendence” into other more appropriate terms for those religions. In a very broad sense, any deity can be regarded as transcending human nature and thus “transcendent.” Reality’s transcending (status) with regard to illusion is emphasized in Upanishads. “Transcendence” holds (more generally) as the source of authority merely by its “higher” status. Faith might be seen as “transcending” any state of consciousness. In Daoism and Shintoism – and arguably Buddhism and Confucianism – divinity is said to be rather immanent than transcendent and human beings at one with divinity or the natural world. The

concept of the Buddha in Mahayana presumes that he is no longer merely the person who attained enlightenment in the sixth century BCE but is regarded as a self-manifestation in the history of the *dharmakaya*, a cosmic principle immanent in all beings, the ground of all expressions of the eternal Buddha nature. These descriptions are meaningful as long as one accepts juxtapositions like “human”–“superhuman” correlative to “natural”–“supernatural.” The meaning of transcendence as gradual surpassing of the present state is also evident here as long as we speak of ever-more-transcendent states of Buddhahood, when a sixth supreme Buddha is placed above the set of five cosmic Buddhas. In Buddhist (Tibetan) tradition, transcendence might mean one of the stages in meditative concentration which is not the highest yet (unsurpassable enlightenment). (The transitional character of transcendent characteristics might explain why this term is used even for religious conversions.) In Buddhism, emptiness is also an affirmation of the immanence of the sacred. However, the empty throne icon in early Buddhist art directed the viewer’s attention toward transcendence (Tanaka), and the same was the case with Nabatean tradition where divinity was presented by a niche within a niche, a void within a void (Patrich) that points to something approaching transcendence. Daoist, Buddhist, and Confucian religions represent orientation of the individual toward the transcendent Way, the Dao; the Dao is transcendent in that it is regarded as the supreme wellspring of creativity for heaven, earth, and humanity, but it is also immanent within all life as the vital power (*de*) that informs the nature (*xing*) of each of the myriad beings (*wanwu*). Visnu in Hinduism has been sometimes characterized as one, i.e., transcendent deity having many local varying forms. Aurobindo’s yoga reaches out the divine not through nature but as transcendent to nature. This question gets even more complicated with regard to preliterate religions. In so far as the High God (Supreme Being) is present in these societies, transcendence cannot be completely ruled out. In Australian indigenous tradition, the concept of dreaming can be understood as the transcendent aspect

that keeps connected all key elements of the cosmos. The questions of transcendence and immanence are always (cor)relational to those of monotheism and polytheism (see ► [Polytheism](#); ► [Monotheism](#)). So in Egyptian monotheism, Amun was worshipped as the transcendental creator, existing independently of the world he had created; this characteristic is encapsulated in his name, which means hidden. For example, Zulu's beliefs about God indicate that God is both a transcendent and immanent being who controls the universe and is responsible for all things and all human affairs (Bongmba). African religions combine principles of unity (see ► [Monism](#)) and multiplicity and transcendence and immanence into a single system, and they generally contain both monotheistic and polytheistic aspects without too much pondering about the problematical aspects in this relationship between both (different) features. Roughly, the supreme beings, which remain in the background of religious life, are rather transcendent; the lesser divinities and spirits are bound up with everyday experience remaining immanent, and their relation to human beings is reciprocal and interdependent. Sometimes, heavenly deities are called transcendent whereas earthly ones immanent. The term in the context of non-European religions might mean "otherworldly" and "other-timely" (primordial time in Eliade, primordial, impersonal realm of consciousness in Jung) instances, beings, or principles as well. A central idea shared by most if not all indigenous traditions is that "country" is sacred and imbued with the powerful and immanent spirits of ancestors as transcendent beings. Different kinds of nationalisms which badly needed transcendent features revived these ideas, making an attempt to integrate them into their systems of legitimation. Here also belongs the tendency of European theorists to find transcendence in non-European religions as soon as whenever their own Western civilization is described in mainly immanent terms. Worringer in the 1920s confessed that "we are all the less familiar with the connections that exist between a state of soul which thus inclines toward transcendentalism, and the form of its expression in art," "for

which we lack the organ of understanding," namely, to grasp it as the activity of the form-determining will, rooted in a "quite diverse psychic function," "remote from all reverent affirmation of the phenomenal world," namely, in the "need for redemption" (Worringer 1953). Art as an expression of transcendent feeling shifts the picture of things into a zone of the necessary and abstract that is defined to be an absolute. The interdependence of man and the outside world which gave rise to the "transcendental humor" in Classical Western art has been underplayed in Orient because it evoked agonizing feelings of dependence. To give expression to the transcendent means to de-organize the organic. Not surprisingly was the crystalline form evoked which hinted to hard, abstract forms and imperishable values. The replacement of laws governing the inorganic by the laws that govern the human spirit led to the fact that the ground for transcendent art in the West was lost. In science, scientific striving for knowledge took over this transcendent volition of the old art, and this new art is immanent, a "mild harmony of the living being" in aftermath of the primitivistic transcendentalism. The transcendental was perceived there as heavily enhancing the feeling of dependence (up to enslaving) in the modern subject that was at best seen as something ambivalent.

Within the framework of the above-mentioned questioning about transcendence in non-Western religions, it is considered that the religions of the ancient Near East made a gradual transition from immanence to transcendence in parallel with a transition from polytheism to monotheism. For example, Mesopotamian deity Baal represented the divine power that is immanent in the world, activating and effectuating things or phenomena. The underlying concept of the Priestly Code was the immanent presence of Israel's God in the tabernacle of the congregation, the establishment of the expiatory cult of offerings at the altar, and, along with the cult, the priest's office ministered by the Aaronites at Mount Sinai. The Old Testament indicates that the tabernacle and the temple were considered to have

a transcendent blueprint. Yet already the Deuteronomy Code grasps God in explicitly transcendent terms.

The next crucial and widely discussed question has been the possibility of transcendence in Western societies in Modern age and its relationship with emergent modern science. After the very transcendentalist Middle Ages, Enlightenment intellectuals propounded the “Idea of Progress,” a dogma about the immanence as the substantiation for progressive change. An idea emerged that modernity no longer includes transcendent concerns and is eminently immanentist, remaining nevertheless in one way or another associated with earlier transcendent patterns by means of immanentizing or secularizing them. The common background idea for scholars like Karl Loewith, Eric Voegelin, Norman Cohn, and Jacob Taubes was that Joachim of Fiore with his Three Ages theory stating the supremacy of the kingdom of Holy Spirit imbued with spirit of love and justice started a process in which Christian eschatology was “immanentized” (Voegelin) or “secularized” (Loewith), or it was even declared that “immanence directs itself polemically against theological transcendence” (Carl Schmitt). The four authors recognized the transformation of Christian eschatology into ideologies of inner-worldly progress as the decisive formative power of modernity. Blumenberg stressed that eschatology presuming a break-in of a transcendent event from heterogeneous sources into history is very far from the view of history where all events and improvements are natural and immanent to this history. When Loewith intervened that it is merely the universal and necessary character seen in this idea of progress that does witness to Christian universal framework, from which standpoint it is formulated, Blumenberg acquiesced that the connection between the idea of progress and human self-assertion indeed might not be necessary and essential. Blumenberg used related notions to mark out modern transcendence: “empty transcendence,” always ready to be filled with ideological surrogates, and “projection of transcendence” that in his view was needed to bring the God of natural teleology with the

personal God of monotheist religions together. Nevertheless, Blumenberg wants to keep the notion of transcendence as a “basic term” for our world without codified norms and mandates to apply it critically to itself. This critical application could preserve transcendence in the Modern age from ideological misuse. What nevertheless remains unclear is what appropriate use as opposed to this misuse is. It seems that it is horizontal transcendence that comes to the fore: the place of transcendence has for him an anthropological meaning. With reference to Pascal’s notion of “immanent transcendence,” Blumenberg connects with this use the idea that man transcends himself and can never catch up with himself. Since then, the notion of “immanent transcendence” has been preferred to express the going beyond oneself within the immanent frame of reference for which the notion of horizontal transcendence was used as well (as an antipode to the “vertical transcendence” or “transcendent transcendence” referring to some kind of otherworldly principle or instance), i.e., legitimating anthropological versus theological use of the term. In the theory of nonlinear dynamics, it is the interaction of the system with its environment that is the necessary precondition of the possibility of its self-organizational transformations in chaotic astructural environments, and it is seen as internal transformation, as a product of the immanentization of the external (Nicolis and Prigogine 1977).

The main question was which transcendent pattern modernity refers to. Some theories about the origins of modernity proved to be more influential and were widely discussed on the continental scene. Karl Loewith stressed the Christian framework of modernity which at the beginning of Modern age was redefined in stoic terms (modernity as Neostoicism in the Christian aftermath). Hans Blumenberg believed to have discovered Gnostic traits in modernity, speaking of modernity as neo-Gnosticism understood as human self-assertion in a decisive reaction against Christianity dominant in the Middle Ages. The main idea was borrowed from Marcion as it was presented by Adolf von Harnack: the creation of the world by omnipotent God and

the salvation of man from this bad world cannot be the concern of the same divine person because it involves a dilemma. Christianity lays emphasis on the second outcome; Gnosticism prefers the first, and the Modern age repeats this Gnostic gesture (Harnack 1921; Blumenberg 1983). Some Jewish scholars maintained the idea of genuinely modern implications of Jewish monotheism or even negative theology. Thus, Aryeh Botwinick emphasized that it is the totally transcendent God who leaves room for this-worldly activities of man and even requires these activities, himself remaining withdrawn from this world. The modern world appears to be not a rejection of this transcendent order but an appropriate form of dealing with it. Tradition–modernity divide with regard to Judaism was called in doubt by Trigano who held that Judaism transcends this divide as well as that of religion and civility by arguing that the dialectics of transcendent and immanent aspects in Judaism itself not only come to full expression in Western societies in Modern age but existed already in Alexandrian Hellenism (Trigano 1995). All the three candidates for the revived sense of transcendence in Modern age, namely, Gnosticism, (Post-)Christian Stoicism, and Judaism offer very different conceptions of what the relationship between the transcendent and immanent is. While Loewith's theory promoted secularization (see ► [Secularization](#)) and was additionally charged with difficulties inherent in this ambiguous and subsequently widely applied term, Blumenberg's theory was faced with redefinitions in understanding of genuine gnosis and Gnosticism after the discovery of Gnostic writings in the midst of the twentieth century. However, there were commonalities as well. What Christian and Gnostic beliefs have in common is that man is related to or is created by transcendent God and belongs not only in the natural order. In Gnosticism, it is a foreign God, *deus otiosus* (see ► [Gnosticism](#)).

Science was the first phenomenon to be seen as a triumph of this immanent development of Modern age. Scholars in the nineteenth century would have liked to discover a more immanentistic religion as a kind of precursor to itself, as

well as invent the own genealogy with a help of primitive religiosity. Positivism in Comte discovered an immanent and mimetic power in fetishism ascribing supernatural or at least extraordinary powers to some objects or artifacts of human world. Even in the case of immanence, “specifically religious categorality” can be detected in, for example, radical atheistic materialists like De Sade's “Philosophy in boudoir,” 1795, or De LaMettrie's “Man–machine,” 1748, which pointed at “originary matter lying at the basis of whole reality” or to “the nature identical with it” and witnessed an immanentistic and sometimes “strong pantheistic religiosity.”

Marx's reading of the fetish character of the commodity inherits positivistic traits and interests in immanent religiosity, but the fetish in his view not just substantiates religion; it is rather a concept which makes it possible to interpret both religion and the secular religion of capital (as ideology, i.e., false consciousness). It was Hegel who denounced transcendence as separation from the world. The infinite (transcendent) is bounded by its counterpart (finite, immanent) and hence not truly infinite. Negating all finite determinations, this transcendence is indeterminate in its abstract universality. So, Hegel takes concrete determinations into godhead and makes world internal to God. Hegelian sophisticated immanentism has influenced many argumentative strategies up to this day. What singled out Marx's criticism of capitalism was its immanent character, in comparison to communitarians, utopians, and anarchists, whose critiques were based on standards external to capitalist economics. The most recent and widely discussed theory of transcendence and immanence in current time was offered by North American scholar Charles Taylor in the context of secularism debate. While Taylor discriminates public spaces or spheres of autonomous activities, in which we participate without any reference to transcendent reality, secularism manifests itself as an experience that conditions both belief and unbelief. Thus, the common understanding of secularization as rejection of belief in the transcendent (so-called subtraction theory) was challenged: we live today within the “immanent frame,” but this does not

necessarily exclude transcendence. Whereas horizontal transcendence does not require any ontologically transcendent being, the vertical one does. The latter does not imply any confrontation to (though no support from) science. Nevertheless, both kinds of transcendence are possible (Taylor 2007). Hegel-inspired critique reminded that transcendence is incompatible with the dynamic of spirituality: there is always only horizontal transcendence in the immanent development of *geist*. This position comes close to Nietzsche's approach. New immanentist impulses were initiated by the so-called Nietzschean diagnosis of the "death of God." The "death of God" theology (1961 by Gabriel Vahanian) arose in the United States and announced the death of God as a cultural fact, the fact that modern man functions intellectually and socially without God as a working hypothesis. Bonhoeffer laid emphasis on the idea that God that is not of this world posits a requisite "this-worldliness" of faith, which is not, however, absorbed by immanentism. This cultural fact, for Vahanian, implied a loss of the sense of transcendence and the substitution of a radically immanentist perspective in dealing with questions of human existence. Already late nineteenth- and early twentieth-century liberal theology laid stress on the immanence of God working in human experience and history, the possibility of Christians living out the ethics of Jesus, and evolutionary human progress while it downplayed divine transcendence and the power of sin. The liberal theology fostered an image of Christ as immanent within the culture and thus an active force for the kind of progressive social change that modernity itself seemed to promise. It came to be known as cultural Protestantism in Germany. Some attempts have been made to fuse scientific materialism with theology without giving up the sense of transcendence. On the Catholic side, an attempt was made by Jesuit pater and anthropologist Teilhard De Chardine who tried to integrate Marxism and evolutionary theory into theology, and even poetical "Hymns for Matter" was composed.

Transcendence in the sense of horizontal one can be exemplified in many different ways. The question might be about transcendence in

extreme sports (mystical and sublime features) which have a high degree of inherent danger and which are played out in nature where sportsmen have to master weather conditions and other obstacles of natural kind (water, snow, mountains). Post-modernity favors speaking of a "new experience" or transgression, a crossing of insurmountable limits (Blanchot) (by insurmountability, one can understand taboos existing in certain cultural traditions). Under that description come mystical experience, religious ecstasy (Bataille), death, and madness. All these phenomena are seen as opening new nonlinear possibilities of some further development. As far as horizontal transcendence is implied, there could be even talk about the transcending of transcendence (the reflexive use of the term). Caputo asks entirely in the spirit of horizontal transcendence: "do we need to transcend transcendence?" This reflexive use of the term can be duplicated in self-transcending. Tugendhat speaks of mystics as going beyond ego-centered experience and reaching in this way the famous peace of mind. The self-transcending accentuates activity on the part of the subject; it links it with passivity required for every serious experience of transcendence: self-transcending is transforming of suffering (passivity) into creativity (activity, spontaneity). Jaspers connects transcendence with immanence through emphasizing history: transcendence means the cipher, namely, hidden possibilities of existence making the empirical world a cipher for transcendence; it is in history (and cannot leave it) but points to transcendence through its historical embodiment here and now. He tries to synthesize both horizontal transcending and vertical transcendence, and individual therapeutic efforts and historical engagements, in order not to allow that therapy without explicit transcendent experience claims to become autonomic and make out religions of its own. According to Jaspers, the mere facing the vicissitudes of life is the way to transcendence. It happens as a leap, a spontaneous act that goes beyond rational procedure. The individual being located in a historical situation finds the transcendence through this situation, transcending it in both

directions – vertically (grounding his authentic being in transcendence itself) and horizontally (as engagements in the world, constructive acting that makes life worthwhile). The entering into relationships with transcendence requires the act deciphering: cipher brings transcendence to presence. For example, a particular event in history may become a cipher of transcendence for an individual.

Even the talk about possible worlds in philosophy and literature since the beginning of the Modern age (Bruno and others) can be regarded as a replacement of transcendence. In the popular culture of today, it is the turn to fantastic (or: myth, Joseph Campbell) that is a turn to the transcendent. The interactive immersion in fantasy, science fiction, and terror films can be explained by the deep “need of transcendence,” and even the “desire for transcendence” proves to be a fan’s need to transcend everyday mundane lives, examination of its limits, and the need to enter otherworldly environments for this purpose. The aesthetic experience (in comparison with pragmatical or epistemological experience) may be described as transcendent. The following assertion still holds true: it is the function of art to provide man with a transcendent ideal, toward which he can strive (Dostoevsky).

In recent decades, we can witness renewed attention to the question: how are religious ideals of transcendence materialized? In this connection, transcendence and loss or absence of presence were treated as parallel, so that the question was reformulated: how is loss (here: transcendence) presented? These questions involve more sophisticated ontologies of the material and immaterial by stressing the role of necessary character of materialization in what form so ever: “The agency of the absent . . . is never finite, but entangled in the dynamics of potential reverberation, reappearance, transformation and return” (Bille, Hastrup, Sorensen) (Bille et al. 2010).

There have been lots of secular religions in the past 300 years, most of them seeking basis in sciences. In “secular or implicit Theology of economics” (Samuelson) that legitimates free-market capitalism, where the good is that which is efficient and evil that which is inefficient,

it was actually economics that – according to Robert Nelson – since the beginning of Modern age has been the source of the most influential religions in public life. As the Judeo-Christian religion had lost much of its earlier authority in public life, posing a large transaction cost problem for the functioning of economic institutions, much of the authority was transferred to science. As dispenser of valid truth claims (see ► [Truth](#)), science became the greatest religious authority in modern society. The success of economics in its religious function was independent of the degree of validity in the specific truth claims produced by economics as science. Economics is to be held not just a positive science but a normative one and might be called secular theology (Nelson 2001). In matters of social action, the role of authority was taken over by social sciences which became the religion of Modern age and assumed transcendent significance in promising the arrival of a future heaven on earth. Since the mid-nineteenth century, people sought a secular salvation through abolishing economic scarcity and arriving at a state of complete material abundance on earth. Economists had to solve transaction cost and collective action problems arising from the loss of transcendent goals. The modern religions of economic progress fell short of expectations, and modern fundamentalisms with their own sense of transcendence were began emerging as a consequence of the turning away from the former in form of communism, socialism, or welfare capitalism. While the transcendent purpose of progress made all involved in it ready to carry any burdens and put up with any difficulties on the way to this aim, the purposes, emancipated from transcendent goals, made progress immanent, involving transaction costs which previous religion was better able to reduce because it fostered trust lacking now. Environmentalism or environmental theology (broadly speaking the belief in inherent right of nature or its intrinsic worth) which initially came to the fore in German Lutheran, American Anglican, and Swiss reformed circles as ecology science is according to Nelson a religion next to economics. Both libertarianism and environmentalism have the

same roots. Evolutionary laws of nature presume that human progress is achieved by competitive struggle in society, and so, references to nature make market economics almost theologically legitimate. Natural theology underlying economics as an implicit theology presumes some redemptive quality in nature whose purpose is human welfare and that always acts wisely making creative use of human faults, so to say, good out of evil. The good in environmentalism is the natural; the evil is the unnatural. This view relies on teleological notions but sets them in a Christian framework thus producing some irresolvable dilemmas. The main objection to that is as follows: “God is the creator not the creation,” and accordingly, not nature/creature has to be revered but the Creator.

The “consumer theory” within the neoclassic theory turns out to be a kind of “religious anthropology.” This theory is characterized by an asocial view on human being who is obliged to pursue individual happiness and by lack of a historical time dimension (the consumer prefers “now”; there is no “tomorrow” for him) and consequentialism in achieving an immediate satisfaction and is seen by Judeo-Christian tradition where every decision is situated in the history from creation to fulfillment at the end of time, as a deep failure (Nixon 2007). This secular metanarrative of human satisfaction is nevertheless normative and can be countered by traditional religious anthropologies. Many of the key metaphors and models of divine–human interaction presented in Judeo-Christian tradition are economic – such as redemption, reconciliation, and stewardship (Oslington). Therefore, reconnection of economics with theology, part of which was used before the divide in the mid-nineteenth century, is seen today as possible and welcome. As appropriate for these reconnections are mentioned the Smithian model (natural theology tradition) and the Aristotelian-Thomistic model on the Christian part. The main ideas substantiating this reconnection remain the Judeo-Christian doctrine of creation, prescribing creativity continuous with God’s creative purposes, and the doctrine of the fall that cautions against human fallibility.

In modern philosophy due to its solipsistic and dualistic inclinations, it was the object of ordinary knowledge that was depicted as transcendent, and its accessibility constitutes the main problem of modern epistemology. The science captures “transcendence” understood as “structure” as it does in the case of “molecular transcendence” (Baudrillard).

The meaning of transcendence developed by Husserl exerted a heavy influence on philosophical and religious theories. The concept of “phenomenological immanence” can be interpreted as having a normative structure, and “noema” is a mental entity which depends on how the world is. The noematic and intentional moments transcend the phenomenologically given (material), immanent, to be more exact. Phenomenological reduction “is not the exclusion of the really transcendent but of the transcendent as such as a supposed existence, i.e., the exclusion of whatever is not in the authentic sense evidently given, absolutely given in a pure intuition” (Husserl 1950). “*Absolutely given* and *really immanent* are no longer obviously and unquestionably one and the same.” Husserl undertakes to double-determine the concepts of “transcendence” and “immanence”: phenomenological immanence includes intentional immanence, which is a real transcendence. Transcendent here is something fundamentally other, non-real, and not really immanent to consciousness. There is an “absolute sphere of materials and of noetic forms in phenomenological reduction to whose determinately articulated texture belongs with immanent essential necessity this marvelous conscious grasp of what is given as determinate or determinable” (Husserl 1950). There lies the very possibility of an objectively valid cognition of the transcendent. Transcendence is constituted in the immanence of subjectivity through the phenomenological reduction. The absolute being, defined with the help of Descartes formulation of substance, contains in itself all mundane transcendences. Merleau-Ponty seeks for a primordial realm underlying the traditional polarizations of transcendence and immanence. The lived body fits in this search, and it allows seeing flesh as an elemental reality characterized by reversibility, based on the image

of a fold and of the body as the place of this fold by which the sensible reveals itself. In Sartre, all objects of consciousness (mental images) transcend consciousness; therefore, consciousness cannot reflectively grasp itself as a transcendent object. Perceptual objects perceived by consciousness are transcendent and so are mental images.

Spiritual transcendence refers to a perceived experience of the sacred that affects one's self-perception, feelings, goals, and ability to transcend one's difficulties and belongs to individual phenomena. To counter the difficulties in conceptualization and measurement of religiousness, the Spiritual Transcendence Index was developed which was an eight-item measure of this construct in which "cognitive aspects of spiritual transcendence refer especially to the influence of spirituality on one's sense of meaning and purpose, and affective components center on feelings of fulfillment and spiritual communion" (Seidlitz et al. 2002).

The transcendence–immanence relationship remains a crucial issue in monotheism. There is an infinite distance between God and man that cannot be diminished or bridged over. Transcendence prevents God from being represented through images or being characterized or described. Transcendent God can only be characterized with a name; therefore, theories of reference appropriate to radical transcendence single out the reference through the name. The inherent problem is that the more transcendent is God (for example, in Platonism), the more there is (actual a) need for mobile instance that would guarantee communication between God and man. Traditional gods become in such cases divine mediators or intermediate beings or even demons. That means that the increasing role of intermediate beings can be seen as a correlate for reinforced monotheistic, transcendent tendencies in order to find some balance in contact with the transcendent being and appropriate immanent counterparts, for it and should not be necessarily seen as a triumph of immanent tendencies going on along their own paths. A most disputable question is the one concerning mysticism with regard to immanence–transcendence distinction.

The main problem is that transcendence in radical monotheism implies theoretical inaccessibility to – or at least real dependence of creature/man on – the Absolute that is depicted in voluntaristic terms (omnipotence, omniscience). Is there not an inherent danger of immanence that is involved in mysticism of even monotheistic religions? Sometimes, it is claimed that religious ethics is much more suitable for grasping transcendence than religious mysticisms might be. Mystical experience is properly religious, however, when it preserves the transcendence of the Absolute by maintaining a tension between it and the self to which it is united.

Cross-References

- ▶ [Concept of God in Contemporary Philosophy of Religion](#)
- ▶ [Gnosticism](#)
- ▶ [Monism](#)
- ▶ [Monotheism](#)
- ▶ [Panentheism](#)
- ▶ [Polytheism](#)
- ▶ [Secularization](#)
- ▶ [Truth](#)

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Transcendental Sense of Physics

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Physics is seen not only as a compendium of facts and theories about the universe as it is in itself, but as a structural path of humanity in its comprehension of the universe, the path which is historically concrete and includes the conditions of observability and mathematical expressibility of reality. Thus physics is a historically contingent human enterprise which represent nature as manifestation rather than the manifest.

Transcranial Magnetic Stimulation

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Related Terms

[Human brain](#); [TMS](#)

Description

Transcranial magnetic stimulation (TMS) refers to painless and noninvasive stimulation of the (human) brain through the intact skull utilizing the fundamental principles of electromagnetic induction (Faraday's law). Thus, an electrical current in the stimulating coil generated by discharging a capacitor induces a changing magnetic field around the coil that in turn induces an electrical current in nearby conductors, such as brain tissue. TMS in its contemporary form was inaugurated by Anthony Barker (born 1950) at the University of Sheffield in 1985 (Barker et al. 1985). The idea to stimulate the brain is much older and goes back to experiments by the German anatomist and physiologist Gustav Theodor Fritsch (1838–1927) and the German neurologist Eduard Hitzig (1839–1907) who proved by galvanic electrical stimulation of the exposed motor cortex of dogs that the brain is electrically excitable. Based on high-power electronics, TMS developed into a rapidly growing field since 1985. The major applications are noninvasive assessment of the function of corticospinal tract as a diagnostic tool in ► [clinical neurophysiology](#) and the assessment of brain function by inducing a transient virtual lesion as a research tool in ► [cognitive neuroscience](#), *neuropsychology*, or *neurophilosophy*. In addition, repetitive TMS protocols provide means for treatment of patients with *neurological disorders* or *psychiatric disorders* through induction of long-term changes in excitability and/or connectivity of the stimulated brain regions (therapeutic tool in *clinical neurology* and *psychiatry*).

Self-identification

Science

TMS is a technique (rather than a discipline). It has self-identified as a *tool in neuroscience* (a subdiscipline of the *natural sciences*) from its early days. It was primarily invented to achieve noninvasive access to the function of the corticospinal tract (*central motor system*) in

humans. In this case, TMS quickly gained clinical utility as a *diagnostic tool* in neurological disorders with affection of the corticospinal tract such as amyotrophic lateral sclerosis, multiple sclerosis, stroke, or myelopathy. Typical pathological findings are muscle responses (motor evoked potentials) that are delayed (prolonged central motor conduction time) and/or reduced in amplitude. More recent technical developments (e.g., paired-pulse protocols) allow measurement of motor cortical excitability, in particular abnormal excitability in neurological disorders such as epilepsy, or under the influence of central nervous system active drugs (pharmaco-TMS). Self-identification as *tool in cognitive neuroscience* came from the demonstration that TMS (or repetitive TMS) can transiently disrupt physiological neuronal brain activity which is considered fundamental for any cognitive or behavioral process. TMS can lead to disruption of the particular process for which normal function of the stimulated area is necessary. Finally, TMS currently evolves as a noninvasive therapeutic tool in neurological and psychiatric disorders with the intention to normalize altered brain excitability.

Characteristics

TMS is distinctive because it stimulates the brain in a painless and noninvasive manner. This contrasts with other methods of brain stimulation. *Transcranial electrical stimulation* was developed in 1980 by the British neurophysiologist Patrick A. Merton (1920–2000) but was never broadly used because it is painful due to the high voltage needed to pass the electrical current through the intact skull to stimulate the brain. *Direct cortical electrical stimulation* is an invasive technique performed (often in concurrence with electrocorticography) for functional mapping of the cortex and identification of critical (“eloquent”) cortical structures during brain surgery. Another invasive technique uses chronic electrodes implanted into the brain. They may record

electrical impulses in the brain or they may stimulate brain tissue (e.g., through intracortical microelectrodes delivering electrical impulses from an external source). One currently important application is ► [deep brain stimulation](#) (DBS). This technique is best established for treatment of *movement disorders* such as Parkinson’s disease, essential tremor, and dystonia. The *Food and Drug Association* (FDA) has approved DBS for all of these indications as *evidence-based therapy*. Emergent, not yet approved indications of DBS include epilepsy, chronic pain, and obsessive-compulsive disorder. Another application of chronically implanted intracortical microelectrodes is to record neuronal brain activity. The recordings can be used to navigate *brain computer interfaces* (BCI) or *neuroprostheses*. These devices can partly substitute neuronal function that is no longer available to the patient due to, e.g., complete paralysis in advanced amyotrophic lateral sclerosis to allow communication with the environment (e.g., through BCI spelling devices).

TMS is also distinct from other methods of ► [clinical neurophysiology](#), such as *electroencephalography* (EEG), ► [magnetoencephalography](#) (MEG), or functional magnetic resonance imaging (fMRI), which record noninvasively neuronal activity of the brain (EEG, MEG) or directly related changes in cerebral blood flow (fMRI) but cannot be used for stimulation of the brain. Recent technical developments combine TMS with EEG or fMRI to measure directly the effects of TMS on brain activity.

Relevance to Science and Religion

TMS is used as a tool in cognitive neuroscience. TMS-induced perturbation of physiological brain activity allows assignment of cognitive function to the stimulated brain area or network if cognitive performance is altered by the stimulation. This bridges the gap between human brain *physiology* and cognition, such as emotional control of behavior, decision making, communication, attention, or self-consciousness.

Sources of Authority

TMS is rooted in a long tradition of attempts to stimulate the cortex by electrical current. In England, the physiologist and Nobel laureate Sir Charles Scott Sherrington (1857–1952) and in Germany the neurologists Oskar Vogt (1870–1959) and his wife Cécile Vogt (1875–1962) were the first in early twentieth century to prove the *somatotopic* organization of body representations in monkey motor cortex. These investigations were followed up in the 1930s by the German neurologist and neurosurgeon Otfried Foerster (1873–1941) in Breslau, and the Canadian neurosurgeon Wilder Penfield (1891–1976) in Montréal, who used *direct cortical electrical stimulation* in conscious patients to map the functions of human cortex. Until today, direct cortical electrical stimulation is the gold standard to identify functionally critical cortex prior to brain surgery. Along this vein, there was a long standing need for development of noninvasive techniques for stimulation of the human brain. In the 1980s, transcranial electrical stimulation (TES) and TMS were successfully invented to investigate the functional integrity of the human corticospinal tract through the intact skull in neurological patients (see above). For this purpose, TMS is nowadays a routine technique in ► [clinical neurophysiology](#). Authority to the clinical diagnostic utility of TMS in several neurological disorders (amyotrophic lateral sclerosis, multiple sclerosis, and myelopathy) has been given by *consensus guidelines* issued by the *International Federation of Clinical Neurophysiology* (ICNF) for diagnostic use, clinical diagnostic utility, and safety of TMS. But TMS has diffused far beyond the borders of clinical neurophysiology into cognitive, perceptual, behavioral, and therapeutic investigation. Several authoritative recent textbooks witness this broadened scope that attracts a highly diverse group of users clinical, cognitive, and basic neuroscience (Siebner and Ziemann 2007; Wassermann et al. 2008). Currently, more than 1,000 scientific papers on TMS are being published every year worldwide in international peer-reviewed journals. International scientific conferences on TMS take place at a regular scheme.

Ethical Principles

As for every medical subdiscipline, TMS applications are guided by the oath and law of the ancient Greek physician *Hippocrates* (born 460 B.C.) who is considered the so-called father of medicine. This “Hippocratic Oath” has been supplemented by the rules of the *Declaration of Helsinki* of 1971.

Key Values

Key values of TMS are (1) quantitative diagnostic investigation of corticospinal tract function that supplements clinical neurological examination and neuroradiological investigation; (2) proof of functional significance of the stimulated brain area or network making TMS an important tool of cognitive and behavioral neuroscience. In this respect, TMS is complementary to traditional research rooted in deriving knowledge from abnormal or absent function after brain lesions caused by, e.g., trauma, stroke, or brain tumors, and complementary to modern neuroimaging techniques such as functional magnetic resonance imaging and; (3) therapeutic efficacy in psychiatric and neurological disorders.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life on our globe. Nature entertains all dynamic processes in the observable environment. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological *being* equipped with a highly developed complex brain, which enables unique functions including speech, abstract thinking, creativity, and the development of ethical categories such as morality, science, and art. Thus, humans are

considered to be distinctive from the rest of the animal world by virtue of the unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems ranging from bacteria over plants and animals to humans. In the human body it includes functioning of the different organs, including the *nervous system*. Death is considered the cessation of such physical functions. A special case, which has raised ethical challenges for Medicine, is that of so-called brain death, which is observed in intensive care medicine. Here, non-brain bodily functions are maintained, but there is no evident brain activity.

Reality

Reality is considered the physical world around us that humans can observe with their senses.

Knowledge

Knowledge is understood to have an *objective* dimension, such that it is the *wisdom* that can be transferred in a verbal form from one person to the next, or has been written down in books or libraries. However, knowledge is also understood to have a *subjective* dimension, which is taken to be the amount of information a person can retrieve from *memory* voluntarily, or by being *cued*.

Truth

Truth is conceptualized as the supreme reality underlying facts and rules. Accordingly, truth is assumed to be absolute or universal which humans can grasp only partially.

Perception

Perception is the *conscious sensation* of the forces and influences the external physical world exerts on living beings. Diseases of the human brain may disrupt or impair perception.

Time

Time is the fundamental category of ongoing change in the world. Humans can measure time *objectively* and perceive it owing to the changes

observed in the surrounding environment. Human perception of time can be affected by the focus of *attention* or impaired by diseases of the brain.

Consciousness

Consciousness is the responsiveness of subjects to any physical stimulus in the outside world. It can be graded in different levels of *alertness* ranging from drowsiness to full *alertness*, which comprises crystal clear orientation concerning location, time, situation, personal biography, and full mental capability. Diseases can impair consciousness globally, or in differentiated fashions.

Rationality/Reason

Rationality is a foundation of accountable and *responsible* human behavior and of understanding reason as ultimate authority. It is impaired in mental diseases such as *dementia* or neuropsychological *disorders*.

Mystery

Mystery is considered that what is as yet unknown, and, thus, grants that contemporary knowledge may not have elucidated the entire physiology of human kind. In this view, mystery is understood as potentially explainable after accumulation of adequate scientific knowledge.

Relevant Themes

An emerging theme as regards “Science and Religion” is to use TMS (in combination with other techniques such as functional brain imaging) as a tool of behavioral neuroscience to understand the neurophysiological foundations of religious thoughts and views. This theme is based on the concept of ► [materialism](#), a philosophical theory of the mind-body problem, i.e., mental phenomena (such as *religious thought*) are neuronal phenomena. Pathophysiological aberrations, such as religious delusions in psychiatric disorders may also be tackled by modern techniques of systems neuroscience, including TMS.

Cross-References

- ▶ [Action Control](#)
- ▶ [Clinical Neurophysiology](#)
- ▶ [Cognitive Neuroscience](#)
- ▶ [Deep Brain Stimulation](#)
- ▶ [Electromyography](#)
- ▶ [Magnetoencephalography \(MEG\)](#)
- ▶ [Neuroimaging](#)
- ▶ [Plasticity](#)

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Transfusion Medicine

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Related Terms

[Apheresis](#); [Blood banking](#); [Blood components](#); [Blood libels](#); [Blood transfusion](#); [Bloodletting](#); [Magical powers of blood](#); [Plasma](#); [Platelets](#); [Red blood cells](#)

Description

Blood has always represented an important element in human culture because its appearance has, even to the present day, been associated with significant emotional reaction system as well as its potential therapeutic usefulness. Both in ancient and more recent times, blood has had

many interesting and not widely appreciated connotations. For example, from a therapeutic point of view, bloodletting (in modern medicine usually referred to as phlebotomy) was a popular medical practice used in antiquity and even in the twentieth century, to treat certain medical conditions. Bloodletting over the years (particularly during the last millennium) has involved the withdrawal of considerable quantities of blood from a patient often in the mistaken belief that it would cure the patient of their ailments. While it is conceivable that, in the absence of other treatments for hypertension, bloodletting may very well have had a short-term beneficial effect in patients with this condition, particularly in reducing blood pressure by the temporary reduction of the blood volume. Of necessity, this effect would have been short-lived as the body's innate homeostatic mechanisms would have soon replaced the reduced blood volume in a matter of only 1 or 2 days.

Human beings appear to have always been aware of blood and the implications of its appearance. Hemorrhage is commonplace and often results in a death. Thus, there is evidence of an awareness of the importance of blood even by prehistoric man, who left drawings of blood emanating from an injury caused by an enemy's arrow. Early in human history, blood was celebrated in religious rituals as an important life force. The Bible in Leviticus (17:11) indicates that "blood is the source of life." Not surprisingly, therefore, was blood often seen as a potential therapeutic agent. Egyptians bathed in it to cure leprosy. Hunters drank the blood of fierce animals to pass such attributes to themselves. Warriors drank the blood of fallen enemies in the belief that their opponents strength, courage, or even wisdom would be passed onto themselves. Romans drank the blood of fallen gladiators as a cure for epilepsy. At hangings in England, during the middle ages, the crowds were so numerous in the quest of blood from a newly executed criminal, to be used as a curative, that a physician's "prescription" became a requirement to attend such events!

It is interesting to note that of the four ancient humors, *blood* alone remained an entity with both

magical and therapeutic powers. There are two reasons why blood has always enjoyed special status. First, it is clearly visible when shed, being the only organ with which most individuals can readily identify. Every injured person knows that bleeding represents that injury, whose severity can easily be gauged by the volume of blood that can be observed. Second, blood has always been associated with life itself, and in many languages, the term “blood” is synonymous with both life and good health. In the Bible, “to take someone’s blood” means to take someone’s life. Thus from a therapeutic point of view, if blood represents life, it does not take great intuition to be able to logically assume that someone who is dying might be successfully treated with blood or alternatively by the removal of their “bad blood.” It is important also to understand that until the twentieth century, physicians had precious little to offer their patients, except herbs, baths, bloodletting, leeching, and cupping. Thus the “balancing of the humors” through bloodletting was a major form of therapy, well into the eighteenth century.

Apropos of the foregoing, it is of interest to relate exuberant bloodletting to the death of the first president of the United States, George Washington, who died in December 1799. While no one is quite sure of what he actually succumbed, it appears that at age 67, he developed a form of acute hoarseness and severe sore throat (probably due to a bacterial form of acute epiglottitis). As he was not responding to the conventional forms of therapy available at the time, he was subjected to three episodes of bloodletting over a 12-h period. This resulted in him having at least 80 oz (over 2½ L) of blood removed, which represented the removal of approximately one-third of his blood volume. He died the next day, before a fourth bloodletting was to have taken place! Historians have suggested that the bloodletting probably contributed significantly to his demise (Morens 1999).

Blood was thought to have special magical powers and, as a result, was widely used as a “curative” agent. Both human and animal blood have thus been administered to patients, as a salve to be applied topically, as a draft either

to be imbibed orally, or as a therapeutic agent to be infused subcutaneously, intramuscularly, intravenously, or by surgical manipulation. The first intravenous use of human blood was in 1818, but transfusion episodes to humans, using animal blood, had been done since 1667. In the two centuries since the first transfusion involving human blood, a variety of techniques and devices have been used to accomplish the intravenous administration of blood. However, it is only during the twentieth century that blood and its derivative products been transfused successfully to replace what is deficient in relevant recipients.

Curiously, there is widely cited a legend that suggests that blood was first transfused to a human over 500 years ago and that this blood transfusion was given to a dying Pope – Pope Innocent VIII, in 1492. This legend recounts that the Pope’s Jewish physician of the time tried to revitalize him by giving him blood from three 10-year-old boys, from whom the physician took a sufficient quantity to cause their death. The evidence that this particular legend is reliable is weak. This legend has recently been traced back to only the early nineteenth century (Gottlieb 1991). It is very likely therefore that this legend represents an anti-Semitic fabrication relating in kind to the various blood libels that had often resulted in the accusation of Jews carrying out ritualistic child murders to serve the needs of the customs for their Passover holiday. Such fabrications often lead to pogroms resulting in the deaths of many Jews.

Definition of Transfusion Medicine

The author of this present entry has previously (1990) published a definition of transfusion medicine as “That multidisciplinary branch of medicine that focuses on all the available medical, scientific and technical information applicable to this specialty for the benefit of patients receiving blood products or related materials produced by biotechnology. Those engaged in the practice of Transfusion Medicine have the responsibility of integrating the various scientific concepts, techniques, and other elements of

relevant knowledge from contributing disciplines such as blood banking, immunohematology, hematology, infectious diseases, immunology, transplantation biology, genetics, protein chemistry, molecular and cell biology, clinical medicine, laboratory sciences, epidemiology, microbiology, and virology. Issues relating to the recruitment of donors and the collection of whole blood and blood components, such as the psychology of the motivation of donors, are also germane, as are legal and ethical questions associated with the collection and the clinical use of blood products. Those engaged in Transfusion Medicine should also be involved in education and research relevant to the specialty (Blajchman 1990)."

Self-identification

Science

The development of transfusion medicine as a distinct subdiscipline began with the dawn of the twentieth century. In 1905, Karl Landsteiner (1868–1943) published a short paper in which he identified, for the first time, differences in the human blood cells (RBCs) in different individuals. With the elucidation of the major RBC blood groups into A, B, and C (now called group O), Landsteiner's seminal work opened the door to the possibility of safely providing immunologically compatible blood transfusions to patients who were either bleeding or anemic for other reasons. This major advance allowed blood to be transfused to individuals with relatively few adverse immunological outcomes. Landsteiner's work opened the door to the recognition of hundreds of other RBC blood group antigens as well as to the identification of antigens on the other circulating blood cells including the various types of white blood cells and platelets. Blood transfusions were certainly used for the treatment of the injured during the First World War, but it was not until the Second World War when it became widely used standard practice. In the 60 years since, improved methods for the preparation and storage of blood products have been devised. Thus at the present time, RBCs can be stored, in the liquid state, for up to

6 weeks! Techniques for the preparation and storage of most of the other blood components have also been developed, including platelets and the various plasma components which can be extracted from the plasma obtained from whole blood donations. Thus, as outlined in the definition provided above, transfusion medicine has defined itself as a scientific endeavor which has effectively enhanced knowledge to facilitate the provision of effective and safe blood products to be given to patients relevant who require them.

Religion

The basis of this subdiscipline is primarily scientific, which requires ongoing basic and applied research and which requires evidence-based data to show that the various blood products are clinically efficacious when transfused to patients.

Nonetheless, because of historical practices related to the use of blood, there still are many religious beliefs associated with blood. In this regard, Goethe in *Faust* made the comment that "Blood is very special liquid (Blut ist ein ganz besonderer Saft)." In this context, it should be noted that there is a Christian religious group known as the Jehovah's Witnesses, who believe that they should refuse blood transfusions as a therapeutic option, even if they can save a human life. This belief is based on various Biblical passages (Old and New Testament) forbidding the *eating* of blood. While it is clear that the transfusion of blood does not represent the "eating" of blood, Jehovah's Witness patients requiring a blood transfusion can represent a very significant problem for their physicians. Apropos of the preceding, it is important to note that the Jehovah's Witnesses have recently moderated their stance about the use of blood products and at the present, time allow adherents the option of deciding that some interventions might be acceptable to each person individually. Thus, the Jehovah's Witnesses have indicated that the use of some blood products and practices (i.e., the use of blood fractions or stem cells for transplantation) are to be left to an individual's conscientious decision (Bodnaruk et al. 2004). The Jehovah's Witnesses thus acknowledge that

some past interdictions in the therapeutic use of blood may have been based on overinterpretation of the biblical prohibition to *eat* blood.

Characteristics

Transfusion medicine is a subdiscipline of medicine that is quite distinctive from most other subspecialties of medicine/surgery. Transfusion medicine is a subdiscipline that interacts with most of the other disciplines of medicine, in that it provides the scientific rationale as well as the therapeutic materials that might often be needed by patients who are deficient in certain blood components or proteins derived from whole blood or plasma. In this regard, practitioners of transfusion medicine can effectively interact with those of other disciplines, including those in surgery, internal medicine, gastroenterology, obstetrics, gynecology, intensive care medicine, etc., to provide the blood products needed by their patients (Duffin 1999).

Relevance to Science and Religion

It is clear from the above that transfusion medicine currently is a scholarly area of scientific endeavor. This has become particularly true since the AIDS epidemic of the early to mid-1980s, when it was shown clearly that the AIDS virus (HIV1/2) can be transmitted to recipients by transfusion. This tragic realization highlighted the importance of transfusion-transmitted infections. Many such HIV1/2 transfusion-transmissions have been documented, and as a result, a considerable research effort has since been mounted in an attempt to reduce the risk of the transfusion transmission of infections of all types (viruses, bacteria, protozoa and prions) (Blajchman and Vamvakas 2006). While this endeavor has been quite successful, it has become evident recently that blood product transfusions can also result in transfusion-associated deaths due to causes other than those due to transfusion-transmitted infections. For example, one of the most common transfusion-associated morbidity and mortality risk is a clinical entity known as

transfusion-related acute lung injury (TRALI). Other noninfectious adverse events related to transfusions include transfusion-associated circulating overload (TACO), graft-versus-host disease (GvHD), and hemolytic transfusion reactions often due to ABO incompatibility. The latter are usually due to the administration of the wrong product, usually due to an error, giving the recipient the wrong type of blood (i.e., A blood to an O recipient). At this point in time, the noninfectious risks of blood transfusion account for more than 85 % of the transfusion-associated mortalities reported to regulatory authorities. Despite the attention they continue to receive, transfusion-associated infections account for less than 15 % of the deaths caused by or attributed to blood transfusions.

It is important to note at this time that the blood donor who provides the raw materials for the manufacture of the various blood products that are transfused to patients requires the interdisciplinary interaction between those involved in transfusion medicine and relevant disciplines which can ascertain the best ways of encouraging blood donation as well as to understand the barriers to volunteer blood donations. However, compared to the many scientific endeavors associated with Transfusion Medicine, these nonscientific endeavors are still somewhat underdeveloped but nonetheless very much related to the scholarly area known as “Science and Religion.”

Sources of Authority

The authoritative sources for transfusion medicine are generally the scientifically based physicians and scientists who clearly are members of academic institutions worldwide. As indicated above, the father of modern Transfusion Medicine, Karl Landsteiner, was a physician-scientist. Landsteiner was awarded the Nobel Prize in 1930 for his seminal work identifying the ABO blood group system. This discovery led to safer blood transfusions and eventually to the scientific endeavor now known as Transfusion Medicine. During the last two decades of the twentieth century, many

academic chairs in transfusion medicine have been established worldwide in many university-affiliated faculties of medicine. These positions are often held by distinguished and authoritative transfusion medicine scholars. In addition, many textbooks on transfusion medicine have been published, as have learned journals which publish peer-reviewed authoritative articles by transfusion medicine physicians and scientists. These include the journals *Transfusion*, *Transfusion Medicine Reviews*, ► [Transfusion Medicine](#), and *Vox Sanguinis* to name but a few. Based on these books and journals, as well as the widespread use of the Internet for scientific communication, there is a rapidly expanding scientific knowledge base related to transfusion medicine and Transfusion Science which have established an authoritative evidence-based transfusion use of blood products for patients (Blajchman and Klein 1997).

Ethical Principles

Transfusion Medicine, as is the case currently for every medical discipline, is guided by clearly enunciated ethical principles, based primarily on the Hippocratic Oath. Hippocrates, a Greek physician who formulated the Hippocratic Oath is generally considered the Father of Medicine. More recently, the Hippocratic Oath has been supplemented by various other relevant statements of ethical principles, primarily that of the Declaration of Helsinki which was initially enunciated in 1971 and updated regularly since. Thus, transfusion medicine practice and related research activities are carefully monitored to ensure ethical practice by its practitioners.

Key Values

The key value of transfusion medicine is to provide the safest possible transfusion products, derived from that special fluid “blood,” to give to patients who need them to correct their specific deficiencies. Because transfusion medicine practice occurs worldwide, tens of millions of blood products are transfused annually. Thus,

the most important value for this subdiscipline is to provide safe and effective blood products to patients!

Conceptualization

Nature/World/Human Being

Since transfusion medicine deals with only humans, nature is conceptualized primarily on the scientific knowledge as to how the human body functions in all of its biologic complexity and diversity.

Life and Death

Transfusion medicine plays an important role in the life and death of the human beings both of which constitute times when its practitioners play an important role!

Reality

The reality for practitioners of transfusion medicine is that while we play an important role in the maintenance of human life, death is an outcome over which we often have little control. This is usually a time that religion also plays an important role for many individuals.

Knowledge

Transfusion medicine views knowledge (particularly scientific knowledge) as ever expanding and readily transferable among those involved in this subdiscipline.

Truth

Truth in transfusion medicine is ever changing, based on current scientific understanding and the evolution of changing scientific paradigms.

Perception

Perception in transfusion medicine is also continually in a state of flux, depending on contemporary scientific knowledge and thinking.

Time

Time is an ongoing change in our state of being, which we cannot control, except by keeping up to date in the knowledge base of our subdiscipline.

Mystery

As outlined above in detail, history has often and to this day seen blood a magical and mysterious fluid or substance. The advent of scientific methodology in this subdiscipline since 1900 has nonetheless provided for an improved understanding and appreciation of the mysteries of blood – that “special” fluid that often sustains life.

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Transhumanism

► Posthuman Condition

Transnational Christianity

► Global Christianity

Transpersonal Studies

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Description

Transpersonal studies are a group of interdisciplinary orientations to scholarship concerned with the examination of various topics from perspectives that stem from science and the humanities. The scientific areas (e.g., transpersonal physics) challenge the reductionistic and mechanistic assumptions typically associated with science, while the humanities areas approach their topics from a similarly broadened perspective (e.g., transpersonal art history) (Friedman 2002). The transpersonal orientations evolved out of initial work in transpersonal psychology, which originated in the 1960s, as the need for transpersonal approaches to various disciplines in addition to psychology became apparent. By the 1990s related disciplines had been birthed, such as transpersonal anthropology, sociology and social work, medicine, education, ecology, art, literature, acting, law, and business (Boucoulalas 1999). While several of these remain in nascent form, others such as transpersonal anthropology are sufficiently developed to be recognized as independent disciplines in their own right (Laughlin 1989). In addition there are closely related fields not carrying the transpersonal name, such as ecopsychology and somatics, which can be seen as transpersonal, at least in part. A transpersonal approach can also be applied within fields such as cultural studies, ecology, neuroscience, pharmacology, philosophy, politics, psychiatry, and religious studies (Daniels 2005). Transpersonal psychology shares some values with feminism, as well as with the field of cultural studies (Brooks 2010). The transpersonal studies perspective is thus one that can be widely applied.

The transpersonal movement began in the United States through experimentation with mystical practices and psychedelic substances that induced non-ordinary states of consciousness (Hartelius and Friedman 2010). In these altered states the nature of reality seems to be not just mere bits of rule-following matter, but an interconnected, self-organizing, and evolving system that may be informed by wisdom and compassion, as well as driven by selfishness and impersonal forces (Grof 1983). Human beings were seen from this vantage as capable of cultivating personal development beyond the conventional socialized ego to what was called the transpersonal (Maslow 1969). This process, though explained in non-religious terms such as personal growth and self-actualization, is closely related to the spiritual development underlying various traditions, such as Buddhism, Advaita Vedanta Hinduism, and mystical branches of various religions and indigenous spiritual paths. Transpersonal psychology, founded in the late 1960s, was the first discipline to form within this movement, and its early leaders came largely from the humanistic psychology movement, including Abraham Maslow, Anthony Sutich, Stanislav Grof, James Fadiman, Miles Vich, and Sonya Margulies (Grof 2008). These first transpersonal psychologists felt that humanistic psychology held an overly restrictive view of human nature, and proposed a psychology that went beyond human nature to connect more broadly with the cosmos, including spiritual realizations (Hartelius and Friedman 2010; Grof 1983). There are now a number of academic degree and certificate programs offered in transpersonal studies (e.g., Atlantic University, California Institute of Integral Studies, Saybrook University, Sofia University), a school named after the orientation (Manchester Academy for Transpersonal Studies), and a journal targeted to its topic areas (International Journal of Transpersonal Studies).

Self-identification

Science

Transpersonal studies spans both scientific disciplines such as transpersonal psychology,

anthropology, and sociology, as well as non-scientific areas of study such as transpersonal art, literature, and religious studies (Friedman 2002; Boucouvalas 1999). In its scientific disciplines, transpersonal studies embraces the use of systematic scientific methods for gathering evidence, and uses this evidence to support or refute its theories (Friedman 2002). It is committed to a broad yet skeptical empiricism that considers phenomena within multiple epistemological frames. As such, it rejects both any romanticism that interprets evidence through an idealizing frame and scientism that maintains an allegiance to simple physicalist philosophical assumptions as if these were proven scientific fact. In this sense it maintains a commitment to examining the processes of knowing even as it employs these to gather knowledge.

Transpersonalism can be critiqued for its relatively modest output of empirical work, in line with similar criticisms of the closely related field of humanistic psychology. Yet the theoretical and philosophical emphases of the orientation is a reflection of the fact that transpersonal studies is engaged at the foundation of the scientific process, struggling with how Western notions of reality may, in the course of useful knowledge-gathering, also distort certain kinds of evidence (Grof 1983; Maslow 1969). This potential for distortion relates particularly to aspects of human life that do not fit comfortably within a rational frame, such as spiritual and non-ordinary experiences. The focus on these issues comes from an interest in the accuracy of knowledge, but it is also concerned about how the assumptions of a materialist philosophy reduce human experience through mechanistic interpretations of human nature. In this sense, transpersonal studies align with critical theory as a way of thinking that seeks to liberate human beings from oppressive systems (cf. Brooks 2010).

Religion

Transpersonal scholars often give serious consideration to the reality-assumptions of spiritual and mystical traditions, but typically in a more skeptical sense than an adherent of those traditions might offer (Friedman 2002). Where a rational empirical science might take religious beliefs as

informational constructs, and a social science might view them as social constructions, a transpersonal approach is more likely to understand them as reflecting not only information and societal creations, but also as responses arising from engagement with some phenomenon that has ontological presence in the world and warrants study. For example, some transpersonal scholars postulate that mystical experiences are not merely distortions of reality, but may reveal something about the cosmos not grasped in more mundane states of mind (Grof 1983; Tart 2000). States and processes such as meditation and enlightenment are considered possible avenues to other ways of knowing. Yet works within transpersonal studies typically step back from any particular tradition, seeking to evaluate spiritual and similar experiences in a frame that understands them as potentially valid parts of the whole person and the cosmos.

Characteristics

Transpersonal studies is most distinctive in its scholarly orientation of granting legitimacy to studying not only various states of consciousness, but also to studying them from the vantage point of various states of consciousness (Hartelius and Friedman 2010; Tart 2000). This is distinct from other scholarly traditions that tend to adopt a dispassionate and rational perspectives, whereas transpersonal studies considers ordinarily assumed divides, such as between the scholar and the object of study, and approaches, such as assumed rationality as opposed to intuitive or transrational approaches, to be artificial constraints. This is particularly apropos to the study of human beings in relation to diverse forms of spirituality and extraordinary experiences. Whereas traditional social science disciplines examining these topics (e.g., mainstream anthropology, psychology, and sociology of religion and spirituality) also explore the complexities pertaining to such phenomena, they are usually more focused on demographics and other etic variables, typically derived and interpreted according to academic frameworks that

hold narrower assumptions regarding reality (ontology), how we can know reality (epistemology), and human potential (what there is to know) (Hartelius and Friedman 2010). In contrast, transpersonal anthropology, psychology, and sociology consider that topics such spiritual experiences may offer valid glimpses into some things that are in some senses as real or possibly even more real than what conventional understanding through ordinary ways of knowing can grasp (Laughlin 1989; Grof 1983). For a transpersonal perspective, these do not necessarily represent distortions of reality so much as they may present aspects of reality that are difficult to grasp from within more ordinary states of consciousness, therefore requiring an emic approach. Transpersonal studies argue for the inherent value of certain types of non-ordinary experience on their own terms without reducing them to other ways of knowing (Laughlin 1989; Hartelius and Friedman 2010; Tart 2000). In addition to the transpersonal social sciences, other areas of transpersonal studies, such as art history and literary criticism, share this common framework for understanding and approaching their topics, but as humanities disciplines rather than as social sciences.

During its early decades, many transpersonal scholars subscribed to a perennialist philosophy, which attempted to understand various spiritual traditions as culturally situated reflections of a single and uniform transcendent reality (Grof 1983; Maslow 1969). However, Ferrer's incisive critiques of perennialism and his introduction of participatory philosophy into transpersonal theory have significantly shifted the debate within the movement to one of appreciating diversity in what is studied and how it is studied (Brooks 2010; Ferrer 2002). Perennialism attempts to perceive a singular ultimate within the world's spiritual traditions – an approach that can be illustrated by the metaphor that all rivers lead to the ocean. Participatory philosophy, by contrast, celebrates the diversity of traditions, and has been represented by the metaphor of an ocean with many shores. Transpersonal studies now typically accepts that, in order to understand the whole person in the context of global human

culture, no single frame of reference can account for all dimensions. The emphasis is therefore on employing multiple philosophical frames of reference as well as diverse research methodologies. Perennialism continues to function as a major framework, but as only one among several competing frameworks and it no longer has authoritative status.

Transpersonal studies provides not just a postmodern orientation that abandons its rootedness in traditional modern assumptions (Brooks 2010), but rather strives to be a post-Newtonian and post-Cartesian approach as well (Grof 1983). Modernism focuses on knowing an objective world; postmodernism addresses the many and different subjectivities by whom that world is known, and their impact on knowledge (Brooks 2010). Both preserve the rather large gap between subjectivity and objectivity that was articulated by Descartes in the seventeenth century, and neither challenges the mechanistic views that Newton's subsequent work has fostered (Friedman 2002; Grof 1983). It is this gap that transpersonal studies seek to address. Early perennialist models attempted to bolster the validity of transformative inner experiences by suggesting that, despite cultural differences in expression, spiritual traditions represent culturally-conditioned reflections of a singular transcendent reality. The notion that there may be spiritual realities that are empirically real in some ontological sense, yet inaccessible to ordinary sensory examination and unable to be studied scientifically, is entertained. Later participatory thought understands reality in more relational terms, where the world is not so much an objective space to which the subjectivity of human experience is an exception, as an intersubjective domain (Ferrer 2002). Differing spiritual traditions do not reflect aspects of some transcendent singularity as much as they embody the different ways that various cultural groups have co-created paths to deeper connection with the life of the larger whole. Participatory philosophy, though only developed in a preliminary way, resonates with more developed philosophical and psychological models that are based on systems thinking rather than

mechanistic models (Grof 1983), and evidences one direction in which transpersonal studies is heading.

Relevance to Science and Religion

Transpersonal studies is engaged with the heart of the debate concerning how science and religion can be understood within a frame that preserves the efficacy of both, though its focus is more on how spiritual, mystical, and other non-ordinary experiences can be studied scientifically without either reifying them or reducing them to the status of delusions (Friedman 2002); it is also concerned with how these can be appreciated from within the humanities tradition in a broadened way. It is interested in how the results of this study may provide a shifted framework within which to understand the mind, human society, culture, and personal and social relationships. In these endeavors, transpersonal studies wrestles with the epistemological divides between science and religion, and between one religion and another. One of the more helpful tools in the transpersonal approach is the notion that state of consciousness is a significant variable in comparative religion or philosophy: that different assumptions about reality may themselves be situated in different states of mind, and can best be understood from within those respective states of consciousness (Laughlin 1989; Tart 2000). This reflects a position that there is no single state of consciousness that has normative access to reality.

Sources of Authority

Transpersonal studies exist and develop within the current academic environment. Much transpersonal research is published in peer-reviewed journals such as *Journal of Transpersonal Psychology*, *International Journal of Transpersonal Studies*, *The Humanistic Psychologist*, *Journal of Humanistic Psychology*, *Transpersonal Psychology Review*, *ReVision: A Journal of Consciousness and Transformation*, and *Anthropology of*

Consciousness. While recent scholarship builds on previous scholarship, some early papers published by luminaries within the field such as Maslow and Grof are still referenced as important conceptual formulations (e.g., Grof 1983; Maslow 1969). For some years Ken Wilber was a particularly influential figure but, after his shift from transpersonal to integral psychology, the transpersonal field has been led by more diverse voices. Thinkers whose writings have contributed to the development and academic acceptance of transpersonal ideas include William James, Carl Jung, Otto Rank, Roberto Assagioli, Viktor Frankl, Abraham Maslow, Ken Wilber, Stanislav Grof, Stanley Krippner, Charles Tart, Roger Walsh, and Michael Harner.

Some accredited U.S. schools offering opportunities to study Transpersonal Psychology at the doctoral level include the Institute of Transpersonal Psychology/Sofia University, California Institute of Integral Studies, and Saybrook University. Many more opportunities are available worldwide to study transpersonal psychology at the master's level, or as an undergraduate course. The British Psychological Society has had its own Transpersonal Psychology Section since 1996 and, in the United States, the American Psychological Association Division of Humanistic Psychology (Division 32) is home to a Transpersonal Psychology Interest Group. Transpersonal Psychology and Humanistic Psychology are increasingly seen as complementary, such that to be fully humanistic requires recognizing the transpersonal while, conversely, to be transpersonal requires being first grounded in humanistic concerns. The Society for the Anthropology of Consciousness has been a division of American Anthropological Association since 1989.

Ethical Principles

Transpersonal studies is guided by the ethical principles of the scientific community with respect to research, the psychotherapy community's various ethical positions concerning clinical assessment and intervention, the values of the humanistic approach that opposes the reduction

of human experience to mechanistic processes, and the explicit transpersonal respect for the validity of experiences that may be situated within non-ordinary states of consciousness (Friedman 2002; Daniels 2005; Hartelius and Friedman 2010; Grof 1983; Maslow 1969).

Key Values

Key values of transpersonal studies include respect for human dignity, and respect for the interconnectedness of life and all of the cosmos. The first of these values it inherits from humanistic psychology, which holds as a central tenet that the present-moment experience of a living person cannot and should not be reduced to mechanistic components (Maslow 1969). Humanistic psychology, in turn, draws on the gestalt psychology tradition in this insight that the wholeness of human experience cannot be adequately represented by breaking it down into constituent parts. The second value obtains more from perceptions derived from spiritual and mystical experience, as well as from phenomenology, which assert that the world is a living unity, and that any division into discrete objects, however utilitarian, is to some degree an artificial construction imposed on an undivided whole.

The interconnectedness of the world, though in some respects a simple proposition, touches on complex issues, for interconnectedness is not a mere opposite to the view that the cosmos is made of discrete bits of matter. Rather, there can be many gradations of interconnectedness, ranging from the trivial notion that objects are always impacted by some parts of their environment, to the more radical notion that what appear as separate objects are in various senses inseparable from their context: Even an individual's sense of self and agency, though real, are shaped by the social, cultural, and geographical container within which they occur.

There is also a related but significantly different teaching within the tradition of Advaita Vedanta, which asserts that all of reality is radically one; Advaita means "not two," a concept that is typically translated as nonduality

(Whitfield 2009). This singular reality, Brahman, has no parts, no extension in space, and no duration in time. All of the world that is available to the senses is an illusory projection of that singularity, and the only reality that these sense objects have is the one reality that is their source. This Advaita teaching concerning the oneness of reality does not refer to interconnectedness of the world, since interconnectedness of those phenomena would simply be a perceived quality within the illusory realm of sense objects. The importance of differentiating this point is that the nonduality of Advaita is at times incorrectly conflated with the quality of interconnectedness. Both positions are views that some transpersonal scholars hold, but the two should be understood as distinct from each other.

Conceptualization

Nature/World

Nature is understood as a living system with which humans are both part and inextricably interconnected. The world is not seen as a collection of mere physical particles under the effect of impersonal forces, but a matrix in which consciousness and compassion may also be present (Grof 1983). The dynamics of ecology mirror those of psychology, because mind and nature are not separate.

Human Being

The human being is understood as an aspect or facet of an interconnected living system (Hartelius and Friedman 2010). The appearance that people are separate, self-directed individuals is balanced by the insight that humans are intimately shaped – physiologically, mentally, and emotionally – within the relational network of the world (Brooks 2010). The limits of the ego are not the boundaries of the person, for an individual is capable of expanding beyond those bounds in both space and time, and perhaps in ways to which time and space have no relevance (Friedman 2002; Grof 1983). A transpersonal perspective posits a larger potential for the development of an individual beyond the conventional stages of sexual

and cognitive maturity achieved in early adulthood, holding the possibility of the ongoing cultivation and deepening of qualities such as empathy, compassion, wisdom, and altruism.

Life and Death

Life is the natural condition of the world, and death is seen as a possible transition to other forms of existence, not necessarily a terminus. Due to this orientation, transpersonal scholars have an interest in topics such as near-death experiences, after-death communication, research into reports of reincarnation, and other such areas of study related to phenomena that assume the possibility of some conscious survival of death (Hartelius and Friedman 2010; Grof 1983).

Reality

The nature of reality is a philosophical question, and transpersonal studies entertains a variety of philosophical approaches, including perennialist, participatory, postmodern constructivist, and critical realist. In this sense, transpersonal scholarship does not have a defined position on the nature of reality. What transpersonal perspectives typically have in common is a view that there is more to reality than a simple mechanistic or materialistic perspective can describe, and that spiritual, mystical, and some non-ordinary experiences may be related to the perception of phenomena that belong to this order (Grof 1983).

Knowledge

Knowledge can be either intellectual, conceptual, and theoretical representations of phenomena, in a standard academic sense, or it can be a process of relational engagement with the world that leads to a lived understanding. Knowledge does not have to be limited to a particular state of consciousness nor set of rules, such as linear logic, as knowing can be transrational. For example, deeply intuitive knowledge can be how a part might immediately know the whole by virtue of being connected from the inside to the whole, rather than through an external way of knowing that is divided between subject and object (Anderson and Braud 2011; Friedman 2002).

Truth

Transpersonal studies is divided on the issue of truth. Those scholars holding to a perennialist philosophy tend to conceive of truth as pertaining to a transcendent spiritual dimension, whose verities are filtered down and variously distorted through different cultures (Ferrer 2002). Scholars more inclined to a participatory philosophy understand knowledge as arising in specific, located, and relational contexts, and do not imagine that there is a monolithic or authoritative truth to be obtained (Brooks 2010; Ferrer 2002).

Perception

In a transpersonal approach, the spectrum of perception is envisioned as containing more than the standard physical senses. It is often assumed that intuitive forms of vision, hearing, sensing, or knowing may also represent avenues of perception – though these may operate in association with states of consciousness that differ in some ways from states typical of ordinary rational thought (cf. Friedman 2002).

Time

There is little transpersonal scholarship that addresses the conceptualization of time, though the concept of transpersonal self-expansiveness beyond the ego can represent expansions into the past and future, as well as a spatial expansion (Friedman 2002).

Consciousness

Transpersonal scholars are more unified in what they reject about consciousness than in what they allow. Consciousness is seen as something more than an epiphenomenal product of material interactions (Grof 1983; Maslow 1969). Consciousness may be the matrix out of which matter arises, or perhaps consciousness is an intrinsic property of matter.

Rationality/Reason

Reason is held as an important standard of mental discipline. However, in contrast to the Enlightenment perspective that imagines a complete knowledge of the world can be obtained by applying the rational mind to the study of the

objects of the world, transpersonal scholars typically recognize that the nature of the world is something more than a simple physicalism might allow. For this reason, deep understanding of the world may require reason at a minimum, but phenomena may also carry a complexity that demands something more than reason alone – some intuitive grasp of pattern or resonance (Friedman 2002; Grof 1983). Knowledge based on exercises of this sort should then be tested in reasonable ways, employing methods that are capable of testing for the possible presence of more subtle or complex patterning, and do not reduce the phenomena based on assumptions that only simple physical mechanics are operant (Anderson and Braud 2011).

Mystery

For transpersonal scholars, mystery typically refers to aspects of the world that are not grasped by a mechanistic or materialistic account of reality, but are directly encountered within experiences related to the practice of mysticism (Friedman 2002; Grof 1983).

Relevant Themes

The emic/etic distinction, derived initially from debates related to anthropological research, pertains to a group or individual's differing perception of reality structured according to a particular cultural background or experiential knowledge. Today it is often considered that an emic account belongs to someone "native" to a culture, while an etic account belong to that of a cultural outsider. This important distinction can also be applied to alternate states of consciousness, which can be difficult to understand if not actually experienced in an emic way (Laughlin 1989; Tart 2000). It would be difficult, if not impossible, for an investigator to provide a neutral etic account, as it would be for a cultural "native" to be able to formulate an emic account, because all are biased by their own worldview. The emic/etic distinction is extremely relevant when investigating transpersonal experiences related to particular cultural

and religious backgrounds of a studied participants. Such difficulties in doing transpersonal studies may require considerable redefining of what it means to be human related to cultural divides and various alternate states, such as springing from psychedelic experiences or immersion in cultures with radically differing worldviews.

Cross-References

- [Christian Healing Cultures](#)
- [Cognitive Science of Religion](#)
- [Consciousness, the Problem of](#)
- [Faith and Belief](#)
- [Meaning, the Concept of](#)
- [Meditation-Research](#)
- [Mindfulness \(Buddhist\)](#)
- [Near-Death Experiences](#)
- [Psychology in Buddhism](#)
- [Psychology of Religion](#)
- [Religious Experiences](#)
- [Self, from a Psychological Perspective](#)
- [Transcendence and Immanence](#)
- [Worldview](#)

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Tripitaka (Sanskrit)

- [Buddhist Canonical Literature](#)

Truth

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Related Terms

[Conceptions of truth](#); [Concept of truth](#); [Definition of truth](#)

Description

The concept of truth is one of the most widely discussed concepts in modern philosophy. And understandably so, for “truth” is what philosophers, scientists, theologians, etc., typically (or at least often) understand themselves to be aimed at pursuing. And not only so, even nonpractitioners of philosophy, science,

theology, etc., also typically take themselves to pursue truth. Indeed, the concept of truth seems more or less to permeate the whole of human culture. What, then, *is* this thing called truth? In what follows, we will survey some sustained and much-discussed philosophical attempts to answer this question, with a focus on Western thought in general and on analytic philosophy in particular.

The Classical Heritage

Two simple but immensely influential characterizations of the notion of truth in traditional Western thought are those of the Greek philosopher Aristotle (384–322 BC) and the scholastic philosopher Thomas Aquinas (1225–1274). Taken together, these two characterizations could be regarded as providing something of a “classical heritage” in Western thinking about truth.

Aristotle’s (1968) characterization of the notion of truth (*aletheia*) is found in his *The Metaphysics* IV and VIII, and consists in the claim that “to say” (*legein*) that “what is is, and what is not is not, is true” (*to on einai kai to me on me einai alethes*). This characterization relates two things to each other: reality (“what is,” “what is not”) and speech (“to say”). The way in which reality and speech are related to each other is left implicit but is clearly understood as some sort of congruence.

Thomas Aquinas’ (1948) characterization of the notion of truth (*veritas*) is found in his *Summa Theologica* I, q16, a2 (as well as in *De veritate* q1, a2). Thomas draws on Aristotle’s characterization but goes two steps further than Aristotle. A first step consists in explaining truth not via a relation between reality and speech but rather between reality and mind (*intellectus*). A second step consists in explaining the relevant relation between reality and mind as a relation of conformity or adequation (*adaequatio*). The resulting characterization runs: “Truth is the conformity of thing and intellect” (*veritas est adaequatio rei et intellectus*).

Aristotle’s and Thomas’ characterizations of truth are usually described as “correspondence

theories of truth,” but one does well to bear in mind that neither Aristotle nor Thomas spoke of their characterizations as “theories,” nor did they seek to shed light on the relevant relation between reality and speech/thought by means of the term “correspondence” (this term was not used in mainstream philosophical theorizing about truth until the early twentieth century).

Correspondence Theories

The most well-known and discussed type of theory of truth is the correspondence theory of truth. This type of theory comes in many different versions. Perhaps the two most famous attempts to develop correspondence theories of truth in modern analytic philosophy are those of Cambridge philosopher Bertrand Russell (1872–1970) and Oxford philosopher John L. Austin (1911–1960) to which we now turn.

In *The Problems of Philosophy* ([1912] 1998), Russell proposes three “requisites” which he holds that all theories of truth must fulfill. A first requisite is that the theory of truth recognizes that truth and falsity are properties of beliefs; accordingly, a theory of truth developed along strictly materialist lines will not work. A second requisite is that the theory recognizes that truth and falsity “always depend upon something which lies outside the belief itself” ([1912] 1998, 70). A third requisite is that the theory admits not only of truths but also of falsehoods; in other words, a theory of truth that entails that there are only truths and no falsehoods must be wrong. Russell regards these three requisites as fairly obvious.

Russell’s attempt to develop a theory of truth that meets the above requisites can be summarized as follows: In line with the first requisite, it is proposed that the things that are true or false are beliefs or judgments understood as essentially involving minds. In line with the second requisite, it is proposed that a true belief or judgment is one in which a mind judges certain objects in the world to be arranged in a certain order, and these objects really are arranged in this order in the world. Given this, the first requisite can also

be seen to be capable of being met for a false belief or judgment can then be said to be a belief or judgment in which a mind judges certain objects to be arranged in a certain order, and these objects are not actually arranged in this order in the world (See Russell [1912] 1998, 69–75).

Austin's theory of truth is put forth in his influential paper "Truth" ([1950] 1961) and differs in many ways from Russell's theory. Contrary to Russell's first requisite, Austin does not take beliefs but statements to be the primary bearers of truth and falsity on the ground that beliefs are beliefs in things that have or can be stated. Crucial to Austin's theory are two pairs of distinctions: first, a distinction between sentences and statements and second, a distinction between types of states of affairs and historic states of affairs. What these distinctions amount to can be explained by the following example: the sentence "the cat is on the mat" has one meaning but can be used to make various different statements, for example, the statements that the cat in Tom's house is on the mat, that the cat in Sally's house is on the mat, and so on. The state of affairs that this sentence picks out is not an actually obtaining state of affairs but rather a type of states of affairs, whereas the particular states of affairs corresponding to the statements that the cat in Tom's house is on the mat, that the cat in Sally's house is on the mat, and so on, are not types of states of affairs but allegedly obtaining, historic, states of affairs. Given these distinctions, Austin now proposes the theory of truth, roughly put, that a statement is true when the historic state of affairs which it picks out is "of a type with" or "sufficiently like" the type of state of affairs picked out by the sentence by means of which the statement is made; if the historic state of affairs is not sufficiently like the relevant type of state of affairs, the statement is false (Austin [1950] 1961, 89–90).

Russell's and Austin's theories are similar to each other in that they both take for granted that there are such things as arrangements of objects, or states of affairs, in the world. They are also similar to each other in that they propose that the truth or falsity of beliefs or statements is to be

explained via reference to these arrangements of objects or states of affairs in the world. It is on account of this last similarity that the two theories are usually dubbed "correspondence theories of truth."

Correspondence theories of truth of the above and other sorts have attracted widespread sympathy, especially from analytic philosophers. But they have also been much criticized. One of the most discussed objections in recent years is the so-called slingshot objection; according to which, the admittance of a plurality of states of affairs entails that there can be only one state of affairs. The arguments adduced in support of this alleged entailment are often very complex, however, and also highly controversial.

Two Tarskian Contributions

In the 1930s and 1940s, the Polish logician Alfred Tarski (1902–1983) made some celebrated contributions to discussions of truth. These contributions were taken by Tarski to provide "a more precise expression" of the "intuitions" underlying "the classical Aristotelian conception of truth" ([1944] 1996, 342–343). Of Tarski's various contributions, two have stood out as especially significant.

A first such contribution consists in Tarski's proposal of a criterion for the adequacy of any theory of truth that is to count as explicating the classical Aristotelian notion of truth. The criterion runs, thus, "X is true if and only if *p*," where "X" stands for the name of a sentence and "*p*" stands for the sentence thus named ([1944] 1996, 344). This is Tarski's well-known "criterion of material adequacy," or "Convention T." The sentence "Snow is white," for example, counts as true if and only if snow is white and so on for all other (declarative) sentences. Tarski argues that the application of this criterion to natural languages such as English generates logical contradictions. The sentence "This sentence is false," for example, will be true if and only if the sentence is false. In view of this result, Tarski draws the radical conclusion that a consistent definition of truth within the context of natural languages is – at least by present lights – impossible.

A second significant contribution of Tarski's consists in the proposal of a definition of truth in the context of formal logical languages. The proposed definition makes use of a distinction between object language and metalanguage; the object language contains, among other things, the linguistic expressions of a formal logical language that are used to refer to objects in the world (typically first-order variables, singular terms, and n -place predicates), whereas the metalanguage consists of various linguistic expressions used to talk about the linguistic expressions of the object language. On the basis of this distinction, Tarski sets as his aim to provide a definition on the metalanguage level of the truth predicate "x is true" as it occurs on the object language level. This is done via the logical notion of *satisfaction*. Tarski offers a detailed and technically rigorous definition of satisfaction, but on the more general level, the notion can be described as a certain sort of relation between objects and linguistic expressions, where, for example, an object a is said to satisfy a predicate such as "x is white" if and only if a is white. The truth or falsity of a sentence of a formal logical language is then defined in terms of an object sequences satisfying the sentence or not satisfying the sentence. The resulting definition can be shown to be materially adequate in the sense of abiding by the above mentioned Convention T. Moreover, inasmuch as the object language does not contain the linguistic resources required for talk about its own sentences, the application of Convention T to this language does not generate contradictions.

Tarski's two above contributions have enjoyed much respect and prestige, especially among analytically oriented philosophers. But there have also been critics. With regard to Convention T, it has been urged that this criterion is philosophically trivial and is fulfilled by any and every theory of truth. With regard to Tarski's definition of truth in terms of satisfaction, it has been urged that this definition sheds no light on the notion of truth as discussed by traditional philosophers for traditional philosophers have not been concerned with defining a truth predicate that figures in a formal logical language but

with understanding the notion of truth at play in natural language and ordinary thinking. On a more general level, it has been urged, with regard to both Convention T and Tarski's satisfaction definition of truth, that they fail to shed light on the notion of truth inasmuch as truth is a value not of sentences but of the objects of propositional attitudes such as beliefs, disbeliefs, doubts, and so on – that is, of propositions.

The Deflationist Thesis

A much-discussed theory of truth in recent literature is deflationism whose chief contemporary elaboration is found in contemporary philosopher Paul Horwich's book *Truth* (1990).

The core claim of deflationism is the thesis that the meaning of the truth predicate is adequately and fully captured by instances of the so-called equivalence schema: "The proposition p is true if and only if p " (not to be confused with Tarski's Convention T, which states necessary and sufficient conditions for the truth of sentences, not of propositions). Instances of this schema are "the proposition *that snow is white* is true if and only if *snow is white*," "the proposition *that the cat is on the mat* is true if and only if *the cat is on the mat*," and so on. Since the list of instances of the equivalence schema is infinite, it is not possible to state the deflationist theory exhaustively; one can only give partial statements of the theory by lists of instances of the equivalence schema of the above sort.

Another central thesis of deflationism is that there is nothing more to the content of the term "true" than what is captured by instances of the equivalence schema. Traditional philosophy's quest for a definition or theory about truth that is to tell us more about truth than is captured by instances of the equivalence schema is considered fruitless and confused: there is simply nothing more to know about the meaning of "true" than is found in these instances.

The above position naturally gives rise to the question why there is a truth predicate in natural languages such as English in the first place. For, after all, "the proposition that p is true" says no

more than “*p*”; why then make use of the truth predicate at all? Horwich’s response is that the truth predicate functions as a sort of referential device enabling us to do such things as refer to propositions the contents of which we are not clear about. For example, the truth predicate enables to say that “what Tom said is true” even if we are not clear about what Tom actually said. These sorts of locutions would not be possible if we only could refer to what Tom said by repeating what he actually said hence the utility of the truth predicate in natural languages.

Like all truth theories, the deflationist theory has received its share of criticism. An important objection to the theory is that it fails to tell us what all true propositions have in common, which, it is felt, a theory of truth ought to be capable of telling us. The deflationist theory only tells us what it means for specific propositions to be true, not what all these true propositions have in common.

The Indefinability Thesis

According to a further approach, which shares with deflationism a rejection of substantial theories of truth, truth cannot be defined at all but should instead be regarded as a primitive or indefinable notion. A major representative of this approach in the analytical philosophical tradition is the German philosopher-logician Gottlob Frege (1848–1925).

In “Der Gedanke” (1918), Frege seeks to support the thesis that truth is indefinable by means of the following argument. With regard to any proposed definition of truth, it can always be asked whether that definition is true, in which case the notion of truth will already be involved in the definition in question. Take, for example, the proposal that truth consists in the correspondence of a proposition with a fact. With regard to this proposal, we can ask whether the proposal is true or not, and it is only in the case of the proposal being true that it will succeed in telling us what truth is. But if this is so, then the notion of truth will already be presupposed in its definition. And this result naturally extends to all proposed

definitions of truth. All definitions of truth, Frege concludes, must be circular.

A possible objection to Frege’s argument for the indefinability thesis is that definitions, strictly speaking, are not the sort of things that can be true or false. If a “true proposition” is defined as, say, “a proposition that corresponds to a fact,” then this definition merely fixes the meaning of the term “true proposition,” and this fixing of meaning is not something that can be true or false. To this objection, it might be responded that Frege’s argument is really aimed at undermining definitions that seek to provide true-or-false explications of the concept of truth, not at definitions that fix the meaning of a term. The cogency of Frege’s argument would seem to depend on the adequacy of this sort of response.

Practical and Epistemic Constraints

There have been various twentieth-century attempts to put practical, epistemic, or other kinds of restrictions on truth. In what follows, we briefly survey some of these restrictions:

Practical restrictions on truth were famously introduced by William James (1842–1910) and other so-called American pragmatists. In *The Meaning of Truth* (1909), James claims that true ideas are “those that we can assimilate, validate, corroborate and verify,” or that which is “expedient in the way of our thinking” (1909, 3–4). Otherwise put true propositions are true only insofar as they have certain practical consequences.

Practical restrictions on truth of the above sort have on the whole been rejected by analytic philosophers. There seem to be numerous obvious counterexamples to such restrictions. Take, for example, proposition events in the far past. Surely, it may be true or false that Julius Caesar’s grandmother was born at 1 o’clock, but it is unlikely that it makes any practical difference to us either way. And so on for various other propositions about the distant past.

More recently, Oxford philosopher Michael Dummett (1978) and Harvard philosopher Hilary Putnam (1981) have argued that there is a strong

conceptual tie between truth and justifiability, such that for any truth p it is the case that p can be justified, if not in practice, then at least in principle, in ideal epistemic conditions, by an ideally rational community or suchlike. An important consequence of this position is its antimetaphysical thrust: there can be no such thing as a proposition whose truth value is in principle inaccessible to human beings.

Dummett and Putnam both argue for their above point of view by means of various meaning theoretical considerations. Dummett's main argument proceeds from the idea that since the meaning of terms is derived from their use, the meaning of the term "true" must manifest itself in some actual linguistic use, to wit, in the capacity to decide whether propositions are true or not. Such a manifestation would not be possible in the case of propositions whose truth values could not be decided, however; hence, there cannot be such propositions (see Dummett 1978, 215–247). Putnam's main argument is that the idea that there are propositions whose truth values are inaccessible to human minds presupposes the further idea that the world consists of a fixed totality of mind-independent objects. But this further idea, argues Putnam, does not ultimately make sense for the only objects we could possibly talk about in any meaningful sense are the objects that present themselves in human experience and conceptualization and hence are not mind independent (see Putnam 1981, 1–74).

Dummett's and Putnam's epistemic restrictions on truth have attracted enormous attention within analytic philosophy but also widespread criticism.

A major objection to Dummett's above-considered "manifestation argument" (as it has been called) for epistemic restrictions is that there are various other ways in which knowledge of the meanings of terms could manifest itself in actual linguistic use besides the capacity to decide whether sentences or propositions are true or not. For example, such knowledge could manifest itself in the ability to use the relevant terms as they are ordinarily used in a natural language, for instance, by being able to combine them with each

other in appropriate ways to form meaningful sentences.

A major objection to Putnam's argument is that the objects that we can meaningfully talk about are by no means limited to objects that present themselves in human experience. Natural languages typically contain various resources – for example, various descriptive devices such as so-called definite descriptions – enabling talk also about objects lying beyond human experience, such as abstract objects (numbers, sets) or quantum particles (electrons, quarks).

More generally, it has been urged against Dummett/Putnam-style epistemic restrictions on truth that these restrictions, just like the practical restrictions familiar from pragmatists such as James, are unable to account for the fact that there are obviously true-or-false propositions about the distant past which nevertheless fall beyond the range of what can be true or false according to the proposed restrictions. Thus, given Dummett's and Putnam's epistemic restrictions, a claim like "Julius Caesar's grandmother was born at 1 o'clock" would seem to be incapable of being true or false since there seems to be no way of verifying it; but clearly, this claim is either true or false, and accordingly, Dummett/Putnam-style epistemic restrictions must be mistaken. For these sorts of reasons, many contemporary philosophers have rejected epistemic constraints on truth and have embraced the opposing idea that there can be propositions whose truth values lie beyond what human beings can find out.

Context-Dependent Approaches

According to some philosophers, the concept of truth should be understood in different ways depending on the context or subject matter in which it figures. Thus, for example, mathematical propositions might be true in the sense that they can be proved within some mathematical system, scientific propositions might be true in the sense that they accurately describe the world, and theological propositions might be true in the sense that they somehow are true to one's existential experience. This view is particularly popular

among philosophers influenced by Ludwig Wittgenstein and has been applied particularly to religious themes such as belief in God. Thus, D. Z. Phillips (1934–2006), the preeminent twentieth-century Wittgensteinian philosopher of religion, says that belief in God is “a matter of what to make of life itself” and is as such not a belief “whose truth depends on whether it tallies with the facts” (Phillips 2004, 85).

A common argument urged in support of the present context-dependent approach to truth derives from Wittgenstein’s dictum that the meaning of a term consists in its use. In line with this, it has been said that in order to know what the term “true” means when applied to the propositions of some particular context or with regard to a particular subject matter, one has to look and see how it is used in the particular context or subject matter in view. Once one does this – it is often claimed – it will often be clear that the term “true” as it figures in one particular context means something different from its occurrence in another context. For example, in religious contexts, the term “true,” as applied to, say, the belief that God exists, does not mean anything like “describes reality accurately,” which may be what the term means in the natural sciences. In religious contexts, the term “true” may instead mean something more like “existentially adequate” or suchlike. And the same goes *mutatis mutandis* for uses of the term “true” in numerous other contexts.

Critics of the present context-dependent approach to truth have urged that there is only one concept of truth and that all subject matters – mathematics, the sciences, theology, and so on – are all concerned with arriving at truth in this one sense of “true.” In support of this claim, it has often been said that this is how people in these various different contexts understand themselves to be using the term “true.” The person who wants to know whether it is “true” that God exists is not using the word “true” in a different sense from the person who wants to know whether it is “true” that numbers, sets, quarks, or electrons exist even though the importance attached to the former question is often considered far greater than the importance attached to the latter ones.

Cross-References

► [Coherentism](#)

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Truths, Four Noble

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Related Terms

[Ariyasacca \(Pāli\)](#); [Aryasatya \(Sanskrit\)](#)

Description

The four noble truths are perhaps the most central teaching of Buddhism, delineating the scope of *dukkha* – a term whose meaning ranges from barely noticeable dissatisfaction to outright

suffering as inherent features of human existence (► [Dukkha](#)) – the arising of *dukkha*, its cessation, and the path leading to its cessation.

What makes these four noble truths particularly relevant to the dialogue between science and religions is the circumstance that the Buddhist discourses correlate the four aspects of this scheme with four qualities of medical practice. This comparison is based on the notion that a doctor needs to be able to identify a disease, diagnose its cause, know what constitutes the appropriate remedy, and administer the medicine until the disease is cured (Takakusu and Watanabe 1924–1934, 2.105a and T 2.462c). In other words, this central doctrine of Buddhist thought conceptualizes the human predicament of *dukkha* in terminology reminiscent of medical analysis. The underlying pattern of the four noble truths could thus be represented as follows:

- Disease: *dukkha*
- Pathogen: craving
- Health: Nirvāṇa
- Cure: noble eightfold path

In this way, while the first noble truth recognizes the nature of the “disease” of *dukkha*, the second noble truth identifies craving as the pathogen responsible for the arising of *dukkha*. The third noble truth then envisages the realization of Nirvāṇa as the condition of health wherein *dukkha* ceases, and the fourth noble truth delineates the eightfold path as the actual cure whose undertaking will lead to realizing the cessation of *dukkha*.

According to tradition, this form of presentation was adopted by the Buddha right after his awakening in order to convey what he had realized to those who were to become his first disciples (Feer 1884–1898, V 421). The four noble truths can thus be considered as the Buddha’s teaching in a nutshell. A simile in fact compares the comprehensiveness of these four noble truths to the footprint of an elephant, which due to its size comprises the footprint of any other animal (Trenckner and Chalmers 1888–1896, I 184).

The scope of *dukkha*, according to the first noble truth, covers physical events such as disease and death, as well as the mental displeasure that can arise from being unable to satisfy

one’s desires. The first noble truth then sums up its description of *dukkha* under the chief fact of the five aggregates (affected by) clinging. These five aggregates are considered in early Buddhist thought as the chief constituents of an individual, comprising bodily form, feeling, perception, volitional reactions, and consciousness. Thus, *dukkha* can in the final count be traced back to clinging to various aspects of oneself. In other words, the actual experience of *dukkha* requires personal involvement in what is taking place by way of clinging, attachment, and craving.

The second noble truth identifies craving as the chief condition for *dukkha*, glossed as the tendency to delight in this and that. A more detailed exposition of the genesis of *dukkha* takes place by way of dependent arising, which has ignorance as the starting point (► [Dependent Arising](#)). This provides the backdrop to the idea that craving is the chief culprit for the predicament of *dukkha*, in that any reaction by way of craving is itself the conditioned outcome of ignorance.

The cessation of ignorance then leads via the cessation of craving to the cessation of *dukkha*, the theme of the third noble truth. Such cessation finds its consummation in the four levels of awakening recognized in early Buddhism: stream entry, once return, nonreturn and arahantship (► [Awakening](#)).

The fourth noble truth presents the noble eightfold path as the means for reaching Nirvāṇa and the cessation of *dukkha*. This path covers the eight central requirements for achieving full awakening:

- Right view
- Right thought
- Right speech
- Right action
- Right livelihood
- Right effort
- Right mindfulness
- Right concentration

Right view in this context is an appreciation of the four noble truths, in that such a type of view sets the direction and context for any undertaking of the path. In other words, rightly directed view is the precursor of the other factors of the path (Trenckner and Chalmers 1888–1896, III 71).

Based on right view, the practitioner then develops right thought by leaving behind thoughts of sensual desire, ill will, and harming, instead engaging in their opposites. With right speech, right action, and right livelihood, the necessary moral foundation for progress to awakening is brought into being. This requires avoiding falsehood and other types of unwholesome speech, as well as refraining from actions like killing, stealing, and sexual misconduct, and not adopting a type of livelihood that involves inflicting harm on others.

Right effort then stands for endeavoring to overcome unwholesome mental conditions and establish what is wholesome in the mind. Right mindfulness covers contemplation of the body, feelings, mental states, and phenomena in an attempt to understand their true nature. With right concentration, the development of mental tranquility comes to the fore, expressed in terms of four levels of absorption (Sanskrit *dhyāna*, Pāli *jhāna*), during which the mind becomes deeply concentrated and internally stable.

According to a stanza found in an early Buddhist collection of poetry, gaining insight into these four noble truths will provide the practitioner with a supreme refuge, far preferable to any sacred place or other type of refuge (von Hinüber and Norman 1994, Stanza 192).

Cross-References

- [Dukkha](#)
- [Reality in Buddhism](#)
- [Religious Experiences](#)
- [Truth](#)

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Two- and Three-Dimensional Art

- [Art, Studio](#)

Typologies in Science and Religion

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Related Terms

[Models of how to relate science and religion](#)

Barbour's Typology

The most influential typology of how to relate science and religion has been developed by Ian Barbour.

Barbour proposes a fourfold taxonomy (conflict, independence, dialogue, and integration) in order to give a systematic overview of the main options today. Advocates of Barbour's first view, the *conflict view*, maintain that science and religion are rivals. They compete on the same turf, and in the end, one will emerge as the winner. His two paradigm examples of advocates of the conflict view are scientific materialists (or proponents of scientific naturalism or scientism) and religious literalists: "They both claim that science and theology make rival literal statements about the same domain, the history of nature, so that one must choose between them" (Barbour 1997: 79). Defenders of the *independence view*, on the other hand, maintain with regard to science and religion that each has its own distinctive domain and its characteristic methods that can be justified on its own terms. Proponents of this view say there are two jurisdictions and each party must keep off the other's turf. Barbour also identifies two mediating positions between these extremes. The advocates of the *integration view* hold that some sort of integration is possible between the content of theology and the content of science (Barbour 2000:3). Thus, for example, proponents of this view could maintain that changes in scientific theories may affect the reformulation of certain religious beliefs (such as ideas about creation, original sin, and divine omnipotence). Barbour maintains that in the fourth model, the *dialogue view*, a less direct relationship between science and religion than that posited in the integration view, is defended. Although an exchange between the two practices may take place about the metaphysical presuppositions, the methods, or the conceptual tools of science and religion, in contrast to the integration view reformulation of the content of science or religion will seldom be called for.

Barbour's typology can be summarized in the following way:

1. *The conflict view* is the view that science and religion are rivals; they compete on the same turf, and in the end, one will emerge as the winner.
2. *The integration view* is the view that there is some sort of overlap between science and religion so that changes in scientific theories may entail the reformulation of religious beliefs or doctrines.
3. *The dialogue view* is the view that an exchange between science and religion can take place about metaphysical presuppositions, methods, conceptual issues, and the like, but it would not or at least seldom result in a reformulation of religious beliefs or doctrines.
4. *The independence view* is the view that science and religion each has its own distinctive and completely separate domain.

Due to its influence among scholars in the science-religion field, Barbour's typology has also been the object of criticism (Cantor and Kenny 2001: 765f).

One problem is that Barbour sometimes writes like three of these science-religion views are compatible with each other, but they are not. It is true that it is compatible with both the dialogue view and the integration view that something is valid in the independence view because if one maintains that there is merely an intersection between science and religion, then this entails that some part of religion is independent of some part of science. However, as soon as there is an overlap in respect to methodology, then this is not compatible with the independence view because by definition, it contains the claim that there are no overlaps between science and religion. Moreover, if there is an overlap with respect to the doctrines of creation and human nature, then this undermines the dialogue view because it presupposes that the overlap is limited to methodology, conceptual issues, boundary questions, and the like. One can advocate only one of these views because they are defined as mutually excluding each other.

A second problem concerns the names Barbour gives to two of these views: "integration" and "dialogue." Irrespectively of which of these science-religion views we hold, we could

argue that its advocates ought to become engaged in a *dialogue* with each other and thus sometimes drop the polemics or stop ignoring each other. Dialogue is thus a way in which people that holds different views can relate to each other. It is therefore unfortunate and biased to call one science-religion view the “dialogue” view, because it could be argued that it is desirable that people, irrespectively of which of these views they hold, should at least sometimes try to become involved in a dialogue with each other and listen carefully to what people with different views think about these issues. To some extent, this is also a problem with “integration.” It seems as though we can talk about integration between two things only if we believe that both are worthwhile but different in some important respect. It does not make real sense to try to integrate science and religion if you think that only religion or only science is worthwhile.

Third, as soon as one allows an interaction between science and religion, one opens the door for potential conflict, consonance, or harmony between science and religion. Drawing on the recent work of astronomers, John Polkinghorne and others have argued that the physical constants in the early universe appear to be fine-tuned as if by design, thus providing additional confirmation for a belief in God as the designer and creator of the universe (Polkinghorne 1998). Religious practitioners could by religious ways of belief formation obtain this knowledge, but now, it seems as if information obtained by scientific ways of belief formation can also confirm this religious belief. However, not only does intersection between science and religion allows the possibility of harmony, it also allows the possibility of conflict. Gordon Kaufman for instance argues that changes in scientific theory make it necessary to reconstruct the conception of God that has traditionally been endorsed by Christians, Muslims, and Jews. There is a conflict between a personal conception of God and scientific theories about cosmic and biological evolution (Kaufman 2001). Nevertheless, Kaufman does not (in terms of Barbour’s typology) accept a conflict view: he holds an integration view. Here, we

have a more serious conceptual problem with Barbour’s typology. Even if a scholar engaged in the religion-science dialogue maintains that there is a conflict between science and religion, this does not automatically make him or her a proponent of the conflict view. *Conflict* between science and religion is compatible with the conflict view, the integration view, and the dialogue view. *No conflict* between science and religion is compatible with not merely the integration view and the dialogue view but also the independence view. Of course, the larger the intersection between science and religion is, the larger the area of potential conflict (or harmony for that matter) between science and religion is.

Haught’s Typology

John Haught has developed slightly different typology for how to relate science and religion than Ian Barbour. Haught, just like Barbour, proposes a fourfold typology (conflict, contrast, contact, and confirmation). Some hold that religion is utterly opposed to science or that science totally undermines religion. This is the *conflict view*. Haught gives a number of examples of scholars who hold this view. The historian of science William Provine writes that we have to check our brains at the church house door if we are to be both scientist and believer, and the physicist Steven Weinberg claims that the deeper science looks into the nature of things, the less the universe seems to bear any imprint of an interested God (Haught 1995: 12, 28).

The second approach is the *contrast view*. Its advocates insist that religion and science are so different from each other that they cannot come in conflict. They are both valid but yet completely separated domains with no overlap. Science is concerned with examining the natural world empirically, religion is a search for ultimate meaning and values. He takes for instance protestant theologians Rudolf Bultmann and Karl Barth to exemplify particular versions of this science-religion as well as theologians inspired by the later work of the philosopher Ludwig Wittgenstein.

Those who hold the *contact view* argues rather that although science and religion are distinct, science always has implications for religion and vice versa. The term “contact” implies coming together without necessarily fusing. Haught sees Ian Barbour, Ted Peters, and many other participants in contemporary science-religion dialogue as advocates of this view. According to the contact view, theologians always bring at least implicit cosmological assumptions to their talk about God. Theology should therefore remain positively consonant with cosmology, and the same applies to all the other sciences. Haught writes that the contact view “proposes that scientific knowledge can broaden the horizon of religious faith and that the perspectives of religious faith can deepen our understanding of the universe. It does not strive to prove God’s existence from science but is content simply to interpret scientific discoveries within the framework of religious meaning” (Haught 1995: 18). He prefers to collapse much of what Barbour in his typology calls “dialogue” and “integration” into this broader contact view.

The forth alternative is akin to but logically distinct from the third. Its spokespersons maintain that religion positively supports the scientific adventure of discovery. It looks for those ways in which religion, without in any way interfering with science, paves the way for some of its ideas and even gives a special kind of blessing to the scientific quest for truth. Haught states the view as follows: “religion’s claim that the universe is finite, coherent, rational, ordered totality, grounded in an ultimate love and promise, provides a general vision of things that consistently nurtures the scientific quest for knowledge and liberates science from association with imprisoning ideologies” (Haught 1995: 4). This is the *confirmation view*; religion does provide confirmation of the trusting that underlies science. Haught, following the theologian David Tracy, embraces this view himself and claims that it envisages a more intimate relationship of religion to science than the contact view.

Haught seems to acknowledge that the first three views are incompatible. People could not hold more than one of these at the same time.

However, his own view is that the contact view supplemented by the confirmation view provides the most fruitful and reasonable alternative of how to understand the relationship between science and religion. Hence, at least the last two views in the typology are not mutually exclusive but can (but need not) be combined.

Haught’s typology can be summarized in the following way:

1. *The conflict view* is the view that science and religion are fundamentally irreconcilable.
2. *The contrast view* is the view that religion and science are both valid but yet completely separated domains with no contact.
3. *The contact view* is the view that although science and religion are distinct, there could be dialogue, interaction, and possible consonance between the two domains.
4. *The confirmation view* is the view that religion on a deep level supports and nourishes the entire scientific enterprise, but it does not support and nourish particular scientific theories.

Haught believes that the confirmation view goes further than the contact view. Haught writes that he “appreciate all the efforts to discover consonance between science and religion” but he “envisage a more intimate relationship of religion to science” than the contact view (Haught 1995: 21). On this point, he can be criticized for giving a too narrow interpretation of the contact view. If it is meant to cover the ways of relating science and religion which are not to be classified as a version of the conflict view, the contrast view, or the confirmation view, Haught cannot take the contact view to be merely about discovering consonance between science and religion nor can he deny that an advocate of the contact view could attempt to prove or, which is more common, give evidential support for God’s existence by appealing to scientific data.

If the contact category is to be broader than Barbour’s dialogue and integration categories, then it must leave open what particular form of contact its defenders advocate. This category should cover not only those who argues for a more thoroughly positive contact than consonance but also those who claim that there is on some points conflict or at least tensions between

science and religion. So for instance, the philosopher Michael Ruse's view is that science and Christianity are two distinct and valid domains but that although it is possible to combine the two, it is not as easy as Christians ordinarily seem to think it is (Ruse 2001).

If, however, we in this way make "contact" a broader category than Haught seems to think, it is then the confirmation view that becomes one particular version of the contact view. If religion, at least in its theistic interpretation, could provide a general vision of things that consistently nurtures the scientific quest for knowledge and liberates science from association with imprisoning ideologies, then there is contact between the two domains. Thus, what seems to be lacking is a typology that illuminates different versions or sub-models of the contact view.

Stenmark's Typology

Mikael Stenmark's typology is influenced by those developed by Ian Barbour and John Haught, but it attempts to avoid the shortcomings of their typologies. Stenmark takes the idea behind a good typology to be to identify and relate in an unbiased way the key positions within the specific field that the typology in question attempts to illuminate. He proposes a fourfold taxonomy to capture different ways of relating science and religion (irreconcilability, contact, independence, and replacement), which is supplemented by a distinction between different sub-models particularly when it comes to the category of "contact" (Stenmark 2004 and 2005).

A first possibility is to maintain that science and religion are rivals. They compete on the same turf, and in the end, one will emerge as the winner. There is no way in which one can be both properly scientifically minded and a true religious believer. This *irreconcilability view* (or conflict view) has been defended by a philosopher like John Worrall and scientists such as Richard Dawkins and Peter Atkins.

According to the *independence view*, conflicts between science and religion could and should be avoided if they are taken to be inquiries in

separate domains. Its defenders maintain that science and religion are not rivals at all because they have no turf in common. Stephen Jay Gould, for instance, claims that "the net, or magisterium, of science covers the empirical realm... The magisterium of religion extends over questions of ultimate meaning and moral value. These two magisteria do not overlap, nor do they encompass all inquiry" (Gould 1999: 6).

Any view in between the irreconcilability view and the independence view would have to presuppose an overlap between science and religion, that is, some area of contact. Stenmark follows John Haught and call this option the *contact view*. The idea is that the two practices are distinct but their content can influence each other, even to such extent that reformulation or modifications of one or both is necessary. However, not merely conflict or tension (causing reformulation or modifications) is possible in the area of contact but also consonance or even harmony.

A fourth possibility is the *replacement view*. Typically, this view is expressed in terms of science replacing religion. The idea would then be that science today or in the near future could replace religion: that is, the domain of science can be expanded in such a way that science might become our new religion. Perhaps the best-known advocate of this view is the father of sociobiology, Edward O. Wilson.

Stenmark's typology can be summarized in the following way:

1. *The irreconcilability (or conflict) view* is the view that science and religion cannot be reconciled while still maintaining the distinctive features that characterize them as science or as religion and not some other human activity.
2. *The independence view* is the view that science and religion are compatible because they are two completely separate but legitimate practices with no overlap or contact.
3. *The contact view* is the view that science and religion are distinct practices, which nevertheless can come in contact with each other, that is, there is some area of overlap.
4. *The replacement view* is the view that science could today or in the near future replace

religion: that is, the domain of science can be expanded in such a way that science might become our new religion.

Stenmark maintains, however, that when we turn to the specialist literature that deals with science-religion relations, we discover that most of the ideas expressed would presuppose an acceptance of the contact view. That is to say, most of the scholars engaged in the dialogue today maintain or assume that science and religion can be combined or reconciled in some way or other; yet, they differ on how exactly this should be done, developing a variety of different standpoints. The challenge is to provide an impartial and illuminating account of the differences among those who subscribe to the contact view.

What is evident, however, is that some scholars think that the contact between science and religion is fairly limited, whereas others seem to think that it is a substantial contact between the two practices. Stenmark's proposal is therefore that we are making a distinction between *strong* and *weak contact views*. The difficulty is to state that distinction more precisely since scholars locate the contact in very different places (Stenmark 2007: 694–696).

Ian Barbour's theology of nature approach, for instance, entails that the main source of theology lies outside science, but scientific theories may nevertheless affect to some degree the reformulation of certain religious doctrines, particularly the doctrines of creation and human nature (Barbour 1997: 98). Gordon Kaufman argues that changes in scientific theory make it even necessary to reconstruct the core conception of God that has traditionally been endorsed by Christians, Muslims, and Jews (Kaufman 2001: 409–25). Less radical is Arthur Peacocke's position, which attempts to preserve the traditional idea of personal conception of God. Still he suggests that the starting point for theology should be the natural sciences, hence his talk of a "naturalistic theology," and in this respect, he goes beyond the theology of nature approach identified by Barbour (Peacocke 2007: 8 f.). Advocates of natural theology, on the other hand, claims that the contact is positive rather

than negative for traditional religions and more direct since their idea is that the existence of God is made probable by evidence discovered by science such as the "fine-tuned" character of the universe, namely that the fundamental parameters of the early universe seem to be fine-tuned for the conditions required for the emergence of life and intelligence. Creationists and defenders of intelligent design would probably see the contact between science and religion to be even greater but negative not for religion but for science because in certain cases, religious beliefs affect significant reformulation of certain scientific doctrines, such as evolutionary theory.

Although these approaches differ radically, all of them are examples of the contact view. They all agree that science and religion are distinct practices, which can nevertheless meet each other, and in those areas of contact, there could be a relationship of harmony, consonance, tension, or conflict between the two.

Stenmark's suggestion is therefore that we define the *weak contact view* as the view that when the relationship between science and religion is not one of harmony or consonance, merely minor reformulations or changes of religion (and sometimes of science) are called for in the area of contact. The *strong contact view* is the view that when the relationship between science and religion is not one of harmony or consonance, then substantial reformulations of religion (and sometimes of science) are called for in the area of contact.

Although the general assumption of the science-religion debate is undeniably that contemporary science is okay as it is and that it is religion that needs to change; the bracketing in the definitions are meant to be a reminder that some defenders of the contact view deny that the traffic only goes in one direction, from science to religion. In their understanding, science sometimes need to change rather than religion.

Stenmark's typology might therefore be understood to actually be fivefold, containing the following ways of relating science and religion: the irreconcilability (or conflict) view, the replacement view, the strong contact view, the weak contact view, and the independence view.

Cross-References

- [Intelligent Design](#)
- [Natural Theology](#)
- [Naturalism](#)
- [Scientism](#)

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Ubuntu

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This is a foundation concept in African indigenous relational ethics. It refers to a belief among peoples in Africa that humans are made persons because of, and through, other persons. That is, that we are who we are through the support and mentorship of others. In this perspective, progress in our lives is influenced by the operation of the principle of mutuality of obligation and care between the individual and the community.

UFO

► [UFO Cults](#)

UFO Cults

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Related Terms

[Aliens](#); [Extraterrestrials](#); [Heaven's gate](#); [Räelian movement](#); [Solar temple](#); [UFO](#); [Unarius academy](#)

Description

The terminology “UFO cult” can be misleading in that the groups do not worship UFOs (unidentified flying objects), rather the beings that they believe control or create UFOs. Religions based around beliefs in UFOs and extraterrestrial beings are mostly a product of the past 150 years. Such beliefs are oftentimes similar to those of New Age religious groups, and one could say that UFO cults are a form of New Age

religion (Albanese 2008). Although theological ties between the two are similar, social structures of UFO cults are more discernible.

Emanuel Swedenborg's publication claiming that he communed with spirits from other planets in 1758 (Swedenborg 1758/2006) is accepted as the first claim of communication with ► [extraterrestrials](#), but otherwise the idea lay fairly out of the public eye until the advent of spiritualism in the late nineteenth century (Albanese 2008). After the late 1940s, the idea of the existence of ► [extraterrestrials](#), and possible communication with these beings, became a common notion. Their publicity and popularity helped push the idea into contemporary western culture.

Many groups have a Christian background and use the Bible, supplemented by a number of unorthodox or apocryphal texts, as the basis for their beliefs. As recently as the Cold War, the theologies started to emphasize a transition into a "New Age," where the knowledge of technologically superior ► [extraterrestrials](#) is used to enlighten humanity (Albanese 2008).

Recent developments in UFO cults have been traced by the media, often in a negative light. During the late 1990s, a string of suicides portrayed the entire body of UFO traditions negatively. The deaths of the members of the Solar Temple and Heaven's Gate fueled the media's portrayal of apocalyptic and millennial cults during the coming of the year 2000. Since then, legal battles have come to the forefront of media coverage, the debate usually being whether or not UFO-based religious groups are legitimate religions and therefore eligible for certain tax exemptions (Melton 2000). After the year 2000, the millennial beliefs of many groups have refocused on a "global consciousness shift" placed at the end of the Mayan calendar cycle ending on December 21, 2012.

Self-identification

Science

One could not say that UFO cults, if taken as one body, identify as a science, but there are

some groups that claim to be a science, such as the Unarius Academy. Although these groups rely in part on the existence of other intelligent life in the cosmos, their methods are not always believed, even from within the tradition, to be fully scientific.

Religion

Some, but not all, UFO cults do not identify as a "religion" due to their identity as a "science," in which case religious identification comes secondary to their identity as a science. Some religions blur these identities, such as Scientology, which markets itself as a science or a psychology; however, many legal battles have been fought to legitimize it as a religion (Melton 2000; Cowan & Bromley 2007).

Characteristics

The marker of this tradition is the belief that UFOs and ETs are superhuman agents acting in our world. The novel nature of such beliefs also allows it to be marked as a subset of the more general typology of new religious movements.

Relevance to Science and Religion

Many UFO cults have an interest in the interchange of science and religion to publicly –and empirically– prove or produce circumstantial evidence for the existence of UFOs and ETs. Otherwise, the interest lies mainly in the use of science to back up the religious beliefs a particular group may hold.

Sources of Authority

Authority comes from a variety of sources, unique to each group. Many UFO cults have a paradigmatic alpha leader who leads through teachings and revelations. Some traditions operate via texts and involve mainly audience-type adherence. Similarly, a growing trend involves the dissemination of information through the

Internet for proselytization and teaching. Individual teachers are the most common authority and derive authority from the ability to obtain knowledge. Some leaders claim that they are physically extraterrestrial, they are inhabited by an extraterrestrial spirit, or in communication with ► [extraterrestrials](#), in order to legitimize authority.

Ethical Principles

Ethics mainly reflect humanist principles and global themes. Some scholars posit that the Cold War context that gave rise to most UFO cults, and the global concerns that arose during this time period, informed the global ethical concerns in an age of potential nuclear warfare (Rothstein 2003).

Key Values

Like most aspects of UFO cults, values are unique to individual groups and usually reflect their respective authority. Many themes run through a majority of traditions, such as environmental concerns, disarmament, and human health concerns (especially in relation to nonhumans, i.e., ► [extraterrestrials](#)). Many groups value medicine and health, consistent with the authority granted to scientific research by the group. The values of some groups challenge those of their host societies and cultures. For example, the International Raelian Movement openly endorses public nudity in a society that eschews such displays (Palmer 2004).

Conceptualization

Nature/World

The natural world is often dualistic in that there is a world where humans interact and our physical reality is manifest, but there is also a spiritual world, which exists along side of our own yet is also able to manifest itself into the physical realm.

Human Being

There is no clear boundary between what is or is not human; rather, the main ontological boundary is between terrestrial and extraterrestrial; biological or semantic definitions of human are not significant in relation to the place of origin.

Life and Death

Reinterpretations of the Judeo-Christian creation story are common origin myths, where concepts such as angels are reinterpreted as ► [extraterrestrial](#) beings. Usually, the afterlife is a Judeo-Christian reinterpretation when time after death is spent in the company of extraterrestrial gods in a non-terrestrial paradise. However, reincarnation is also a common belief.

Reality

Reality is treated in much the same way as “nature” or the “world.” The reliance of empirical evidence, either scientific or the reoccurring sightings of UFOs and reports of ► [extraterrestrials](#), leads one to see that UFO religions view “reality” as something tangible; however, reality is not limited to the world around us. UFOs, their abilities, and the ability for a human to contact extraterrestrial entities violate traditional views on reality, but these concepts are very real to a believer.

Knowledge

Knowledge can be anything that is learned, or for some traditions, something unlocked through experience and progression.

Truth

When truth is important to one particular group, it is only important as a concept that represents that which is known to be true and usually understood as subjective.

Perception

Perception is usually similar to beliefs of New Age religions in that it is something perceived by the human mind.

Time

Conceptions of time exist in parallel to notions of reality and nature. For traditions that view the

world linearly, time has a beginning and an end, usually similar to the Judeo-Christian creation myth and apocalyptic end time where the world enters a Utopian age. For some groups, time moves incrementally, where humans progress to the next level of existence or age when adequate spiritual and/or technological advancement is achieved. For other groups, time is cyclical; this is most prominent in traditions that believe in reincarnation.

Consciousness

Consciousness is not generally defined across UFO groups. However, consciousness and debates on its nature, its existence, and its meaning are prominent discourses in the groups individually.

Rationality/Reason

Many traditions place great weight on rational thought, but this will always come second to the value placed on the faith and authority in a UFO cult.

Mystery

Mystery is viewed in relation to revelation and truth, anything that cannot be revealed or shown to be true is a mystery; it is therefore more of a temporary label for something that is not yet known.

Relevant Themes

Important to most groups is the concept of potential. Many groups emphasize what the world or humanity could be like at its pinnacle. Like most eschatological religions, the potential for this paradise to manifest itself in our reality weighs heavily on the traditions, but unlike Christian apocalyptic beliefs, the paradises are often extraterrestrial.

Cross-References

- ▶ [Eschatology](#)
- ▶ [Evolution](#)
- ▶ [Incarnation](#)
- ▶ [New Age Religions](#)

- ▶ [Online Religion](#)
- ▶ [Posthuman Condition](#)
- ▶ [Scientism](#)
- ▶ [Space and Time](#)
- ▶ [Transcendence and Immanence](#)

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Unarius Academy

- ▶ [UFO Cults](#)

Unconscious Sight

- ▶ [Blindsight](#)

Uniquely Individual

- ▶ [Personalism](#)

Universal

- ▶ [Metaphysics, Darwinian](#)

Universality

- ▶ [Cross-Cultural Psychology](#)

Universe

► Astronomy

Unsatisfactoriness

► Dukkha

Upper Paleolithic

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A period of time beginning about 35,000 years before present when increasingly sophisticated stone tools, complex social systems and settlement patterns, cave art, and other abstract, symbolic artifacts emerge in the archeological record in Europe. This period is often cited as a “cultural revolution” marking the beginning of modern thinking. Recent work questions the extent to which modern behavior emerged suddenly with the Upper Paleolithic as increasing evidence of modern behavior continues to accrue in the pre-Upper Paleolithic African archeological record. However, the quantity and, to some degree, quality of UP artifacts associated with modern cognitive abilities (e.g., symbolism) continue to stand as significant.

Urology

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Description

Urology focuses on the diagnosis and conservative as well as surgical therapy of diseases of the

urinary system (kidneys, ureters, urinary bladder, urethra) and the male genital tract (testicles, epididymis, seminal vesicles, penis, prostate). Since circumcision and catheterization of the bladder have been verified to date back to very early in medical history, the existence of Urology dates back to ancient Egypt, particularly to time between 2318 and 2300 BC. Urology was part of surgery, and it was not before the end of the nineteenth century that Urology was developing into a specialty of its own.

This development was driven by three major medical inventions:

1. The introduction of antiseptic principles into surgery (Abbou et al.)
2. The introduction of a special instrument to evacuate bladder stone fragments (Bigelow 1875) (Best and Neuhauser 2004)
3. The introduction of endoscopy of the bladder (Maximilian Nitze 1879) (Chaussey et al. 1980)

Urology was established as a science of its own first in France, where in 1890 Felix Guyon was appointed to a chair of “Clinical Urology” in Paris. It was also in France where the first scientific association of urology, the Association Francaise d’Urologie, was founded in 1896.

There are two important recent developments in Urology:

1. The development of the extracorporeal shock wave lithotripsy (ESWL) that was first introduced in Germany as a noninvasive method to treat stones in the kidneys and the ureters and almost completely replaced open surgery (Herr 1764).
2. The development of laparoscopic techniques for surgery of the urinary tract and the male genital organs. These techniques have a major impact on patients comfort in that they reduce pain and shorten the hospital stay (Schuessler et al. 1997). Moreover, laparoscopic techniques are currently improved by the addition of three-dimensional vision and virtual reality. This technique, robotic laparoscopic surgery, initiates a change of paradigms in urologic surgery, since the surgeon works on a remote computer workstation without physical contact to the patient (Smith 1979).

Self-identification

Urology uses scientific methods to gain knowledge and to evaluate clinical experience with new approaches to diagnosis and therapy. The major keys to understanding of urologic disease are pathology and pathophysiology. New therapies or diagnostic methods are evaluated using the scientific methods of medical statistics. By this approach, Urology identifies itself as a science.

Characteristics

Urology is a medical subspecialty not only derived from surgery but also from medicine. Urology deals with the diagnosis and therapy of diseases of the urinary tract in men and women and in the male genital organs. The distinction to other medical specialties is by the focus on particular organs.

Relevance to Science and Religion

Urology sees itself as a part of scientific medicine and thereby contributes to the understanding of human health and disease as a whole.

Sources of Authority

Like in other medical specialties, it were the outstanding contributions of single physicians and researchers that were authoritative in the past. These days, journal articles and congress presentations are the major source for distribution of knowledge in Urology. Since it is virtually impossible to read all relevant journal articles even in a relatively small specialty like Urology, the direct impact of individual journal articles is decreasing. Systematic reviews and clinical guidelines are gaining more and more importance in this context. The major source of authority nowadays is therefore statistical proof of significance.

Ethical Principles

There is no formal written compliance to certain ethical standards in Urology as well as in other medical specialties. However, it can be assumed that all urologists worldwide adhere to the principles of the oath of Hippocrates (460 BC–370 BC) in general and the Declaration of Helsinki as far as clinical studies are concerned.

Key Values

The key values of Urology are the prevention, identification, and treatment of diseases of the urinary tract and the male genital organs.

The major key value is removing the burden of suffering from each individual patient. For this purpose, a variety of minimally or noninvasive methods of diagnosis and therapy have been developed. One key development in diagnosis was the introduction of endoscopy of the bladder (cystoscopy) by Maximilian Nitze (1848–1906) which – for the first time – allowed for nonsurgical inspection of an internal organ and thereby formed the basis of endoscopic surgery. In the 1980s, stone therapy was revolutionized by the introduction of a new noninvasive form of stone therapy (extracorporeal shock wave therapy: ESWL) which almost completely replaced open surgery for stones in the kidneys and the ureter. Nowadays, there is a strong focus on laparoscopic surgery which in some fields is expected to replace open surgery soon.

A second key value of Urology focuses on preservation of organ function. Reconstructive surgery, such as replacement of a tumor-infiltrated bladder by a “neobladder” crafted from ileum, forms a major part of Urology. Moreover, kidney transplantation is part of Urology and helps people to survive without dialysis.

A third key value of Urology is the cooperation with other medical specialties. Urology has a strong interdisciplinary approach to diagnosis and therapy. This applies – among others – to the therapy of urologic cancer and the diagnosis and therapy of neurologic disease of the urinary tract, human reproduction, and venereal diseases.

Conceptualization

Nature/World

Nature is conceptualized as the natural environment which provides the basic resources required for human living.

The world is conceptualized as the place that hosts human beings and all other components of nature.

Human Being

A human being is conceptualized as a complex biological unit with unique potentials. These include (among others) a highly functional brain, emotions, the capacity for abstract reasoning, language, and bipedal walking.

Life and Death

Life is conceptualized as a coordinated function of complex biological systems coordinated by the brain. Male reproduction and urinary excretion are subfunctions of life, the latter of which is essential for survival of a human organism, and the first essential for long-term existence of mankind.

Reality

There is no specific concept of reality in Urology; however, Urology uses surgical methods that are based on “virtual reality,” such as robotic surgery, where the surgeon does not have haptic contact with the patient and performs surgery from a computerized workstation.

Knowledge

Knowledge is the basis of Urology as of all other medical subspecialties. Since medical knowledge is based on personal experience and controlled clinical trials, it is essential to organize knowledge according to commonly accepted rule in order to transfer knowledge between generations of physicians.

Truth

Truth is an essential prerequisite in the development of knowledge. Only trusted sources are generally accepted in this specialty, like all others in medicine.

Perception

Perception is conceptualized in Urology as the ability of the physician to “see, what is there.” However, perception is not restricted to sight but also includes hearing, touch, and smell. The sense of taste is currently not used any more in Urology.

Time

Time may be useful in Urology for diagnosis in difficult situations. If a CT scan reveals some minor changes in a certain organ, repeating the examination after some time can help to make the correct diagnosis. For example, if after 6 months a minor change in an organ has not further grown, it should be unlikely that the diagnosis is “cancer.”

Consciousness

There is no specific concept of consciousness in Urology. However, the loss of consciousness under general anesthesia was an important prerequisite for making major surgical operations possible. In addition, loss of consciousness may be an indication of severe urologic disease, such as kidney dysfunction or blood loss after internal organ injury.

Rationality/Reason

Rationality and reason form the basis for decision making in Urology.

Mystery

There is currently no concept of mystery in Urology, since Urology is based on scientific concepts rather than mystery.

Relevant Themes

Science dominates two aspects of Urology:

1. The active development of this medical specialty is critically based on scientific research. Research, however, is generally restricted to specialized institutions, such as universities, university hospitals, and research centers.
2. Daily practice of Urology is dependent on science, since its methods are based on science. Outside research institution, the major focus of Urology is on patient care rather than on the active development of science.

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Utilitarian Ethics

► Utilitarianism

Utilitarianism

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Related Terms

[Consequentialism](#); [Teleological ethics](#); [Utilitarian ethics](#)

Description

Utilitarianism is a moral theory or ethical perspective which judges the morality of actions based on an evaluation of consequences (or effects, outcomes). The good consequences of actions (e.g., that people's preferences are fulfilled, or that they become happier) are

weighed against the bad consequences (e.g., any pain or suffering which the action leads to), and the central ethical obligation is to perform the action whose overall consequences are the best (or most beneficial) in a given situation. By implication, actions are considered morally wrong if there was something else which the agent could have done in the situation which would have produced a better outcome. Being a central form of teleological or consequentialist ethics, utilitarianism is commonly contrasted with deontological ethics – which judges the morality of actions based on their adherence to (most often strict) action-principles or rules – and virtue ethics – which holds that morality essentially concerns the development of virtuous character traits. Consequently, utilitarianism holds that whether a certain action is right or wrong does not depend on what kind of action it is (whether, e.g., it is a case of lying or killing) or with what intention it is performed (whether, e.g., it is performed with good or bad intentions). Rather, the central issue is what consequences or outcomes different actions produce, that is, what the results of different actions are.

Utilitarianism was first introduced by the British philosophers Jeremy Bentham and John Stuart Mill in the late eighteenth and early nineteenth centuries. They were both political thinkers and used their account of utilitarianism primarily to justify certain legal and social reforms, which were generally considered radical at the time. Interestingly, one of Bentham's and Mill's main ideas was that utilitarianism should be the ethical theory of choice for people in a post-religious and scientific society, since it essentially poses a challenge to all those philosophers and theologians promulgating, for example, a sacred right to life or a list of the "natural rights of men." Before we are to believe in such things, Bentham and Mill suggested, we must be presented with some idea as to how they connect with what people actually value – that is, with people's welfare. However, it may be noted that some utilitarians argue that the theory also fits very well with many religious conceptions of morality. Indeed some argue, for example, that utilitarianism is the most plausible interpretation of the "Golden Rule"

common to several religious traditions (roughly that you must “only treat others in a way in which you would like to be treated yourself”). According to utilitarianism, namely, what ultimately matters is how people are affected (roughly how well-off they are made) by different actions – and all people’s welfare matters equally in this, that is, I cannot count my own welfare as more important than yours when evaluating the consequences of actions.

What is roughly utilitarian moral thinking is often involved in contemporary debates on more particular ethical issues – like, for example, charity, abortion, and euthanasia. Utilitarianism is probably the best explanation of the popular view that we have strong moral reasons to give to charity, for instance, since – as was just noted – everyone’s welfare is given equal moral weight in this perspective. Thus, even though I may desperately want an iPod for myself, I would probably make the world a much better place if I gave the money away to famine relief. Arguments to the effect that abortion or euthanasia should be legal because of the negative effects associated with prohibitions are also rather straightforwardly utilitarian; that is, they are arguments about what sort of policy would produce the best outcome. At the same time, it may be noted, there can be utilitarian arguments going in the opposite direction as well. There may, for instance, be utilitarian grounds for arguing that numerous individual instances of abortion or euthanasia are immoral – because it probably would have had better effects in many situations to let the child or elderly person live. In the end, however, it is often rather difficult to say exactly what utilitarianism implies in a given situation, and this is so for several reasons. One reason is that one never can know in advance what consequences a given action will have (more on this below). Another reason is that several strands of utilitarian thinking may be possible.

While utilitarianism to some extent is a more uniform moral tradition than, for example, deontological ethics, a number of variations of its central theme are indeed possible. A first dimension of variation is what more precise theory of value one relies on, that is, exactly what it is that

makes outcomes good or bad. Many utilitarians use the general term “utility” (from which the theory derives its name) to denote whatever it is that is valuable in life or society. But it may be noted that many different views obviously are possible on exactly what utility is. Bentham’s and Mill’s classical view on this was that only happiness or pleasure matters (this is commonly called Hedonism, or Hedonistic Utilitarianism). What this means, it should be added, is that only pleasure is *intrinsically* good (and that only pain is intrinsically bad). Many things can be *instrumentally* good in the sense that they *lead* to happiness. So, for instance, knowledge and virtue can be instrumentally good in so far as they tend to lead to happiness, both for the one who attains them and for people around them. But knowledge and virtue would not be good, or so the idea goes, if they did not have these relations to pleasure and pain. According to classical utilitarianism, then, the only thing which is good *in itself* is pleasure. But this is not the only possible view. According to another view (called Preferentialism), knowledge and virtue are only valuable to the extent that they lead to people getting what they want – that is, to the *satisfaction of preferences*. A good deal of utilitarian thinkers have supported this view, but some support yet another view (sometimes called Objective List Theory, or Perfectionism) according to which such things as knowledge and virtue indeed can be good *in themselves* and not only instrumentally good.

A second dimension of variation is perhaps more technical and concerns value aggregations, that is, how individual instances of whatever is good or bad are aggregated into one overall measure. Bentham’s and Mill’s credo is often restated as “the greatest good for the greatest number of people.” However, we may note a certain ambiguity in this credo: In certain situations, one’s only options may be to either give a greater benefit to fewer people, or to give a smaller benefit to more people. That is, one may have to choose between the greatest good, on the one hand, and the greatest number of people, on the other. What should one choose? The classical utilitarian answer to this question is that one should try to find the best mix between

the two, that is, that it is the *total amount* of utility which matters (this is sometimes called Total Utilitarianism). In the case just mentioned, the total amount of utility is most easily calculated by taking the size of the benefits distributed and multiplying this by the number of people who get it. If the number of people to which you can give the smaller benefit is sufficiently large, then, this may outweigh the fact that the benefit is smaller and you should then go for the smaller benefit. By caring about the total amount of utility, classical utilitarians suggest that they strike a reasonable balance between the quality of benefits and the quantity of people enjoying them. But, once again, this is not the only possible view. According to a different view (called Average Utilitarianism), “quality is more important than quantity” and so what ultimately determines whether an action is right or wrong is how the *average* level of welfare in the world is affected.

A third and final dimension of variation is exactly how one goes from an evaluation of outcomes to the moral evaluation of actions. The underlying goal of utilitarianism is roughly to steer our behavior in the direction of producing the best outcomes. Now, classical utilitarians take this to rather straightforwardly imply a criterion of rightness for actions; as noted above, the central ethical obligation is said to be to perform the action whose overall consequences are the best in the situation. (Just to clarify: What determines the rightness of a particular action are not only the consequences of that distinct action, it may be noted, but also what the consequences would be of all other actions open to the agent in the situation. In most situations in our lives, utilitarianism suggests, there are simply more than one line of action “open” to us, that is, there are a lot of things that we could do if we wanted to. The morally correct action is then the *one out of these* which produces the best consequences.) But this is not the only possible view. According to so-called Rule Utilitarianism, one should instead perform actions which are in line with the *set of rules* which produce the best consequences – that is, one must first figure out what set of rules that would have the best outcome if everyone

followed them, and then one’s ethical obligation is to abide by this set of rules. Rule Utilitarianism may be seen as a sort of mix between utilitarianism and deontological ethics.

According to proponents of utilitarianism, this sort of moral perspective has a number of characteristics which should make it more appealing than rival ethical theories (e.g., deontological ethics or virtue ethics). As noted above, utilitarian ethics is sometimes said to be in line with the Golden Rule, for instance, and also to provide a kind of secular test of, or standpoint against which to counter, appeals to supposedly “fundamental values” (like dignity, liberty, or equality) which not everyone share. Most importantly, however, utilitarian ethics is typically held out to be a very simple ethical theory: All that matters is utility, or people’s happiness, and actions are simply morally right or wrong in so far as they maximize this kind of value. Of course, on the other hand, critics of utilitarianism suggest that its simplicity is one of its main weaknesses. And indeed, it may be noted that a good deal of philosophers and theologians have been very critical of utilitarian ethics. The central criticisms of utilitarianism can be divided into two main groups: One the one hand, it is often argued that utilitarianism is too *permissive*, and on the other, it is sometimes argued that utilitarianism is too *demanding*.

The argument that utilitarianism is too permissive takes as its starting point the fact that utilitarianism can approve of all kinds of actions, however barbarian or morally repulsive they may seem to be, as long as they happen to maximize utility. As noted at the outset, utilitarianism holds that whether a certain action is right or wrong does not depend on what kind of action it is (whether, e.g., it is a case of lying or killing) or with what intention it is performed (whether, e.g., it is performed with good or bad intentions) but the only interesting issue is what outcomes different actions produce. Here are some things which utilitarianism often is thought to be unable to accommodate for: Firstly, the idea that human beings have certain fundamental *moral rights* does not easily square with the theory. Utilitarians may respect such rights when nothing can be gained by contravening them, but as soon

as one can increase the general welfare level in the world by contravening such rights, this is morally required. Secondly, the fact that someone has promised me to do X is never directly or in itself a reason for their doing X. Since utilitarianism only cares about consequences or, one may say, *forward-looking* considerations, *backward-looking* considerations like the fact that someone has promised something are never morally relevant as such.

Thirdly, utilitarianism is sometimes said to be at odds with our most basic judgments about *distributive justice*. Say that I can confiscate all of the resources of one person and distribute them to enough other people so that the total sum of preference satisfaction is greater than before. If this is possible, utilitarianism suggests that I ought to do so (and, indeed, that it would be wrong not to do it). I may even have an obligation to do so if the first person dies as a result of my behavior, and the people to which I donate the resources were quite well-off to start with. Fourthly, utilitarianism seems to be inconsistent with popular judgments about *retributive justice* as well. While it most often may be best to punish the guilty for felonies, there is nothing in principle which prevents utilitarians from accepting punishment of the innocent. In fact, utilitarianism seems to imply that convicting an innocent person to death may be justified as long as it prevents enough other people from committing serious crimes.

Apart from being criticized for being too permissive, utilitarianism is sometimes also criticized for being too demanding. If there is one thing which utilitarianism is quite insistent on, namely, it is that we ought to dedicate our entire lives to increasing the general level of welfare in the world. But what this means, critics say, is that we are required to give up all of the life projects we currently are engaged in and completely dedicate ourselves to the serving of others. Some critics suggest that this in a sense means giving up our very *identity*, since we to a large degree tend to identify ourselves with our personal projects. According to others, what is most problematic in this context is that utilitarian ethics is at odds with the value of personal relationships. At the core of

utilitarianism, as noted above, lies the idea that we should pay equal attention to how everyone's welfare is affected by our actions. However what this means in practice, it is argued, is that I must care just as much about, for example, other people's spouses as my own, and as much about other people's friends as my own. It is not difficult to see why this result has been thought to be deeply troubling.

One could say that philosophers defending utilitarianism, in turn, generally have presented three main kinds of responses to the criticisms above: First of all, many utilitarians suggest that their theory actually is much closer to some of its rivals than what is generally appreciated. Even though the theory *in principle* implies that even quite abhorrent actions could be justified if and when they maximize utility, such actions will quite rarely be the best alternative *in the real world*, they say. Convicting innocent people to death will seldom lead to much good consequences, for instance, because the fact that they are innocent will most often come out in the end. And redistributing wealth from the poor to the rich will certainly never be a good thing, because the poor simply get more enjoyment out of a given amount of resources than the already well-off do. In essence, then, the differences between utilitarianism and rival ethical theories may often be exaggerated.

Secondly, many utilitarians actually suggest that their theory is consistent with the use of non-utilitarian moral principles as a method for decision making. As noted above, there are many reasons for why it seems almost impossible to *know* what action utilitarianism favors in any given situation, and so what actions ultimately are morally right and wrong. Consequences are by definition things that happen in the future, and only seldom will we know for certain what even the most immediate and local outcome of a specific action will be. But, of course, utilitarianism does not only care about the *immediate* consequences of an action, but everything which happens as a result of this action until the end of time. Nor does it only care about *local* outcomes, but how the world (or universe) *as a whole* is affected by a certain action. Since it is impossible to know exactly what action

maximizes utility in real life scenarios, many utilitarians suggest that various kinds of rules of thumb may be used. And these rules of thumb may indeed be exactly the kind of principles which the critics insist on; that is, roughly, that no horrific actions are to be performed. Since the situations in which the action which maximizes happiness will be an instance of, say, violating people's human rights or breaking one's promises are likely to be uncommon, namely, it may be better to never even consider such actions as viable alternatives than to do so and sometimes break one's promises when it has disastrous consequences.

The introduction of rules of thumb into utilitarian thinking is interesting. An obvious observation is that these rules seem quite different from the core idea of utilitarianism, and so there seems to be some tension between going for maximizing utility and abiding by these rules of thumb. But the general idea here is simply that, when one does not know what specific *action* that maximizes utility, a reasonable thing to do may be to adopt the *decision procedure* which, if one follows it over a longer period of time, has the best consequences compared to (ones' following) other decision procedures. In this sense, then, utilitarians suggest that they can provide utilitarian reasons for following seemingly non-utilitarian moral principles. Indeed, as noted above, utilitarians typically commend themselves exactly for being able to say so much about ethics from such a simple thing as an appeal to utility.

Bringing in rules of thumb may work in some situations, but it may not work in others. If or when all of the above fails, utilitarians typically resort to a third and final way of responding to the criticisms outlined before; namely to fully *embracing* the supposedly absurd implications of their theory. Most of the criticisms above are based on our intuitive judgments, it may be noted. Critics say that it just seems so *counterintuitive* to us to say that convicting innocent people sometimes may be morally right, or that we ought to dedicate our whole lives to the serving of others. But some utilitarians respond to this by saying

that the fault simply may lie in our intuitive judgments, or perhaps our moral upbringing, more than it lies in utilitarianism. For instance, the reason for why we think that killing always must be morally wrong may just be squeamishness on our part – that is, that we hesitate to do the right thing when it calls for actions which we find unpleasant for some reason. Similarly, perhaps our aversion against dedicating our whole lives to serving others may be self-indulgence. Instead of modifying utilitarianism to suit our own intuitive judgments, then, perhaps we must simply modify our judgments. On this perspective, it should be noted, utilitarianism is indeed a radically revisionist ethical project.

The considerations above suggest that utilitarian ethics, although perhaps theoretically simple, is an enormously flexible moral framework. And perhaps it is this flexibility which explains utilitarianism's longstanding place as one of the main contenders in moral philosophy. Whether utilitarians ultimately are able to avoid all of the problems which their theory is said to have, however, and whether utilitarian ethics indeed captures something important in our ethical thinking, will probably be central issues in debates for centuries to come.

Cross-References

- ▶ [Altruism](#)
- ▶ [Deontology](#)
- ▶ [Ethics](#)
- ▶ [Justice \(philosophically\)](#)
- ▶ [Virtue Ethics](#)

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V

Verse

- [Poetry](#)

Vice

- [Sin \(Vice, Human Limits, Negativity\)](#)

Video Games

- [Games, Computer](#)

Views of Creation in the Jewish Culture

- [Creation in Judaism](#)

Views of Redemption in Jewish Science

- [Redemption in Judaism](#)

Views of Revelation in Judaism

- [Revelation in Judaism](#)

vijñāna (Sanskrit)

- [Consciousness \(Buddhist\)](#)

viññāṇa (Pāli)

- [Consciousness \(Buddhist\)](#)

Violence

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Related Terms

[Abuse](#); [Aggression](#); [Hostility](#)

Description

Violence is the use of physical or verbal force or exploitation against self, others, or property whose effect is bodily or psychological harm. As a human action of hostility and aggression, violence needs to be distinguished from other events, including natural disasters or accidents, that might also cause injury, damage, trauma, loss of life, or property, but whose cause is ontic or physical evil.

Violence is an act that goes against human dignity and reason, and from a religious perspective, even against divine law. However, the interpretation of actions as reasonable or otherwise – and consequently as morally good, evil, or neutral – is, to some extent, culturally and historically conditioned. At different points in history, and in different cultural contexts, actions that today would indisputably be considered to be violent and immoral were tolerated and even normative, for example, slavery.

The ambiguity of violence lies in the fact that the same act, for instance, physical harm, can be of willful cruelty and therefore sadistic, a measure of self- or communal defense interpreted as heroic, a method of social control, indoctrination, and discipline for the greater good of societal concord, or even a combination of the above. For this reason, we need to distinguish between necessary, or at least tolerable or proportionate human acts of violence, and willful violence that is totally unnecessary. While irrespective of the context, and insofar as it leads to perceptible harm, all violence is a lesser good, and therefore an evil, moral culpability for the act still needs to be discerned through the intent of the actor, even if it is legitimate to argue that unnecessary violence is intrinsically evil. For this reason, violent acts like war, capital punishment of criminals, extreme disciplinary measures in the education of children or for religious purposes, or even institutionalized violence for public entertainment and spectacle have all been used and legitimized as proportionate actions amid the outcry of others that they are intrinsically wrong.

Moreover, modernity's shift to the rights of the individual, as well as the liberal emphasis on the equality of all citizens rather than a hierarchical organization of society, has alerted us more to the indignity of many violent acts that were previously condoned, for example, war crimes, torture, child abuse, and domestic violence. This shifts the moral locus of violence from the intentionality of the aggressor – which, in any case, can never be fully known – to the effect of the act as interpreted by the victim, other involved individuals, and ultimately, the objective body of the law. Consequently, even when the actual or stated intent of the abuser is morally neutral (for example, burst of

uncontrollable emotion), or even good (for example, the use of force for discipline or law enforcement), a modern emphasis on the individual's rights is less likely to tolerate it. For this reason, in modern western culture, violence is usually associated with acts that go against the dignity of the person, in particular as articulated in the Universal Declaration of Human Rights, and which disrupt social order. The law acts as an interpreter of grievances and injustice and as an arbiter among the rights of the individuals concerned and the general well-being of society. In addition, democracy and public opinion keep in check the possible excesses of law enforcement, in particular when disciplinary measures become violent.

Simultaneously, precisely because violence is socially disruptive, the understanding of its root causes has been a major concern of religious and scientific discourse. It is also a central conundrum for the social sciences and the humanities, whose insights have influenced the positions of scientists and theologians. Most fundamentally, the question of the causes of violence has been approached with a prior philosophical bias of whether human action and, even more pointedly, human beings are inherently free agents or determined automatons, irrespective of whether the “programming” is existential, biological, or social. While most thinkers would not exclude the validity of either side of the freedom-determinism anthropological debate, many religious and scientific approaches can be interpreted as leaning toward one side more than the other.

Major global religions, with their emphasis on moral and spiritual formation, often emphasize the power of the will to control “impulses,” implying that while in the “natural” or developmentally premature state, humans are prone to irrational acts – including violence – based on instinct, emotion, or a combination of both; self-discipline can be inculcated and learnt to control negative inclinations for a more rational, harmonious, or enlightened existence. Simultaneously, the religions postulate the reality of a metaphysical disorder (variously defined) that influences human behavior and relationality.

A central tenet of Christianity, for instance, is the reality of sin as fundamental disorder in the

human relationship with God that corrupts the initial divinely established order of creation, and human relationality. Thus, by virtue of original sin, evil is introduced into the created realm both in its ontic and moral dimensions, just as by the ongoing disobedience of human beings, sinful structures continue to be perpetuated in society and in all human relationships. Still, Catholic and Orthodox perspectives tend to emphasize the inherent goodness that continues to permeate human nature and the created realm even after the Fall, and consequently stress both divine intervention and human free collaboration for the healing of persons and societies in the here and now. In contrast, Protestant views tend to be more pessimistic about human nature, highlighting the corrupting influence of sin in contrast to the weakness of human will, and consequently the absolute dependence on divine intervention for human other-worldly salvation. However, irrespective of the theological nuances in the view of sin, Christianity understands violence as an unbecoming behavior that needs to be controlled, but that can never be completely suppressed until the end times.

In contrast to these classic religious perspectives that promote rules of moral conduct, emphasize the human responsibility to act righteously, and have influenced the modern secular moral imperative of civil society, in these past decades, science has been studying biological causes of violence, that measure an individual's susceptibility to violent behavior, and consequently tend to be more deterministic by virtue of their reductionist methodology. Neuroscientists, psychiatrists, and geneticists are trying to establish the psychophysiology, neurobiology, and psychiatric genetics of aggression, in particular of impulsive violence that undermines the human capacity to act rationally or intentionally. These genetic markers, dysfunctions in neural circuitry, and chemical imbalances in the brain interpret violent behavior as a disease to be prevented as well as cured, but for which the person strictly speaking cannot be held accountable since their freedom is impaired. Less deterministically, the study of the biological basis of violent behavior from an evolutionary perspective suggests that

humans are hard-wired for violence, which would appear to increase the chances of survival in a context of harsh struggle and competition. However, equally likely are postulates that suggest a propensity for collaboration since partnership and cooperation also offer obvious advantages for the propagation of the species.

While useful to our understanding of violence, the relationship between nature and nurture is complex, and these approaches cannot account for all the variables that emerge in actual living in an environmental and social context that shapes our bodies, attitudes, and behaviors as much as they shape it. However, while the environment and social dimension of human development cannot be ignored or separated from nature, psychological perspectives like behaviorism and social learning theory can also be deterministic. From these perspectives, violence is a learned behavior, which can be unlearned with difficulty, appropriated first and foremost in the home – particularly if domestic abuse is present – but also through other “models” that permeate contemporary culture. Violence on television and video games, for instance, has been implicated repeatedly in the development of more aggressive tendencies in children and adolescents.

The notion that violence, or any other behavior, is appropriated through imitation is not new. In fact it is the foundation of most pedagogical models, particularly in antiquity. However, of particular interest is the mimetic theory developed by René Girard, which implicates religion or the sacred in the human propensity to violence that in itself creates the distinctly human milieu of culture. Girard postulates that through imitation, human beings learn to desire the qualities and objects that others already have, a situation that inevitably leads to rivalry and, if it escalates, to violence. Yet when violence in a social context escalates to such an extent that it threatens the integrity of the group, an outsider, or insider with random but distinct features, is marked as a scapegoat for the group's wrath. The scapegoat is murdered, and as the act of violence reestablishes communal “peace,” the victim is hailed as savior and effectively sacralized.

The sacred is thus imbued with violence, just as it serves to control it – to the extent that human history becomes caught up in a vicious circle of violence and scapegoating. Similar to the Freudian emphasis on the unconscious and deep-seated primal rootedness in murder and violence that effectively constructs civilization, Girard's theory postulates how human culture is in itself the milieu of inescapable violence, but also its hope for controlling it.

In conclusion, it is the combination of insights into human violence – from the religious, to the scientific, to the psycho-cultural and learning theories – that can help shed light on some of the most serious expressions of violence in contemporary culture: the rise in terrorism especially in relation to religious fundamentalism; weapons of mass destruction that threaten to wipe out the planet; gang activity in many cities; bullying in schools; domestic violence and abuse; self-inflicted violence through psychological conditions like depression, drug abuse, or eating disorders; the structural violence of economic and political systems that create greater poverty and injustice; violence to the earth that threatens the well-being of the ecosystem.

Cross-References

► [Aggression](#)

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Vipassanā

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Vipassanā (Pāli) or *vipaśyanā* (Sanskrit) means insight, clear seeing. It is a type of meditation (*bhāvanā*) unique to Buddhism. Generally, two types of meditation can be differentiated in the teaching of the Buddha: concentration meditation (*samatha-bhāvanā*) and insight meditation (*vipassanā-bhāvanā*).

In *samatha*, concentration (*samādhi*) is favored and the leading factor. Its aim is to deeply concentrate and calm down the mind by temporarily removing the mental hindrances, which leads to tranquillity, relaxation, and mental peace. The highest state to achieve are the various meditative absorptions (*jhāna*), fine material or immaterial, or even supernormal power or knowledge (*abhiññā*). In contrast, in *vipassanā*, wisdom (*paññā*) is favored and the leading factor. Its aim is nothing less than the irreversible cessation of suffering (*dukkha*), permanent liberation, and full enlightenment, the attainment of *Nibbāna*.

Passanā is seeing or in a figurative sense experiencing or knowing. The prefix *vi* means special, differently, in other ways. Therefore, *vipassanā* is seeing an object differently than normal. Normally we see or understand things wrongly, as concepts and see just the surface. But concepts are the objects for *samatha* meditation only. With *vipassanā*, we penetrate into the real nature of whatever we observe and see or, rather, understand things as they really are. *Vipassanā* needs a great deal of mindfulness (*sati*) to sharpen the mind and to be in the present moment directly

with the respective experience. The object of *vipassanā* is always an ultimate reality (*paramattha-dhamma*), either physical or mental, never a concept (*paññatti*). Ultimate realities are phenomena which can be experienced directly and intuitively with our six senses (including the mind as sixth sense that perceives mental objects like memories, ideas, thoughts, etc.). In *vipassanā*, we penetrate and know their individual characteristics that are typical for them, obvious and unambiguous, and by which one can differentiate and recognize them. This is in order to grasp one phenomenon clearly. The next step to insight is to penetrate to the universal characteristics of the object of ultimate reality, which means the nature that is common to all ultimate realities. These are impermanence (*anicca*), suffering or insufficiency (*dukkha*), and non-self (*anatta*).

A necessary foundation for *Vipassanā* is first the purification of morality (*sīla-visuddhi*), and second, the purification of mind (*citta-visuddhi*) through concentration. Only then the training of wisdom (*paññā*) or insight (*vipassanā*) can start. The practice of *vipassanā* is best described in the Buddha's discourse called "Mahāsatipaṭṭhāna Sutta" (Collection of Longer Discourses, Dīghanikāya, D 22, and Middle Length Discourses, Majjhimanikāya, M 10) and its commentaries. There, four foundations of mindfulness are taught and the respective contemplations, literally "repeated seeing" (*anupassanā*):

1. Contemplation of the body (*kāya*) or rather physical phenomena (*rūpa*)
2. Contemplation of feeling (*vedanā*)
3. Contemplation of the mind or consciousness (*citta*)
4. Contemplation of the *dhammā*, mental objects which are other ultimate phenomena not yet mentioned

In each of the four sections, a variety of exercises is given. Like a refrain, it is always repeated, how and for what purpose to contemplate: "...with effort (*ātāpi*), clear comprehension (*sampajañña*), and mindful (*satima*) – overcoming attachment (*abhiññā*) and grief (*domanassa*) to the world," and "seeing the arising conditions, seeing the dissolving conditions, and both," "internally, externally, and both."

Before meditation really turns toward *vipassanā*, two preliminary insights are necessary:

1. Differentiation between mind (*nāma*) and matter (*rūpa*)

2. Discerning the conditions (*paccaya*) of their arising and ceasing

Following that insight, the characteristics of *anicca*, *dukkha*, *anatta* become apparent and have to be contemplated. Nine steps of insight knowledge follow (See, Path of Purity (Visuddhimagga), Path of Discrimination (Paṭisambhidamagga), Abhidhammattha Sangaha, explanations of meditation masters like Mahāsi Sayadaw (who counts 14), and others), leading through various experiences to disenchantment and equanimity. According to individual personality, one of the three characteristics becomes more significant and clear and should be contemplated intensively as *aniccānupassanā*, *dukkhānupassanā*, or *anattānupassanā*, respectively. When *Nibbāna* is experienced, it consequently will show up with the marks of being signless (*animitta*), desireless (*appaṇihitā*), or empty (*suññatā*). Accordingly, different kinds of emancipation (*vimokkha*) and liberation are taught.

Through slight differences in their appearance, altogether 18 types of contemplations are taught as "great insights (*mahā-vipassanā*)" in Paṭisambhidāmagga and Visuddhimagga.

Virtual Particles

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Because of Heisenberg's uncertainty principle, one can have small fluctuations in energy for short periods of time. This means that subatomic particles can fleetingly pop into existence out of empty space, the energy required to do this being "borrowed" thanks to this fundamental uncertainty. Such particles disappear again so quickly one cannot see them. For this reason they are called virtual particles.

Cross-References

► [Space](#)

Virtual Worship

► [Online Religion](#)

Virtue

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Description

Virtue usually refers to some kind of dispositional perfection or excellence, as its opposite *vice* refers to the lack, or in some cases the excess, of some valued qualities. The central property of virtue is that it is a golden mean between excess and deficit. In many cases, however, the golden mean cannot be defined invariably. For example, what is courageous for one person can be foolhardiness for another. In Western tradition, the fundamental virtue that is supposed to control the reflection and help to find the proper way of conduct is called prudence or practical wisdom (*phronesis*). It is possible that virtues can contradict each other, and practical wisdom is needed to resolve these issues.

Both virtues and vices equip their holders with a potency to act toward some determined end. In classical Christian theology, virtues have been understood as “good operative habits,” which are in accord with reason and our nature. From the viewpoint of actions, being virtuous means not necessarily always succeeding to produce desired ends and simply “being good” (while this is always hoped for), but rather “being for the good” through loving, respecting, protecting, and acting to promote, wishing for, and speaking in favor of good things (Adams 2006).

Some virtues are virtues absolutely while others are so only in a restricted sense, which

means that possession of such a virtue does not make the person good even if the person’s actions may display excellence. For example, it is possible for a criminal to be loyal and courageous but the criminal is not good in absolute sense because he lacks the more fundamental virtues of justice and ► [love](#). Some virtues, such as benevolence, are motivating: they aim a person’s actions toward good ends and thus enable the flourishing of one’s neighbors as well. Some virtues, such as courage and temperance, are structural and they are not defined in relation to some external good or aim. Instead, they are ideal ways of conducting one’s actions.

Virtues and Religions

As virtues, in minimal sense, deal with the excellence of human conduct, they are not restricted within a religious sphere alone. Ancient Greek and Roman philosophers, such as Aristotle, Plato, Seneca, and Cicero, offered accounts on virtues, which were later discussed by religious thinkers. The Roman culture and philosophy was known of its interest in virtues; the concept itself originated from Latin word *vir* (man) and the meaning of virtue was initially associated with manliness. Later the meaning was expanded to include general good behavior, not only in the battlefield but in the everyday life as well. The first Christian philosophers saw in virtue theories something they could resonate with and they were to some extent redefined and absorbed as a part of Christian theology. Sometimes, the pagan virtues were referred as “excellent vices,” that is, good in themselves, but not worthy of Heaven. For example, Thomas Aquinas makes a distinction between acquired and infused virtues. It is possible for anyone to have acquired virtues through their natural powers, but infused virtues are given by God as a gift. The difference between these two classes is that one can lose infused virtue through one action (i.e., mortal sin), but still retain the similar acquired virtues. Consequently, it is possible for one to have all acquired virtues, but still be in the state of sin.

Christian theology divides virtues to intellectual (e.g., science, understanding, art), moral

(e.g., prudence, justice, temperance, courage), and theological classes (faith, hope, charity), although insisting that it is not always possible to draw a sharp distinction between them. In some cases, intellectual lapses are due to moral lapses, and vice versa. Yet, it is possible that persons have differing sets of virtues and very few have them all. One may be courageous, but lack temperance. The virtues are connected through prudence since it is not possible to be wise without being moral, and moral person is necessarily wise.

By and large, all religions and cultures have more or less similar virtue vocabulary consisting of six main classes of courage, justice, humanity, temperance, transcendence, and wisdom, which can be then divided to various subclasses (Peterson and Seligman 2004). Different religions however stress some virtues more than the others, which give the religions some of their special features. Some religious virtue theories are dependent at least to some extent from metaphysical views. In Thomism, *phronesis* presupposes the knowledge of the final causes, that is, God. In Confucianism, the virtuous actions of humans should reflect the balance of *Tian* ("Heaven"). The central virtue in Islam is obedience or submission to Allah from where all other virtues follow.

Even if the form of the virtues can be gained easily by divine act of grace, as it is claimed in Christianity, almost all traditions agree that putting virtues into practice consistently in daily life is hard, and religions contain theorization that seems to denigrate the feasibility of virtuous life. For example, Confucius says: "I have never seen one who loves virtue as much as he loves sex" (Analects 9:17), and in protestant Reformation Aristotelian theories, according to which one becomes good by doing good, were criticized for distorting the doctrine of justification by faith alone. The theologies based on Reformation thought usually held a grimmer picture of human nature than the one that was available for Eastern or Catholic Churches.

Despite these metaphysical underpinnings, it has been suggested that because the virtue

vocabulary is so common to all cultures, the virtue language could function as a common feature that can join together different worldviews at least to some extent and help communities to communicate their values in understandable manner even when there is no consensus, for example, on deontological rules of action.

Virtue Ethics and Virtue Epistemology

The twentieth century philosophy saw the rise of interest in virtues in two related areas: first virtue ► [ethics](#) and then virtue ► [epistemology](#). Elizabeth Anscombe's famous essay "Modern moral philosophy" (1958) criticized the current trends in moral philosophy by pointing out that they speak about laws, but without the notion of the lawgiver. To avoid inconsistencies the post-metaphysical age could benefit from the ancient virtue theories. More specifically, modern virtue ethics grew out of dissatisfaction with deontology and ► [utilitarianism](#), especially in their inability to address classical themes of interest in moral theory, such as inception of moral character and virtuous behavior, wisdom, and moral discernment as personal skills; the role of emotions in habituation; and mundane questions like "what sort of person should I be." Instead of relying on formal guidelines, like Kantian imperative, or the calculation of profit, virtue ethics guides action by trying to conform one's actions according to ideal, virtuous agent (*phronimos*).

Similarly, in virtue epistemology, justified belief is something that conscientious epistemic agent would believe. Instead of concentrating on the features of beliefs (such as whether it is adequately based on evidence) in order to see whether they are justified or not, the focal point now is the enquirer of knowledge and his or her intellectual properties. These virtue-based approaches thus require more holistic understanding of the strengths and weaknesses of human nature than the previous theories (Roberts and Wood 2007). The sciences that are most relevant for virtue theorization are sciences that study human nature and behavior, such as cognitive psychology and neurosciences.

Virtues and Psychology

Virtues are closely linked with character traits and personality. A character trait is a deep-seated disposition to act in certain ways for appropriate reasons. Traits persist over time and are relatively stable. Human personality is formed during the first 20 or so years, and it is very resistant to change, while traits are more fluid. It is possible that two persons have different personalities (say, A has temperance, while B does not) but they may share similar moral character, which is manifested in the willingness of B to apologize whenever she has lost her temper.

From the evolutionary perspective, our psychological mechanisms that control our moral reasoning have coevolved with cultural institutions and practices that give shape to our moral convictions. The basic moral modules are thus to a great extent innate. Jonathan Haidt (2012) has argued that moral reasoning and behavior is linked to various intuitive cognitive modules that vary from person to person, which consequently produce different moral outlooks. Human moral deliberation centers around six basic modules, which are avoidance of harm, fairness, liberty, loyalty, authority, and sanctity. More liberal individuals usually use only the first two modules while conservatives employ all six of them. This often creates puzzling confrontations when the basic moral sentiments and the interpretation of the virtues seem to clash. A spontaneous conclusion here is that the other group is not acting morally and virtuously. Still, the conservative outlook, for example, helps people to cultivate communities that consequently help their members to improve their characters efficiently. It is natural for us to emphasize intra-group fairness because this tends to strengthen our chances of survival. The same applies to empathy and care, which resonates with our attachment system. Our moral modules also work on communal level. Loyalty, self-sacrifice, subordination, respect for authority, and sanctity enhance group cohesion, demarcate the boundaries of the communities, and suppress selfish behavior. Innateness means that these dispositions are easy to learn and compelling, and we are born with tendencies to favor certain

modules over others. These moral foundations can be developed to actual virtues through practice and repetition. Despite the innateness, personal histories and life narratives, and even education and indoctrination, can shape our moral outlook.

Since the twentieth century renaissance, one criticism of virtue theories has been the purported impracticability of these theories. Among others, philosopher Gilbert Harman has criticized the resurgence of virtue-based approaches to ethics, politics, and epistemology. Harman argues that human behavior is best explained by situational factors rather than character traits, and focusing on the personal disposition is counterproductive and misleading in solving the crises. The existence of character traits has been called into question by referring to, for example, Milgram experiments and Philip Zimbardo's Stanford prison experiments that can be interpreted to undercut the thesis that humans have a character, which forms a firm basis for their actions presupposed by classical Aristotelic-Thomistic theory. In these experiments, the test subjects showed very weak ability to resist immoral authorities or the temptation to mistreat others when there were no sanctions for such actions. It therefore seems that humans are easy to manipulate and they conform effortlessly to their surroundings and there is no inherent character or habit that can prevent this. The real life, non-staged, situations that have been subject of much debate include the actions of execution groups during the holocaust and the torture of prisoners in Abu Ghraib after the Second Gulf War. From this point of view, the talk about virtues is not very effective because when things get serious the people do not generally act very virtuously or that moral excellence is possible only for a select few.

Becoming More Virtuous?

However, some studies in psychology suggest that it is possible to train oneself in virtues but this is very energy and time consuming (Slyke et al. 2012; Thiele 2006). The reason for this is that our cognitive machinery constrains our abilities to achieve excellence.

In ► [cognitive psychology](#), it is common to talk about *dual-process models* of cognition, according to which there are two fundamentally different information processing strategies in human cognition: *reflection* and *intuition*. The evidence for the dual-process model of cognition comes from many different sources of which the most important are developmental studies and the study of practical rationality and cognitive biases. Generally, reflection is quite rare in information processing and requires enormous amounts of time and effort. In everyday situations, we automatically trust our intuitions. This means that we automatically acquire and process information in different ways all the time and the information acquired triggers beliefs and actions without any conscious effort. Additionally, due to our brain structure, our first responses to perception are emotional and subconscious, whereas the deliberation takes place only after the initial, fast response. Virtuous reasoning, however, entails that evidence and inference is transparent to the epistemic subject and claims are treated conscientiously. In intuitive thinking, we are driven by factors that are mostly out of our conscious reach. Thus, it seems that we are not designed to act virtuously in all possible cases since our evolutionary history favors conscientiousness only as a means to survival, not as a value per se.

In Plato's *Meno and Protagoras*, it is asked: Can virtue be taught? The answer depends on our understanding of **personhood* as having ability to ground stable dispositions. Pessimistic view, which is usually linked with **eliminativism*, denies the existence of **self* and personhood that could function as the conscious the enduring basis of our actions. In this view, the language of virtue is used mainly as a term of convenience, while the only facts of the matter are the ways how people survive optimally in certain contexts. In this approach, the focus of interest is not in the agent but in the environment in which the agent is situated. Such a view does face the challenge, however, of accounting for the common sense view that we judge persons and not just actions of environments as being "good" or "bad". No one denies that environment has

a great effect to human behavior, and, as already noted, some contexts can effectively thwart virtuous behavior. However, drawing a conclusion that there is no such thing as personhood or self, based on these studies and neuroscientific reflections about the locus of the self, is not necessarily warranted. In addition, the behavioral patterns that erase the notion of the self are usually hazardous for people. In order to lead meaningful lives, we need to presuppose such elementary things as freedom and responsibility, and virtues can be seen as ideal instantiations of these forms of action.

Virtues require much more than being exposed to beneficial theories and impulses, namely, repeated exercise. The results of ► [neuroscience](#) show that repetition strengthens the neural connections in areas that are constantly put in use. This way neuroscience can help us give additional information why, for example, recovering from addictions is so hard: our destructive habits have been engraved in our brain. Naturally, this works other way around as well.

In conclusion, as well as being one of the oldest and fundamental ideas in ethics in antiquity and mediaeval times, virtues have once again become a central theme in philosophy and moral theory. Furthermore, the new developments in neuroscience hold promise for a notable renaissance in the future.

Cross-References

- [Cognitive Psychology](#)
- [Epistemology](#)
- [Ethics](#)
- [Love](#)
- [Neuroscience](#)

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Virtue Ethics

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Aristotelian Ethics

Virtue ethics is a branch of normative, or “deontological,” ethics – a subdivision of ethics as a whole, which is a special field of philosophy. Virtue ethics distinguishes itself from the other main sectors of deontological ethics as well as utilitarian, or “consequentialist” ethics, by its concern with the moral character of a person, rather than with one’s action. It is wrong, however, to assume that virtue ethics is not at all interested in actions, as some of its critics have often charged. Virtue ethics seeks rather to understand the teleological or purposeful content of what we do. It presupposes that any action, which stems from desire, is always aimed at an end, and that this end will result in the eventual formation of our moral character and identity. The central question in virtue ethics is that of “who am I?” As Alasdair MacIntyre, the leading contemporary exponent and popularizer of virtue ethics, has put it, virtue ethics asks these key questions: “Who are you? Who are you becoming? How are we to get there?”

Virtue ethics begins with a fundamental discernment into “who you are.” To answer such a question, you must understand yourself first and foremost in order to figure out where your character resides and where it must then go, its striving toward “excellence” (Greek = *arête*) and “happiness” (*eudaimonia*). The term *eudaimonia* also means “well-being,” or “good fortune.” In Aristotelian ethics, *eudaimonia* is the supreme aim of life, the “highest good” or summum bonum. The importance of self-knowledge within the tradition of virtue ethics begins with the Socrates’ maxim of “know yourself” as well as his famous remark that “the unexamined life is not worth living.”

The premier question of virtue ethics can also be phrased as “how ought (generally speaking) I to conduct myself as a person?” But it also remains the case that “ought” is not to be regarded as the imposition of duty or obligation, as is contained in Immanuel Kant’s categorical imperative or in the utilitarian rule of the greatest good for the greatest number of people (Jeremy Bentham). Moral philosophies of both the Kantian and the Benthamian type dominate modern normative ethics. Yet their common emphasis on moral obligation, their assumption that one is constrained to obey a “command of reason” (Kant) or make proper decisions according to what Bentham refers to as a “felicific calculus” of maximum consequential utility in one’s actions, is problematic so far as virtue ethics is concerned. Indeed, it can be said that the difficulty with modern ethics since Kant is that it turns out simply to be a secularized variant of the Judeo-Christian tradition, locating morality in the commands of a Divine lawgiver. With the loss of this Divine giver of law, the trouble is locating the reason “why” one “ought” to be obliged to the categorical imperative or utilitarian principle.

Besides the loss of an ultimate, transcendental “why,” there is also the issue of “universalism” in modern ethics. Critics of virtue ethics charge it with going with the flow of fashionable relativism, since there is no final touchstone against which its outcomes can be measured. But that accusation has also been leveled against Kantian

ethics, which often has a hard time specifying concretely what would be a “universal” rule of action in a given case. Virtue ethics, on the other hand, does not pretend to be rationality but only about desire, character, and the good life. The intent of virtue ethics is the achievement of *eudaimonia* through virtuous living, which was the primary concern of the ancient Greeks. Virtue ethics seems to recapture in modern form the classical ideal.

Besides *arête*, such an ethics concentrates on classical “table of virtues,” especially justice prudence, temperance, and fortitude. Within this listing, prudence is the highest virtue, inasmuch as it regulates the means by which one achieves excellence throughout their character. In addition, for classical thought, there is a unity to the virtues. Each virtue bears relation to each other. Socrates held that there was not many virtues, but only one, that is, *sophia* or wisdom. All the other virtues are variants. Plato held that there are several virtues united by the virtue of justice, whereas Aristotle contended that the many virtues are united by prudence.

Virtue ethics finally gives special attention to *eudaimonia*, for which still other translations is are “well-being” and “good fortune.” *Eudaimonia* is striving for the highest good, the *summum bonum*, as it was called in Medieval philosophy. The ancient Greek poets and playwrights understood *eudaimonia* as a blessed state conferred by fate, or the gods, and thus was the lot not of the many, but of only the few. The philosophers attempted to wrest away the strength of fate, fortune, luck, or chance to one’s state of well-being, and posited that *eudaimonia* was mostly a matter of choice. It is the choices we make, which become the habits that form our character, that make it possible eventually to achieve happiness, or the good life. *Eudaimonia* means living a life that is meaningful and fulfilled. There is no exact rule, commandment, or formula to reach this goal. As Aristotle observes in the *Nicomachean Ethics*, there can never be precision in ethical decision-making.

Aristotle draws a careful distinction between intellectual and character virtues. And he gives

priority to the former. Socrates believes that all desires are rational, because they possess within themselves reasons (*aitia*). Therefore, knowledge and ignorance correspond to virtue and vice, respectively. For the Stoics, what is naturally appropriate to us is desire (*oikeiosis*). Because of our human nature, rational desires seeking our own good are built into human nature, but it is the corruption of this nature that often leads to vice. Christian ethics in late antiquity, especially the thought of St. Paul and St. Augustine, built upon this insight, attributing such corruption not to bad, individual character but the fall and the subsequent degeneracy of the created order.

Virtue ethics, which builds upon both classical pagan and Christian sources of inspiration, dwells on the need to consider the whole of life, not just specific behavior. Our character is rooted in human nature, which includes our natural inclinations and instincts, and our desire for the *summum bonum*, which is some kind of well-being based on making the right decisions and aiming for the higher rather than the lower pleasures. Virtue ethics is both agent-centered and personality-centered. Agent-centered is distinguished from rule-based, law-founded, or calculative decision-making, and typifying de-ontological reasoning. The *eudaimonia* that we seek is first our own personal good. But our personal well-being is intimately bound up with our relations to others. Ethics in the classical sense is inherently situated and pursued within the context of a responsible community, within a *polis*.

Although what we now call “virtue ethics” was the dominant strand of discourse in moral philosophy up until the eighteenth century, it fell out of favor after Kant. The revival of virtue ethics in the contemporary context can be traced to an article published by Irish philosopher G.E. Anscombe entitled “Modern Moral Philosophy” in 1958. The piece is credited with bringing virtue ethics back to life as well as coining the term “consequentialism,” which is now a stock part of the vocabulary of virtue ethics. She argued that Kantian preoccupation with moral laws and commands has stirred up a hornet’s nest of conceptual problems in philosophy, and proposed

a return to Aristotle and his central concern for character and virtue. In the 1980s, Alastair MacIntyre, another prominent British philosopher, carried Anscombe's argument forward in his seminal book *After Virtue*, in which he called on the carpet the liberal philosophy of Enlightenment, resorting ironically to Nietzsche, who had been ignored in ethics until then.

MacIntyre found modern precept-grounded (deontological) and rule-or-outcomes-based ethics severely deficient because it avoided themes that had been the center of interest for the ancient Greeks, such as motives, moral character, moral education, moral discernment, and "relational" or "communitarian" issues like friendship, family responsibilities, and civic engagement. Whereas conventional modern ethics has routinely asked the question "what must I do," virtue ethics inquires "how must we live?"

Over the past quarter century, the field of ethics has been transformed by the impact of this line of thinking. In the practical and professional, virtue ethics has had profound effects on health care, economic policy, practical theology, and ecological activism. It has impelled us to recognize that the virtues are more than just mere tendencies or dispositions to particular actions, but deep-reaching habits work in tandem with other formative tendencies. Our character is the totality of values, choices, desires, and strength, and good moral choices are impossible in the absence of sound moral character.

Virtue ethics cannot be considered a science, unless one employs the latter word in the sense that the ancient Greeks meant it – *scientia* = wisdom. On the other hand, one of the chief values of modern science has been exactitude in observation and a concern for the general rule rather than the particular case. Much of modern ethics since Kant, who sought to make moral philosophy compatible with experimental science, has aimed to tailor the method of following certain general rules and making them "universally valid," that is, applicable in all situations. Virtue ethics, as noted above, rejects rule-grounded moral reasoning, a procedure Kant

himself tried to borrow from Newtonian physics. Although the "ends" of human life may be universal and consistent for what Kant termed "all rational being," virtue ethics emphasizes the cultivation of personal character in ways that are appropriate to one's own life circumstances. Kant himself, fearful that so-called eudaimonism would inevitably lead to morally inconsistent and subjective decision-making, stressed instead the importance of the "formal" principles operative in our actions, whether they lead to happiness or not.

At the same time, virtue ethics is not, and does not rely on, a religious world view of any kind. On the contrary, virtue ethics is founded on the ancient, naturalistic standpoint that human beings are, as Aristotle said, "rational animals," and that reason unaided by any religious guidance or mystical or supernatural illumination is capable of achieving and fulfilling our true desires as finite creatures. Virtue ethics is preeminently a practical philosophy that draws on the traditions of classical wisdom and the situation insights of trained professionals in today's world.

Cross-References

- ▶ [Bioethics in Christianity](#)
- ▶ [Christian Ethics](#)
- ▶ [Ethics](#)
- ▶ [Philosophy of Religion](#)
- ▶ [Philosophy of Science](#)

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Visual Art

- [Art, Studio](#)

Vital Satisfaction

- [Happiness](#)

Voluntary Movement

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Voluntary movements are manifestations of a centrally generated intention to act. The way in which intention is generated is irrelevant for the notion of voluntary movement. It may result from bodily needs such as hunger or thirst, or from higher order deliberations based on one's own beliefs and desires. What counts for voluntary movements is that the individual has a goal and that this goal determines movements leading to its achievement. Unlike for reflexes, in voluntary behavior stimuli do not determine a motor response, they only *set the occasion* for it. According to their needs, animals may or may not respond to the same stimulus.

Walkthrough

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Similar to an inspection, a walkthrough is a review conducted by four to six individuals. When teams use a waterfall model or one of its adaptations, the members of the team are as follows: a developer from the current phase, a representative from the next phase, a client representative, and a member of the software quality assurance (SQA) group. Note that a small company may not have dedicated SQA personnel.

A walkthrough can be conducted for any software artifact, such as requirements, design documents, or code. Unlike an inspection, a walkthrough has only two steps:

1. Preparation. Each participant of the walkthrough compiles two lists: (1) a list of likely faults and (2) a list of items that are unclear.
2. Walkthrough meeting. The meeting should be chaired by the individual from SQA. The purpose of the meeting is to find faults; they will be corrected later.

Note: See also ► [Inspection](#).

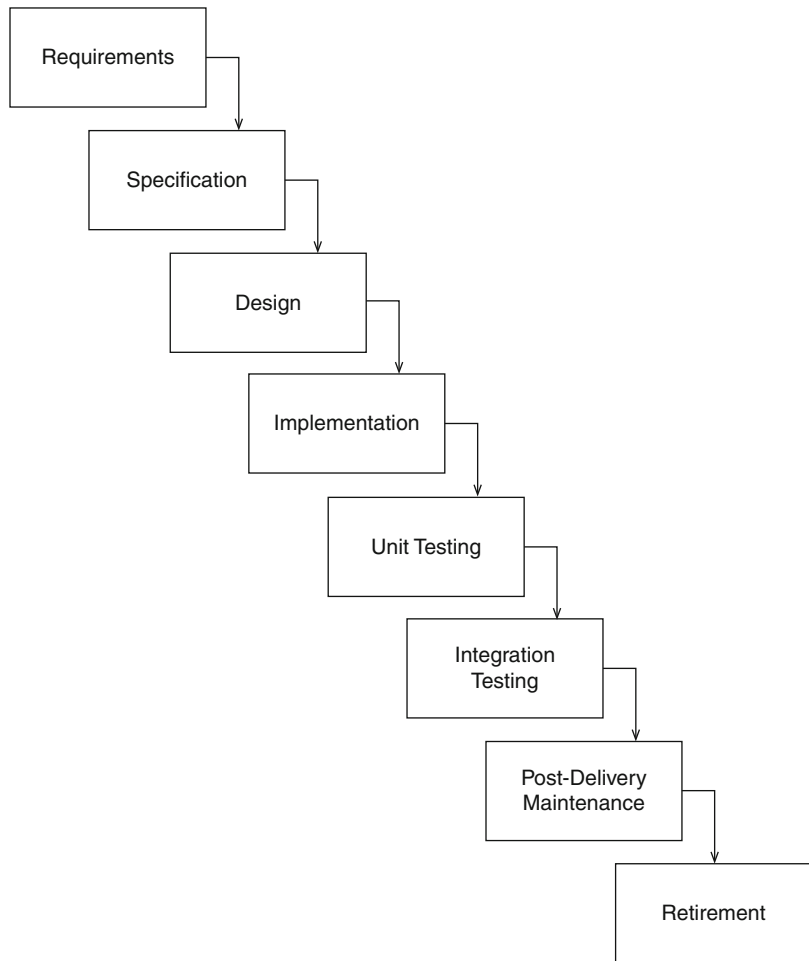
Waterfall Model

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The Waterfall Model is a software development life cycle model that was originally defined by Royce around 1970. This model has the advantage of dividing the life cycle into phases that are easily understood by management. The phases follow:

- Requirements (the needs of the customer are collected).
- Specification (a formal document containing the requirements is constructed).
- Design
 - Architectural – the modules for the program are specified.
 - Detailed Design – the algorithms and the data structures are defined.
- Implementation (coding is completed).
- Unit Testing (the components are tested individually).
- Integration Testing (the components are combined and tested).
- Post-delivery Maintenance (corrections or enhancements are made to the code).
- Retirement (the code can no longer be maintained or is obsolete so it is removed from service) ([Fig. 1](#)).

Waterfall Model,
Fig. 1 A modern waterfall
model (Adapted from
Schach 2007)



Note: A more modern Waterfall Model has feedback loops to the previous phases, because faults may be found during development, or the customer may change the requirements necessitating a return to a previous phase. In some renderings of the model, the testing phases are removed, since testing (reviews in early phases or execution of code in latter phases) should occur throughout the life cycle model.

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Western Psychotherapy

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In this entry on African psychotherapy, we must clarify its relationship to Western psychotherapy. This is because although African psychotherapy is built on the secure foundations of African indigenous healing systems. As currently practiced it operates as a hybrid science which involves the study and application of the best practices in Western and indigenous psychological therapies to the

amelioration of the psychosocial wounds and damages, and stresses and challenges of the postcolonial Africans and their world. Seen in this way, African psychotherapy encompasses the study of the major theories and perspectives, and the techniques and approaches of individual psychotherapy, family therapy, and systemic practice in both indigenous Africa and the modern West.

Whole

► [Holism](#)

Wisdom (Philosophically)

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Related Terms

[Reflective judgment and moderate living;](#)
[Theoretical and practical reason](#)

Description

The concept of wisdom lies at the heart of Western philosophy, as the very name “philosophy” is Greek for the love of wisdom. In general, there is a prevalent notion that a wise person is one who has both substantial theoretical and practical knowledge (or reasonable beliefs), as this bears on the conduct of life, and that the wise person actually does indeed live life in light of such knowledge. Merely having the knowledge is compatible with being a fool, because one might know how to live rightly and yet not do so. Traditionally, wise persons have been thought of as humble, moderate in their appetites and desires, and good teachers. Each of these taken alone may not constitute wisdom, as it is possible to be humble and foolish, not wise in one’s

moderation, and one may be a good teacher while not following one’s own teaching. A wise person is often thought of as someone who has an integrated life. They may live in a time of great turmoil, but there is a tradition of thinking that a wise person would have sufficient internal serenity that they may be counted on to find the best ways of addressing bad states of affairs.

Modern Developments

The starting point for some modern theorizing about wisdom is the topic of reason itself. There is a strong desire-based concept of reason that was articulated by David Hume and defended recently by Bernard Williams. In this tradition, reason is very much anchored in what a person desires. If a person desires X (going to the market), then she has a reason to go to market. But on this tradition, if you do not have the relevant desire, you have no reason to go to market. This position is sometimes called “internalism,” for it makes reason rest on what a subject internally desires. The alternative position is often called “externalism,” and its modern defenders include Derek Parfit, but its heritage goes back to Plato and Aristotle. On this view, reason and goodness do not depend on what a subject desires. So, let us imagine that a person has no desire to live; it may still be that such a person has lots of reasons to live (he is loved by his family and friends; he is healthy and has many promising opportunities in the future; and so on). In the West, in general, most philosophers, who have contributed to what might be called the philosophy of wisdom, have been in this second school of thought. Wisdom consists in discerning what kinds of reasons one should recognize and what sorts of desires one should have. One reason for thinking that this latter tradition is more plausible is because internalists seem forced to hold that most wicked people have no reason not to be wicked. So, to take an extreme case, if Hitler desired the extermination of all European Jews, he had a reason to seek out such an *extermination*, and no reason not to. Many philosophers find such a conclusion unacceptable.

While many philosophers who contribute to the philosophy of wisdom tend to favor

externalism, some seek out a middle position that recognizes some ideals that are important to reason which are independent of a subject's current desires. So, it has been proposed that a wise person is someone who will have those desires that she would approve of if she knew all the relevant facts. To take a simple example: a person may rightly claim to desire to drink X, but she does not realize that X is actually a slow-acting poison that will kill her. On this view, it is not wise for her to desire X because she would not desire to do so if she knew what X would do to her. This middle position can also be adopted by externalists who may well claim that knowing all the relevant facts is one element in discovering what a person has the most reason to do.

While there is widespread support for the notion that wisdom involves reflection, there is some reason to not adopt a simple identification of the two. Arguably, sometimes it is not wise to reflect. When, for example, one is in an emergency and action is urgent to avoid a catastrophe, the wise thing may be to not reflect, but simply to act and to make the most of the opportunity available.

The contrary of being wise is being foolish, but one might be neither. A wise person may also seek to appear foolish in order to avoid some harm, just as a foolish person might seek to appear wise in order to attain some perceived good.

There seems broad support that a wise person is not wise simply out of luck. It may be that someone has gained wisdom because they were lucky (perhaps a person survives a shipwreck out of pure, undeserved good fortune and then learns to sail more wisely), but that the exercise of wisdom itself must stem from the wise person's own abilities.

The Classical Tradition

There is a strong tradition in the West and East in philosophy, which is sometimes called the wisdom tradition or the wisdom literature (in Latin referred to as the *sapiential* tradition). This tradition may be found in sacred scriptures, such as the Torah or Hebrew Bible, in the New Testament; the Qur'an; the Analects; and so on,

in which there is practical advice on moderate living and balance. This tradition was often developed in terms of precepts or proverbs and parables. This tradition also includes appeal to exemplars of the wise life, whether it be Abraham, Jesus, Mohammed, the Buddha, and so on.

This wisdom tradition has sometimes been underappreciated in the history of philosophy. Ancient Greco-Roman philosophers were very much concerned with practical advice on how to live one's life wisely. Some of the more active moral thinkers were very popular in their day, such as Cicero, Seneca, Epictetus, Dio Chrysostom, Philo, Marcus Aurelius, and others. But these thinkers are not at the forefront of much contemporary, standard histories of philosophy.

Probably one of the best-known classics in the wisdom tradition is Boethius' the *Consolations of Philosophy* (*Consolatio Philosophiae*) composed in the sixth century. This book is an extended meditation on human, temporal life in light of the eternal, supremely good Creator, God. While contemporary philosophers focus on the central theme of the philosophy of time and God's omniscience, the book itself is largely taken up with warnings about the hollowness of worldly glory, and the dangers of vanity.

Mention of Boethius brings up a broader point. Arguably, the truth of broader worldviews can have an impact on what counts as wisdom. If, for example, Christian theism is true or (whether it is true or not) it is plausible, there is a certain wisdom in reflecting on and taking into account the virtues of a relationship with God. Alternatively, if secular naturalism is true or plausible, it may (especially if secular naturalism is overwhelmingly evident) seem quite foolish to pursue the virtues in theistic traditions (worship, prayer, and the like). And similar points may be raised in connection with Buddhism and other worldviews.

Humility and Arrogance

While humility is not sufficient for wisdom, it does seem that it is a common component of much of the wisdom literature, and so it is worthy of further reflection.

It may be thought that humility consists in a form of self-depreciation or a tendency to underestimate one's powers and accomplishments, but these may be marks more of humiliation or self-hatred or even outright deception, rather than humility per se. On reflection, humility seems to come very close to the concept of proper pride, in which a person has a just or reasonable view of herself, neither exaggerating her virtues or vices. Humility as a wise virtue seems perhaps only distinguished from proper pride insofar as a humble person might be expected to be more wary of when she might (knowingly or unknowingly) be guilty of vanity.

While foolishness does not seem to necessitate arrogance, the vast amount of the wisdom tradition views arrogance as foolish or at least not a sign of wisdom. Both in the classic wisdom literature and today, the paradigm case of not being wise is the person who is so self-possessed that he arrogantly assumes his propriety and power without any thought that he may be mistaken.

Love of Wisdom

An important strand in the wisdom literature, which goes back to Plato but it is evident in sacred scriptures of different traditions as well, is the thesis that wisdom should be pursued wisely. This raises the paradox in Plato's *Meno*. If one does not already know what wisdom is, how can one inquire into wisdom wisely? Perhaps the answer to this quandary is that we inquirers into wisdom have an inchoate ability to identify wisdom when we see it, and we have some predisposition to appreciate that when inquiring into virtue, it is better to do so with humility, an open mind, an effort to listen fairly to different sources, to exercise patience, and so on. At the least, we may see that such inquiry is more likely to lead one to wisdom than if we approach the topic of wisdom with vanity, arrogance, rage, envy, and impatience.

Cross-References

- [Attention](#)
- [Awakening](#)

- [Emotion](#)
- [Empathy](#)
- [Epistemology](#)
- [Ethics](#)
- [Imagination](#)
- [Virtue Ethics](#)

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Women in Buddhism

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Description

Women make up two of the four assemblies of disciples recognized in Buddhist texts: nuns and female lay disciples, being the counterparts to the other two assemblies of monks and male lay disciples. The attitude displayed toward female lay disciples and nuns in Buddhist texts is complex and does not allow for simple unequivocal statements. The complexity of the subject finds its reflection in different hermeneutic approaches evident in the academic study of this subject.

Early generations of scholars studying the textual sources on women in Indian Buddhism

tended to emphasize the freedom that early Buddhism allowed women (e.g., Horner 1930), a tendency still evident among some academics in Buddhist countries. Subsequent writings, often undertaken from a western feminist perspective, tended to focus instead on negative aspects and instances of misogyny in Buddhist texts and traditions (e.g., Wilson 1996). This has recently led to a call for a synthesis that affords a broader perspective (Collett 2009), especially emphasizing the need to engage in comparative studies of the relevant texts in parallel versions preserved by different Buddhist schools so as to employ a more comprehensive textual basis, enabling the detection of possible signs of later interpolations.

According to a taxonomy that has met with considerable approval among scholars, the attitudes toward women in early Buddhist texts can be subsumed under the following headings (Sponberg 1992):

- Soteriological inclusiveness
- Institutional androcentrism
- Ascetic misogyny

The notion of soteriological inclusiveness stands for an attitude prevalent in what appears to be the early textual strata of the Buddhist discourses on women. A central component of this attitude is a clear endorsement of women's ability to reach all of the four stages of awakening recognized in Buddhist thought (Morris and Hardy 1885–1900, IV, 276). A collection of poems by early Buddhist nuns, the *Therīgāthā*, gathers what according to tradition are women's own words expressing the joy of emancipation (Blackstone 1998). These verses by ancient Indian Buddhist are outstanding among the recorded voices of women from any religious tradition.

One discourse indicates that women and men proceed by the same path to liberation (Feer 1884–1898, I, 33); another passage proclaims that without fully awakened nun disciples the Buddha's teaching would be deficient (Trenckner and Chalmers 1888–1896, I, 490). In short, gender does not matter to one whose mind is concentrated and who has insight (Feer 1884–1898, I, 129).

Institutional androcentrism allocates Buddhist nuns in an inferior hierarchical position compared to Buddhist monks and views them as a less fertile field of merit for lay support. Thus, for example, even the most senior nun should pay respect to a junior monk ordained on that very day (Morris and Hardy 1885–1900, IV, 276). Or else, nuns are prohibited from criticizing monks, whereas monks are permitted to criticize nuns.

The apparently felt need to subordinate female monastics to their male counterparts reflects values in ancient Indian society and would have become a prominent concern after the Buddha's demise (Sponberg 1992: 13), when the still fledgling Buddhist order had to struggle for survival among other competing religious groups and traditions. The notion of female inferiority underlying institutional androcentrism would have received backing from the presumably current belief that to be born as a woman is the result of bad karma (► [Karma](#)).

Lack of sufficient support as a result of being considered inferior recipients of gifts must have been an important factor contributing to the disappearance of the order of fully ordained Buddhist nuns from most of South and Southeast Asia, only surviving in China and adjacent countries like Korea and Vietnam. In the Himalayan regions, where Buddhism arrived comparatively late, an order of fully ordained nuns never came into existence.

Thus, in the countries of Theravāda Buddhism, as well as in the Tibetan tradition, until recently the only option for women to live a renunciate life has been to adopt a status situated somewhere between the monastic and the lay, neither wearing traditional monastic robes nor taking the full set of monastic precepts. This, in turn, has inevitably meant lack of official recognition and support.

The prevalent attitude of ascetic misogyny sees the female as signifying desire per se and posing a continuous threat to male monastics wishing to preserve their celibacy. It typically expresses itself in vilifying women for their presumed ability to prey on innocent males to satisfy their sexual desires. An exceptionally harsh example of the tendency to malign women can

be found in a discourse that compares women to snakes, indicating that the two share the same negative qualities (Morris and Hardy 1885–1900, III, 260). This attitude appears to have its roots in pre-Buddhist times, presumably coming to prominence in the Buddhist traditions once in the course of time monasticism had become more cloistered and thus distanced from the outside world (Sponberg 1992: 24).

The assumption that these three tendencies of soteriological inclusiveness, institutional androcentrism, and ascetic misogyny reflect slightly different historical periods – although they would soon have come to be held synchronically in different sections of the Buddhist community – finds support in comparative studies. Thus, the prevalent notion that women by nature are incapable of being a Buddha appears to be the result of later developments (Anālayo 2009). Similarly, the account of the founding of the order of nuns, a tale often cited for its negative attitude toward female renunciation, allows for a considerably more nuanced reading on being subjected to a comparative study of the different extant canonical versions (Anālayo 2011).

Nevertheless, the three attitudes surveyed above have continued to make their impact felt throughout the history of Buddhism. Thus, there appears to be no major difference in this respect in the Mahāyāna traditions, even though the feminine as a symbol acquires a powerful function in certain texts and practices, especially in Tantric traditions.

The same complexity of differing attitudes is still reflected in Buddhism to the present day. Attempts made in the Theravāda tradition to revive the order of fully ordained nuns, and in the Tibetan Vajrayāna traditions to create such an order, have met with resistance. While in Sri Lanka the revival of female monasticism appears to be fairly successful, the situation in Thailand and particularly in Burma is quite different. Similarly, while the Dalai Lama has expressed his open support, an order of fully ordained nuns in the Tibetan tradition has not yet come into existence. Although the Buddhist traditions are in theory committed to a teaching that denies any ultimate validity to discriminations – be it based

on gender, race, or whatever else – the attitude toward women inherited from the past is not easily reconciled with such teachings and the resulting tension is one of the challenges faced by Buddhism in the modern world.

Cross-References

- [Feminism in Islam](#)
- [Feminist Philosophy of Religion](#)

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World Economy

- [Globalization, Sociology of](#)

World Health Organization International

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The ICF model describes the impact of health conditions on people's lives. The ICF has two parts: Part one covers functioning and disability and includes body functions and structures, and activity and participation; Part two covers contextual factors, including environmental and personal factors.

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World Religions

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An ambiguous term that emerged in the nineteenth century in particular theological academic context used for a delineation of Christendom and other religions. Later, the term was employed for other biblical or scriptural religions in opposition to so-called primitive local religions. Currently, the term is used for (1) living religions, (2) major religions with some missionary aims, and (3) religions with a universal appeal transcending particular local and ethnic settings.

Worldview

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The concept *worldview* usually refers to an interpretation of reality that provides an overarching framework for the constitution of the world or the ► **cosmos**. Various belief systems, religions, ideologies, and science itself are examples of worldviews that contain differing pictures of the world. A worldview is furthermore connected with a particular moment in history.

The concept of worldview is used in two fundamentally different ways. On the one hand, the word can refer to a scientific worldview in which perceptions of the ► **universe** are derived from

scientific theories in such fields as astronomy, physics, and biology. On the other hand, the concept of worldview can be broader and encompass perceptions that override scientific knowledge – including values, perceptions of the human being, life, and the world – that are not possible to test scientifically. This latter, broader use of the concept incorporates attempts to answer or to formulate an attitude toward existential questions and to create meaning with and/or in life.

In the twenty-first century, the momentous and interconnected changes in society, science, and the arts have created a new situation, in which one may wish to use the concept *neo-worldview*. That concept refers to less systematic, more individual, and changing perceptions of the world or the cosmos. These contextual worldviews are an aspect of the postmodern situation in which human beings live. In society, there is no longer one predominant worldview, but many different and sometimes contradictory worldviews. In present-day scholarly work, there is doubt that human beings can obtain conclusive or reliable knowledge of the world. Nonetheless, human beings seem to have a need to create a basic outlook on life. The neo-worldviews popular under such conditions are not to be regarded as fundamentally true and commonly held pictures of the world or the cosmos but rather as personal attempts to find orientation in life.

The concept of worldview is of relatively recent origin. It stems from nineteenth-century idealism and the somewhat later *Lebensphilosophie* tradition. Nineteenth-century philosophers like Hegel and Nietzsche made use of the contemporary term *Weltanschauung* in their discussion of cultural and historical perspectives on the world. Concepts like *Weltanschauung* and worldview became useful tools at the intersection between religion and science as human beings entered the modern world. After the Age of Enlightenment, human beings replaced God as the center of the universe, and in the scientific evolution that followed, the entire base of knowledge was questioned. Knowledge became dependent upon empirical evidence, and a naturalistic or scientific worldview evolved with no need for god(s) or

supernatural forces. The task for science was to unveil the laws of nature that govern everything in the world, and questions about the origin of the course of events were often dismissed as “metaphysics.” The previously relatively homogenous and to a large extent Christian worldview was vigorously questioned. The rise of a new naturalistic picture based on facts prompted theologians to describe Christian faith as an intellectual and intelligible worldview. This devolvement within both science and ► [theology](#) shows that the word “worldview” belongs to the vocabulary of modernity. Consequently, at the turn of the twentieth century, worldviews became popular both in everyday language and in academic discourse.

During the continuing evolution of science, scientific worldviews have changed significantly in response to scientific findings in natural sciences – notably physics, astronomy, and biology. But new knowledge in social sciences and the arts – not least psychological and sociological knowledge – has also challenged dominant worldviews. Both within science, in ► [religious studies](#), and ► [theology](#), there has been a continuous need to adjust worldviews to new scientific findings. One of the most important discoveries that brought about major challenges for religions and for scholars of religions and theology was Darwin’s theory of evolution.

Philosophically, worldviews have been of great interest. In line with the scientific development at the time, philosophy in the nineteenth century and the beginning of the twentieth century was dealing with questions of how to understand and differentiate between ontological or scientific facts and values or value-laden philosophy. Value orientation was not necessarily assigned to the realm of worldviews and fact to science. Thus, philosophers were preoccupied with distinguishing between objective and subjective standpoints, and they stressed that both kinds of standpoint could be brought together in a worldview.

In modernity, there has been a tendency within science to hold onto a scientific worldview – a worldview that not only is built upon the natural and social sciences but is also strictly materialistic. With a broader understanding of the concept

of worldview, other parallel and trend-setting ideologies such as Marxism, existentialism, and liberalism can be described as worldviews. Ideologies like these are materialistic, but, unlike scientific worldviews, they embrace ethical convictions and (to differing extents) perceptions of the meaning of human life.

During the rise of modernity and in the twentieth century, there has been an ongoing conflict between scholars who argue that the only rational worldview to hold is a scientific one (scientism) and others – such as theologians and philosophers – who have stated that science can never provide a worldview but only contribute to the revision of a worldview. Science cannot give explanations to existential questions like who human beings really are nor can it provide orientation in life or ultimate values. It is argued that a strictly scientific worldview is of limited usefulness because it lacks moral and existential relevance.

In the postmodern situation of the twenty-first century, with growing individualism, secularization, and globalization, worldviews tend to be less generalized and broadly shared. When people no longer accede to traditional religions or ideologies, worldviews tend to be more fragmented and transmutable. These neo-worldviews are more individualistic and eclectic, and they also transcend the traditional division between religious and secular worldviews.

The growing need for a concept like neo-worldview is also rooted in the postmodern development within social sciences and the arts, in which grand narratives have lost their legitimacy and where one acknowledges that political, religious, moral, and scientific authorities are contextual and conditioned by a specific history and culture.

Worldviews in a more traditional meaning – as a commonly held and true overarching framework of the cosmos – are met with suspicion. One way of understanding neo-worldviews is as social and linguistically constructed systems of meaning. Language can no longer state true facts or objective values about the world; it has lost its previous metaphysical, epistemological, and moral meaning. Philosophically, this means that there is no distinct division between the subjective

and the objective world because human beings are recognized as part of the world and are continuously constructing meaning in the world and in human life. Traditional worldviews are reduced to self-referential systems (reifications or narratives) fabricated by the human beings in power. The situation can be described as a post-worldview era, with a pluralism so far-reaching that one can no longer speak of a conflict between worldviews, because worldviews can only be in conflict if they compete as rational presentations of the same “world.” In extreme postmodernity, there exists not one world, but as many worlds as there are possible worldviews.

Ever since the emergence of the term worldview and its forerunner *Weltanschauung*, these concepts have been important to theology and religious studies. The articulation of religions as alternatives to scientific and naturalistic worldviews has brought the concept of worldview to the forefront of religious studies and theology, and it remains relevant in the contemporary pluralistic situation. Scholars of religion and theologians have stressed that human beings need an orientation in life and that every human being has a worldview that forms a background to her or his life. The concept of worldview in religious studies and theology has been and is used in a broad manner, including religions, ideologies, and in some respects also individual human beings’ interpretations of life, the world, and the cosmos. A worldview in this contextualized or individualized sense can function as orientation in life in both moral and existential domains. The concept has been fruitful in various analyses of religions as well as secular ideologies. A basic question in relation to a worldview is what is referred to as the fundamental reality. Are God (s), human beings, or nature found at the base of reality? Moreover, analysis of worldviews can seek to elucidate differing views on ethics, epistemology, ontology, teleology, and theories of explanation. Used in this way, the concept has also functioned as a critical tool in revealing inconsistencies, ethically problematic convictions, and irrational or non-intelligible perceptions in worldviews.

From the end of the nineteenth century, there has been a development within religious studies

and theology toward a more individualistic understanding of worldviews. Research has been conducted to describe ordinary people's worldviews. Individual worldviews among a secular population or those of people belonging to different interest groups have been a research focus, together with worldviews projected in literature or in various artistic forms. These neo-worldviews that have arisen, for instance, in interpretations of the world that are ecologically or holistically oriented and in New Age-inspired worldviews, are less systematized and more contextual than traditional religions and ideologies.

Within other areas of the arts and social sciences – notably anthropology, sociology, and psychology – the concept of worldview has played an important role in studies of groups' and individuals' interpretations of the world or the cosmos.

New findings in the fields of biology, neuroscience, and physics in the twenty-first century have also provided new ways of thinking about the relation between human beings and the world that have or will affect scientific and religious worldviews.

Worldviews interact with specific perceptions in history. In premodern times, trust was placed in a general Christian worldview in which facts as well as values were based on God and his revelation. With modernity, the center of the worldview moved to the human being and to science. Human beings were the starting point, and with their own methods, they were seeking knowledge – facts – about the world. In postmodernity, the trust in human objectivity is lost, together with the hope of reliable knowledge of facts and values of the world. But the attention to and interest in worldviews as a central intellectual concept has continued up to the present time. The concept is still used in a variety of scientific and everyday contexts. There is, however, no single scientific discipline that can claim to give an exhausting picture of what exists or comprehensive knowledge of the cosmos. Every assertion

of that kind is a metaphysical rather than a scientific statement.

Human beings continue to interpret reality out of the ways in which they think, live, and experience the world. This ongoing human activity points toward a specific feature in human beings, namely, the need for orientation and meaning in the world. Scientific theories or scientific facts alone could not build worldviews that give human beings moral orientation and existential comfort. Language, myth, religion, science, and history will continue to shape worldviews or neo-worldviews – which will play an important role in human life by creating interpretations of reality and providing orientation and meaning.

Cross-References

- ▶ [Christian Cosmology](#)
- ▶ [Cosmology](#)
- ▶ [Existentialism](#)
- ▶ [Faith and Belief](#)
- ▶ [Meaning, The Concept of](#)
- ▶ [New Age Religions](#)
- ▶ [Religious Studies](#)
- ▶ [Scientism](#)
- ▶ [Secularization, Secularity, Secularism](#)
- ▶ [Systematic Theology](#)

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List of Entries

A Priori Arguments	Alchemy
A Priori/A Posteriori	Alchemy in Islam
Abhidhamma Piṭaka	Algebra in Islam
Abhidhamma, Southern	Algorithm
Abhidharma	Algorithmic Complexity
Abhidharma, Northern	Algorithms, Computer
Aboriginal Studies	Aliens
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Agape	Anthropological Genetics
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Aggression	Anthropology and Darwin
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AI	Anthropomorphism

- (Epistemological) Antirealism
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Biosemioties	Catholic Church and Science
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Blood Libels	Causality
Blood Transfusion	Causality in Physics
Bloodletting	Causation
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<i>Bodhisatta</i> [ideal] (Pāli)	Celibacy
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Buddhist Causality	Christian Healing Cultures
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Buddhist Doctrine	Christianity
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Creationism	Dementia
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Creativity	Deontological
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Critical Thinking	Destiny
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Cultural Diversity	Developmental Psychology
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Cultural Psychology of Religion	Deviant Behavior
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Cybernetics	Dioptrics
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Eastern Orthodoxy	Energy
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Ecological Optics	Enlightenment
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Ecological Theology	Entropy
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Ecology in Judaism	Environment of Evolutionary Adaptedness (EEA)
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Economy	Environmental Theology
Ecotheology	Environmentalism
Ecumenism	Epilogue
Eddington	Epistemology
Education	Epistemology, Evolutionary
Education in Buddhism	Epistemology, Reformed
Education System	Equality
Education, Sociology of	Eros
EEG (Electroencephalogram)	Eschatology
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Electrodynamics	Ethics of Duty
Electromagnetic Theory	Ethics/Moral Theology, Roman-Catholic, Europe
Electromagnetism and Optics	Ethnography
Electromyography	Ethnology
Electroneurography	Ethnology of Religion
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Electrophysiological Responses	Eudemonia
Elementary Particle Physics	European Medical Genetics
Elite Deviance	European Studies
Embodied Theology	Evil
Emergence, Theories of	Evil, Problem of
Emergent Monism	Evoked and Event-Related Potentials
Emergent Phenomena	Evoked Responses of the Brain
EMG	
Emotion	
Emotional Contagion	

Evolution	Fixed Action Pattern
Evolution, Convergent	Flow of Time
Evolutionary History	Flowcharts
Evolutionary Prototyping	fMRI
Evolutionary Psychology	Focalization
Evolutionary Theism	Folk Physics
Evolutionary Theology	Folk Psychology
Exaptation	Folklife Research
Existentialism	Folkloristics
Exo-system	Folktale
Expansion of the Universe	Force of Attraction
Experience	Forensic and Legal Medicine
Experiential Philosophy	Forensic Medicine
Experimental Philosophy	Forensic Pathology
Experimental Psychology	Forensic Psychology
Explanation	Formal Logic
Extended Cognition	Formalism
Externalism and Internalism	Foundational Theology
Extraterrestrials	Four Noble Truths
Eyewitness Memory	FPGA
Fable	Frankfurt School
Faculty of Innovation	Free Action
Fairytale	Free Choice
Faith	Free Will
Faith and Belief	Freedom
Faith and Reason	Fulguration
Fallacy	Function
<i>Falsafa/hikma</i>	Functional Explanation
Falsifiability	Functional Magnetic Resonance Imaging (fMRI)
Fancy	Functional Stereotactic Neurosurgery
Fantasy	Functional System
Fatalism	Functionalism
Fate	Functionalism in Sociology
Feeling	Fundamental Theology
Feelings	Fundamentalism
Feminism in Judaism	Game Theory
Feminism in Islam	Games, Computer
Feminist Philosophy of Religion	Gautama Buddha
Fiction	Gene
Fictional Tale	Gene Flow
Fine Art	General Divine Action
Finitude	Geodesy
Fire-Walking	Geography in Islam
Firewall	Geometry in Islam
First Order	Geriatrics
First Philosophy	German Philology
First-Order Logic	German Studies
Five Pillars	Germanistik

Geropsychology	Hellenization
Gibbs Energy	Helmholtz Energy
Gifford Lectures	Hermeneutics
Gift	Hermeneutics and Hermeneutic Philosophy
Glia	Hermeneutics, Theological
Global Christianity	Hierarchy
Global Governance	High Art
Global Psychology	Highest Point
Globalization, Sociology of	Hindrances (Buddhist)
Globalized Christianity	Hinduist Anthropology
Gnostic	Histology, Cytology
Gnosticism	Historical Theology
Goal	Historiography (Classical)
Goal Programming	History
God	History of Chemistry in Islam
God and Devil in Buddhism	History of Ideas (Intellectual History)
God as Semper Creator	History of Islamic Medicine
God of the Gaps	History of Medicine
God's Foreknowledge	Holism
Golem	Hominins
Good Clinical and Good Laboratory Practice (GCP)	Homunculus
Good Life	Hope
GoodWork Project	Hope (Life After Death)
Grace	Hope, Theology of
Graph Theory	Hope-Healing Communities
Graphic and Plastic Arts	Hopi Religion and Anthropology
Graphs	Hormesis
Gravity	Horoscope
Gravity: From Classical to Quantum	Hostility
Gross Body Language	Human Brain
Group Altruism	Human Development
Group Dynamics	Human Genetics
Group Processes	Human Intelligence
Group Theory	Human Limits
Guidance	Humanism in Islam
Hadith	Humanistic
Happiness	Humanistic Movement/Values
Health Science	Humanities
Heart	Human-Machine Organism
Heaven's Gate	Hyperstructures
Hebrew Bible (Old Testament)	Hypnosis
Hebrew Christianity	Hypnotisability
Hebrew Literature	I
Hedonism	Idea of Holy
Hegel's Thesis-Antithesis-Synthesis Model	Idealism
Hegemony	Identity
Heisenberg's Uncertainty Principle	Identity (Philosophy of Mind)
	Ihsan

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- 'Ilm al-falak
 - 'Ilm al-hay'a
 - 'Ilm al-nujūm
 - Image of God (About the Human Being)
 - Imagination
 - Imago Dei
 - Immunological Computation
 - Impermanence (Buddhist)
 - Implicit Religion
 - In Vitro Fertilization, Stem Cell Research and Ethics
 - Inactivity
 - Incarnation
 - Indeterminism
 - Indian Dialectics
 - Indian Logic
 - Indigenous Religions
 - Indigenous Studies
 - Individualism
 - Industrial Psychology
 - Infatuation
 - Infectious Disease
 - Inference of Analogy
 - Inflation
 - Information Assurance
 - Information Ethics
 - Information Security
 - Information-Processing Models (Philosophy of Mind)
 - Innate Releasing Mechanism, IRM
 - Insight
 - Inspection
 - Installation Art
 - Instrumental Reason
 - Intellect
 - Intellectual
 - Intellectual Development
 - Intellectual History
 - Intelligence
 - Intelligence Quotient (IQ)
 - Intelligence, Swarm
 - Intelligences, Multiple
 - Intelligent Design
 - Intentional Action
 - Intentionality
 - Interbeing
 - Interfaith
 - Interiority
 - Internet and Religion
 - Internet Ethics
 - Interpersonal Relationships
 - Interpretation Theory
 - Interreligious Dialogue
 - Interreligious Studies
 - Interventional Neuroradiology
 - Inverse Problem
 - Islam and Medicine
 - Islam and Science
 - Islam: An Overview
 - Islamic
 - Islamic Alchemy
 - Islamic Bioethics
 - Islamic Medicine
 - Islamic Religious Psychology
 - Islamic Science
 - Islamicate Mathematics
 - Jew
 - Jewish
 - Jewish Bioethics
 - Jewish Christianity
 - Jewish Cosmology
 - Jewish Culture
 - Jewish Feminism
 - Jewish Identity
 - Jewish Mysticism
 - Jewish Philosophy
 - Jewish Religion
 - Jewish Renewal Movement
 - Jewish Science and Creation
 - Jewish Science and Psychology
 - Jewish Science and Revelation
 - Jewish Science and Theology
 - Jewish Theology
 - Jewish Thought
 - Jewish-Christian Relations
 - Jews and the Study of the Universe
 - Journey
 - Judaic Studies
 - Judaism
 - Judaism and Physics
 - Judaism and the Study of the Universe
 - Judaism: An Overview
 - Judeo-Christian Tradition
 - Judgment
 - Jungian Psychology
 - Justice (Philosophically)

Justice Theory	Logic
Kabbalah	Logic in Buddhism
Kabbalah in Judaism	Logic in Islam
Kabbalah and Science	Logic, Informal
<i>Kamma</i> (Pāli)	Logic, Predicate
Kamma/Karma	Logical
Karma (Buddhist)	Logos
Key Stimulus	Love
Kierkegaardianism	Love (Affective, Sexual)
Kin Altruism	Love (Alterity, Relationship)
Kinetic Energy	Machine Intelligence
Knowledge, Sociology of	Machine Learning in Robots
Koch's Postulates	Magic
Koran	Magical Powers of Blood
Kurzweil	Magnetic
Labeling	Magnetic Storage
Landscape	Magnetoencephalography (MEG)
Language	Mahāyāna Buddhism/Vajrayāna Buddhism
Language and Literature, French	Man-Machine
Language and Literature, German	Māra
Language and Literature, Hebrew	Markov Process
Language and Literature, Spanish	Marxism
Language of Science	Materialism
Languages and Literature, Africa	Mathematics and Empirical Sciences
Last Days	Mathematics in Islam General
Last Things	Mathematics in Judaism
Lateral Inhibition	Mathematics and Religion
Latino Studies	Mathematics in Human Learning
Laws of Nature	Mathematics in Latin America, History
Learning	Mathematics, Ancient and Medieval
Legal Medicine	Mathematics, Early
Legal Psychology	Mathematics, Formal and Contemporary
Legendary	Mathematics, Modern
Length Contraction	Matter
Liberal Judaism	Maya Religion
Liberal Theology	Mayan Cosmovision
Liberation, Theology of	Mayan Religion
Life	Mayan Spirituality
Life After Death	Meaning Theories
Life Course, life cycle, life history, life span and life stage	Meaning, the Concept of
Life Sciences	Meaning-System Analysis
Limbic System	Mechanico-materialism
Liminality	Mechanics
Linguistic Meaning	Mechanization
Linguistics	Media Studies
Literary Theory	Mediatic Societies, Theology in
Living	Medical Genetics
	Medical History

Medical Microbiology	Mindreading
Medical Procedure	Minimalism
Medical Psychology	Miracle
Medical Sociology	Mirror Neuron Mechanism(s)
Medicine in Islam	Mirror Neuron System
Medieval Arabic	Mirror Neurons
Medieval Arabic Music	Mistery
Medieval Hebrew	Model
Meditation	Model Theory
Meditation-Research	Models of How to Relate Science and Religion
Memory	Modern Buddhism
Memory Loss	Modern Hebrew
Memory, Types of	Modernity in Buddhism and in Islam
Mensuration	Molecular Modeling
Mental Ability	Molecular Neuroscience
Mental Culture	Monism
Mental Disease/Disorder Treatment	Monotheism
Mental Disorder	Mood
Mental Events	Moore's Law
Mental Health	Moral Evil
Mental Process	Moral Judgment
Mental Representations	Moral Panic
Mental Simulation Theory	Moral Philosophy
Mental States	Morality
Mentalizing	Movement Disorders
Mesmerism	M-Theory
Messiah	Muhammad, Prophet
Messianic	Multi-criteria Decision Analysis (MCDA)
Messianic Age	Multiculturalism
Messianic Judaism	Multiple Intelligence
Messianism	Multiple Intelligences
Mestizaje	Multi-robot Systems
Meta-heuristics	Multiverse
Metaphysical Theology	Museum Art
Metaphysics	Music in Islam
Metaphysics, Darwinian	Music Literature
Method	Muslim Prophet
Methodology in Psychology	Muslim Religious Psychology
Microcosm	Muslim Scripture
Microprocessor	Mutakallimun
Migration	Mysterium Tremendum et Fascinosum
Mind	Mystical and Religious Experience
Mind Uploading	Mysticism
Mind-Body	Mysticism in Islam
Mind-Body Problem	Myth
Mind-Body Relationship	Myths
Mindfulness (Buddhist)	Nag Hammadi Library
Mindfulness Research	Names of God

- Narrative
 Narrative Nonfiction
 Narrative Psychology
 Native American Church
 Native American Religions
 Native American Spirituality
 Native American Studies
 Natural
 Natural Evil
 Natural Language Processing
 Natural Religion
 Natural Sciences in Judaism
 Natural Selection
 Natural Selection of Behavior
 Natural Theology
 Naturalism
 Naturalism, Ontological and Methodological
 Nature
 Near-Death Experiences
 Negative Theology
 Neglect
 Neo-charismatic Movements
 Neoclassical Theism
 Neo-Pentecostalism
 Neoplatonism
 Neopragmatism
 NeoZen
 Nerve Conduction Study
 Nervous System
 Nestinari
 Neural Activity
 Neural Plasticity
 Neurobehavioral Biology
 Neurobiological Constructivism and Insight
 Meditation
 Neuroethics
 Neuroethology
 Neuroimaging
 Neuroimaging Technologies
 Neurology in Asia
 Neurology in Europe
 Neuromodulation
 Neuron
 Neuropathology
 Neurophysiology
 Neuroplasticity
 Neuropsychology
 Neuroradiology
 Neuroscience
 Neuroscience of Religion and Spirituality
 Neurosurgery
 Neurotheology
 Neurotology
 Neurotransplantation
 New Age Religions
 New Buddhist Psychology
 New Pragmatism
Nīvaraṇa (Pāli)
Nivāraṇa (Sanskrit)
 Non-consequentialism
 Nondualism
 Non-duality
 Nonreductive Materialism
 Nonreductive Physicalism
 North American Indian Religions
 Not-Self
 Numinosa
 Numinous/Numinosity
 Nuptial-Marian Ecclesiology
 Nyāya
 Nystagmography
 Objectivity in the Human Sciences
 Object-Oriented (OO) Programming
 Obstetrics
 Occupation
 Occupational Health Psychology
 Occupational Science
 Occupational Therapy
 Oculomotor Control
 Off-Line Simulation Theory
 Oneness Churches
 Online Religion
 Online Ritual
 Ontic Evil(or Physical, Nonmoral, or Premoral
 Evil)
 Ontological Arguments
 Ontology
 Operational Research
 Operations Research in Applied Mathematics
 Optical Observations in Astronomy and
 Meteorology
 Optical Sciences
 Optics
 Optics in Islam
 Organic Evolution
 Organization of Science

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- Organizational Behavior
 Organizational Psychology
 Orientalism
 Orphism
 Orthodox Christian Theology
 Orthodox Christians
 Orthodox Theism
 Orthodox Theology
 Orthodoxy
 Oscillations
 PA
 Paediatric Surgery
 Paideia
 Pain (Suffering)
 Pain Medicine
 Pan-Buddhist Core Themes/Terms Relevant for
 Buddhist Psychology
 Panentheism
 Pan-Indian Movement
 Pan-Indianism
 Papal Infallibility
 Pāramitā
 Particle Physics
 Passion
 Passion and Emotion, Theories of
 Pastoral Theology, Roman-Catholic, Europe
 Pathological Science
 Pathology of the Nervous System
Paticca samuppāda (Pāli)
 Pavlovian Conditioning
 PBUH (an Abbreviation)
 PC Games
 Pediatric Gastroenterology
 Pediatric Surgery
 Pentecostalism
 Pentecostalism, Charismatic Movements
 Perception
 Perceptual Systems, Gibsonian
 Perfect Being Theology
 Perfection
 Performance
 Performance Art
 Performance Event
 Performativity
 Perinatal
 Person
 Person Perception
 Personal God
 Personalism
 Personality
 Personality Psychology
 Personhood
 Personhood and Scientific Methodology
 Personification
 Pfingstbewegung
 Phenomenology
 Phenomenology of Religion
 Philology
 Philosophical Anthropology
 Philosophical Discourse on Humans
 Philosophical Ethics
 Philosophical Naturalism
 Philosophical Theology
 Philosophy and Way of Life
 Philosophy in Buddhism
 Philosophy in Islam
 Philosophy in Islamic Intellectual History
 Philosophy in Judaism
 Philosophy of Aesthetic Experiences
 Philosophy of Art
 Philosophy of Being
 Philosophy of Existence
 Philosophy of Experience
 Philosophy of Language
 Philosophy of Mind
 Philosophy of Organism
 Philosophy of Religion
 Philosophy of Science
 Physical Anthropology (Paleoanthropology)
 Physical Determinism and Indeterminism
 Physical Knowledge
 Physical Optics
 Physical Suffering
 Physicalism
 Physics
 Physics in Buddhism
 Physics in Catholicism
 Physics in Christianity
 Physics in Judaism
 Physics and Orthodoxy (Physics and Eastern
 Christian Theology)
 Physics in Protestantism
 Physics, Science in Islam
 Physiological Psychology
 Physiology and Psychology of Visual Perception
 Physiotherapy

- Pietism
 Pilgrimage
 Pilgrims
 Place
 Planck Length
 Planck Time
 Plasma
 Plasticity
 Platelets
 Pleasure
 Plot
 Pluralism (Religious)
 Plurality
 Poesy (Archaic)
 Poetry
 Policy
 Political Ideology
 Political Philosophy
 Political Principles
 Political Science
 Political Theology, Theological Politics
 Political Theory
 Political Values
 Politics of Sexuality
 Polytheism
 Popular Culture and the Mass Media,
 Sociology of
 Positive Psychology
 Positivism/Neopositivism
 Posthuman Condition
 Posthumanism
 Postliberal Theology
 Postmetaphysical Theology
 Postmodern A/theology
 Postmodern Religious Theory
 Postmodern Theology
 Postmodernity
 Post-Post-Modern Pragmatism
 Post-Secular Theology
 Potential Energy
 Practical Logic
 Practical Reasoning
 Practical Theology
 Pragmatism (Theological Interpretations)
 Pragmatism on Religion and Science
Pratītya samutpāda (Sanskrit)
 Predestination
 Predictability
 Prediction
 Prevention Psychotherapy
 Primatology
 Principle of Relativity
 Prion
 Prions and Memory
 Prismatic Clock
 Prismatic Language
 Prismatic Theology
 Probability and Statistics
 Problem-Solving
 Process of Believing
 Process Theology
 Process-Relational Theology
 Production and Distribution of Goods and
 Finances
 Production of Sounds
 Program Complexity
 Progressive Judaism
 Protestant Education
 Protestant Epistemology
 Protestant Reformation
 Providence
 Proximate Causes
 Psyche
 Psychiatry
 Psychiatry in America
 Psychiatry in Europe
 Psychoanalysis of Religion
 Psychoanalysis/Depth Psychology
 Psychoanalytic Psychology
 Psychobiography
 Psychobiology
 Psychodynamic Psychology
 Psychogerontology
 Psychohistory
 Psycholinguistics
 Psychology
 Psychology in Buddhism
 Psychology in Judaism
 Psychology and Law
 Psychology in Jewish Religion
 Psychology of Language
 Psychology of Positive Human Functioning
 Psychology of Relational Buddhism
 Psychology of Religion
 Psychology of Religion China/Asia
 Psychology of Spirituality

Psychopathology	Regulation
Psychotherapy	Relational Buddhism
Psychotherapy in Africa	Relational Dharma
Pueblo Indian Religions	Relational Ontology
Pulmonary	Relationality
Punishment	Relations
Purpose	Relations in Buddhism
Qualia	Relationships
Quantum Chemistry	Relativism Cultural
Quantum Computing	Relativity
Quantum Mechanics	Relativity Theory
Quantum Physics	Religion
Quantum Physics Interpretation	Religion and Pseudoscience
Quantum Theory	Religion as Attachment
Quantum Theory, Generalized	Religion, History of
Quarks	Religion, Sociology of
Quasi-Science	Religion, Theory of
Queer Theology	Religionswissenschaft
Quietism	Religiosity
Qur'an	Religious
Rabbinic Hebrew	Religious Affiliation
Rabbinic Tradition	Religious Beliefs and Philosophy
Radical Orthodoxy	Religious Commitment
Râelian Movement	Religious Coping
Randomized Controlled Trial	Religious Education
Rate of Entropy Production	Religious Education (RE)
Rational Theology	Religious Education Theory, Roman-Catholic,
Rational Thinking in Islam	Southern Europe
Rationalism	Religious Education, Protestant
Rationality (Philosophical)	Religious Epistemology
Rationality of Theistic Belief	Religious Experience
ReaffERENCE Principle	Religious Experiences
Realism	Religious Faith
Realisms in Philosophy of Religion	Religious Practice
Reality in Buddhism	Religious Ritual
Reciprocal Altruism	Religious Sociology
Reciprocity	Religious Studies
Reckoning	Religious/Spiritual Marketplace
Reconstructionist Judaism	Religiousness
Recovery	Reproductive Success
Recursion	Research Design
Red Blood Cells	Research Methods
Redemption in Judaism	Residual Vision
Redemption and Science in Judaism	Respiratory Medicine
Reductionism	Respirology
Reflective Judgment and Moderate Living	Restoring Health
Reform Judaism	Revealed Knowledge
Reformation	Revelation

Revelation in Judaism	Second Law of Thermodynamics
Risk Analysis	Secular
Rite	Secular Jewish Movements
Ritschlianism	Secularism
Ritual	Secularism in Judaism
Ritualization	Secularization
Robot Embodiment	Secularization, Secularity, Secularism
Robot Emotions	Sedation
Robot Languages	Selection Pressures
Robot Programming	Self
Robotics and Religion	Self Organization
Robot Singularity	Self, From a Psychological Perspective
Robot Societies	Self-Actualization
Role of Religion in Society	Self-Awareness
Roman-Catholic Pastoral Theology in Europe	Self-Help
Romance	Self-Organization
Romantic	Self-Regulation
Rule-Based Ethics	Semantics
Sacrament	Semeiotic
Sacred Language	Semiconductor Physics
Salvation	Semiology
Sanctity of the Individual	Semiosis
Sarvāstivāda	Semiotics
<i>Sati</i> (Pāli)	Semitic Languages
Scalp-Recorded Potentials	Sensation
Schizophrenia	Sense-Datum Theory, The
Science	Sensory Cortex
Science and Catholicism	Sensory Evoked Potentials
Science and Kabbalah	Sensory Experience
Science and Redemption in Jewish Religion	Sentiment
Science and Religion	Sex and Gender
Science and Religion Dialogue and the Interreligious Dialogue	Sex Drive, The
Science and Revelation and the Jews	Sexual Orientation
Science and Revelation in Jewish Culture	Sexuology
Science and Scientific Knowledge, Sociology of	Shakyamuni
Science in Buddhism	Siddhartha Gautama
Science in Islam, Classification	Simulation Theory
Science in Islam, Transmission	Simulators
Science of Happiness	Sin (Vice, Human Limits, Negativity)
Science of Human Strengths and Virtues	Singularity
Science of the Stars	Skinner Box
Scientific Expansionism	Sleep Disorders
Scientific Naturalism	Sleep Medicine
Scientific Study of Religion	SLI
Scientism	<i>Smṛti</i> (Sanskrit)
Scientist-Practitioner	Social
Screenwriting	Social Cognition
	Social Component and School

Social Construction in Psychology	Sport, Sociology of
Social Constructivism	Standard Intelligence
Social Deviance	Statistics and Probability
Social Evolution	Stereotactic Surgery
Social Inference	Story
Social Influence Processes	Stress
Social Interaction Explanations	String Theory
Social Interactionism	Structure
Social Movements	Study of Character Strengths
Social Neuroscience	Study of Intelligence
Social Perception	Suffering
Social Psychology	Sufism
Social Scientific Study of Religion	Suggestibility
Social Stigma	Suggestion
Socialization	Supervenience
Socialization Process	Surgery
Sociological Psychology	Surgery in Childhood
Sociology	Surgical Procedure
Sociology and Religion	Survival
Sociology of Communication	Symbolic Interactionism
Sociology of Culture	Sympathy
Software Design	Synapse
Software Development	System
Software Engineering	System Assurance
Solar Temple	Systematic Theology
Somatology	Systems Approach
Somnology	Systems Theory
Soteriology	Tale
Soul	Taoism
Source Localization	Tawhid
Space	Technology
Space and Time	Technonature and Theology
Spacetime	Teleological Ethics
Space-Time	Television Writing
Spandrel	Temper
Spatial Dimensions	Temperament
Spatial Hemi-inattention	Temples
Special Divine Action	Theater
Speech	Theemithi
Speed of Light	Theism, Classical
Spirit	Theistic Naturalism
Spiritual Intelligence	Theodicy Problem
Spiritualism	Theological Anthropology
Spirituality	Theological Critical Realism
Spirituality, African	Theological Determinism and Indeterminism
Spirituality and Christian Theology	Theological Liberalism
Split-Brain Research	Theological Metaphysics
Spoken Language	Theological Revisionism

Theological Views and Judaism	<i>Tripitaka</i> (Sanskrit)
Theology	Truth
Theology in Judaism	Truths, Four Noble
Theology and Media	Two- and Three-Dimensional Art
Theology in Islam	Typologies in Science and Religion
Theology of Liberation	Ubuntu
Theoretical and Practical Reason	UFO
Theoretical Chemistry	UFO Cults
Theoretical Psychology	Unarius Academy
Theories of Governing	Unconscious Sight
Theories of Government	Uniquely Individual
Theories of Light and Color	Universal
Theory of Empathetic Understanding	Universality
Theory of Games	Universe
Theory of Knowledge	Unsatisfactoriness
Theory of Meaning	Upper Paleolithic
Theory of Mind	Urology
Theory of Mind Debate	Utilitarian Ethics
Theory of Relativity, The	Utilitarianism
Theory of Vision	Verse
Theory of What There Is	Vice
Theory Theory	Video Games
Theosophy	Views of Creation in the Jewish Culture
Therapy	Views of Redemption in Jewish Science
Theravada Buddhism	Views of Revelation in Judaism
Thermodynamics	<i>viññāna</i> (Sanskrit)
Thorn of Alterity	<i>viññāṇa</i> (Pāli)
Time	Violence
Time Dilation	Vipassanā
Time Reversal Invariance	Virtual Particles
<i>Tipitaka</i> (Pāli)	Virtual Worship
Tissues	Virtue
TMS	Virtue Ethics
Top Down	Visual Art
Torah	Vital Satisfaction
Traditional Theism	Voluntary Movement
Trance	Walkthrough
Tranquility	Waterfall Model
Transcendence and Immanence	Western Psychotherapy
Transcendental Sense of Physics	Whole
Transcranial Magnetic Stimulation	Wisdom (Philosophically)
Transfusion Medicine	Women in Buddhism
Transhumanism	World Economy
Transnational Christianity	World Health Organization International
Transpersonal Studies	World Religions
	Worldview